Lady of the Sea Medical Clinic
Lady of the Sea General Hospital
Cut Off, LOUISIANA 70301

Owner:
Lady of the Sea General Hospital

PROJECT MANUAL
Construction Documents Specifications

GHC Project No. 2403

GOSSEN HOLLOWAY CORTEZ
A Professional Architectural Corporation

MOLIERE CHAPPUIS ARCHITECTS
architecture planning interior design

A Joint Venture

LADY OF THE SEA MEDICAL CLINIC

ARCHITECT'S PROJECT NO. 2403

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OCTOBER 20, 2026

ARCHITECT

GOSSEN-HOLLOWAY-CORTEZ + MOLIERE

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Determination of what constitutes an equivalent product shall be the responsibility of the professionally employed architect or engineer for the project.

Substitution procedures and requirements are further described in the Instructions to Bidders, Article 3, Paragraph 3.3, “Substitutions.”

COMMUNITY DEVELOPMENT BLOCK GRANT PROGRAM
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SECTION 01000

COMMUNITY DEVELOPMENT BLOCK GRANT PROGRAM DISASTER RECOVERY RIDER

Lafourche Parish Government
New Clinic for Lady of The Sea General Hospital

Community Development Block Grant Program Disaster Recovery Rider & CDBG Compliance Provisions For Construction Contracts

This Community Development Block Grant Program Rider contains supplementary general conditions for use with procurement contracts and subrecipient agreements that are funded in whole or in part by the U.S. Department of Housing and Urban Development ("HUD") under Title I of the Housing and Community Development Act of 1974 (Pub. L. 93-383) as amended.

For all procurement contracts and subrecipient agreements funded fully or in part by the Community Development Block Grant Disaster Recovery ("CDBG-DR") Program by and between the *Lafourche Parish Government*, State of Louisiana, acting herein by Kristi M. Lumpkin, Gants & Economic Development Director hereunto duly authorized, and [*contractor*], a [*type of business (partnership, corporation)*] organized under the laws of the State of Louisiana, acting herein by Mitch Orgeron, Parish President, hereunto duly authorized; this CDBG Rider will serve as a universal addendum to each of those contracts and/or agreements.

This Rider must be signed separately as a stand-alone document, and the terms and provisions outlined herein will be applicable to all contracts and agreements between _____ *Lady of The Sea General Hospital* , and Woodward Construction in which CDBG-DR grant funds are a funding source.

FEDERAL REGISTER NOTICES

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

Federal Register Notices applicable to the use of CDBG-DR Funds for all associated grants are available on the HUD Web site at:
https://www.hudexchange.info/programs/cdbg-dr/cdbg-dr-laws-regulations-and-federal-register-notices/

CDBG COMPLIANCE PROVISIONS

for

CONSTRUCTION CONTRACTS

(These provisions must be included in all construction contracts)

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1. EQUAL EMPLOYMENT OPPORTUNITY (Equal Opportunity Clause)
(Applicable to contracts and subcontracts above $10,000)

During the performance of this contract, the Contractor agrees as follows:

A. The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, sexual orientation, gender identity or national origin. Such action shall include, but not be limited to, the following:

Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

B. The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

C. The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.

D. The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the Contractor's commitment under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

E. The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, as amended, and the rules, regulations, and relevant orders of the Secretary of Labor.

F. The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, as amended, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and others.

G. In the event of the Contractor's noncompliance with the non-discrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be cancelled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for

further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

H. The Contractor will include the provisions of the sentence immediately preceding paragraph A and the provisions of paragraphs A through H in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as administering agency may be direct as a means of enforcing such provisions, including sanctions for noncompliance:

Provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, the Contractor may request the United States to enter into such litigation to protect the interest of the United States.

2. <u>STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS</u>

(Applicable to contracts and subcontracts above $10,000)

A. As used in these specifications:

(1) "Covered area" means the geographical area described in the solicitation from which this contract resulted;

(2) "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;

(3) "Employer identification number" means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941.

(4) "Minority" includes:

(a) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);

(b) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South America or other Spanish Culture or origin, regardless of race);

(c) Asian and Pacific Islander (all persons having origins in any of the original people of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and

(d) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

B. When the Contractor, or any subcontractor, at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract, in excess of $10,000, the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.

C. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in compliance with the provisions of any such Hometown Plan. Each Contractor or subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other Contractors or subcontractors toward a goal in an approved Plan does not excuse any covered Contractor's or subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

D. The Contractor shall implement the specific affirmative action standards provided in paragraphs G(1) through G(16) of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered construction contractors performing contracts in geographical areas where they do not have a federal or federally-assisted construction contract shall apply the minority and female goals established for the geographic area where the contract is being performed. Goals are published periodically in the Federal Register in notice form and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The Contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.

E. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.

F. In order for the non-working training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

G. The Contractor shall take specific affirmative action to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:

(1) Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to

work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

(2) Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organization's responses.

(3) Maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source, or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefore, along with whatever additional actions the Contractor may have taken.

(4) Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement have not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.

(5) Develop on-the-job training opportunities and/or participate in training programs for the area which expressly includes minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under G(2) above.

(6) Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on a bulletin board accessible to all employees at each location where construction work is performed.

(7) Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination, or other employment decisions including specific review of these items with on-site supervisory personnel such as Superintendents, General Foreman, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

(8) Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written

notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.

(9) Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

(10) Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer, and vacation employment to minority and female youth both on the site and in other areas of a Contractor's work force.

(11) Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.

(12) Conduct, at least annually, an inventory and evaluation of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

(13) Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.

(14) Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

(15) Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitation to minority and female contractor associations and other business associations.

(16) Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

H. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (G(1) through G(16)). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the Contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under G(1) through G(16) of these specifications provided that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation shall not be a defense for the Contractor's non-compliance.

I. A single goal for minorities and a separate single goal for women has been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).

J. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any persons because of race, color, religion, sex, or national origin.

K. The Contractor shall not enter into any subcontract with any person or firm debarred from government contracts pursuant to E.O. 11246.

L. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause including suspension, termination, and cancellation of existing subcontracts as may be imposed or ordered pursuant to E.O. 11246, as amended.

M. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph G of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

N. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the government and to keep records. Records shall at least include for each employee, the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number where assigned, social security number, race, sex, status (e.g., mechanic, apprenticeship trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and location at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, Contractors shall not be required to maintain separate records.

O. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application or requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

3. <u>NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION</u>
(Applicable to contracts and subcontract over $10,000)

A. The Offeror’s or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.

B. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Goals for minority participation: *(see table below)*

Goals for female participation: 6.9%

These goals are applicable to all the Contractor's construction work (whether or not it is federal or federally assisted) performed in the covered area. If the contractor performs construction work in a geographic area located outside of the covered area, it shall apply the goals established for such geographic area where the work is actually performed. With regard to this second area, the Contractor also is subject to the goals for both its federally involved and non-federally involved construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3 (a) and its efforts to meet the goals established for the geographical area where the contract resulting from this solicitation is to be performed. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order, and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

MINORITY PARTICIPATION GOALS

PARISH	MIN. GOAL (%)	PARISH	MIN. GOAL (%)	PARISH	MIN. GOAL (%)	PARISH	MIN. GOAL (%)
Acadia	24.1	E. Baton Rouge	26.1	Madison	27.9	St. Landry	24.1
Allen	17.8	East Carroll	27.9	Morehouse	27.9	St. Martin	24.1
Ascension	26.1	East Feliciana	30.4	Natchitoches	29.3	St. Mary	24.1
Assumption	27.7	Evangeline	24.1	Orleans	31.0	St. Tammany	31.0
Avoyelles	29.3	Franklin	27.9	Ouachita	22.8	Tangipahoa	27.7
Beauregard	17.8	Grant	25.7	Plaquemines	27.7	Tensas	27.9
Bienville	29.3	Iberia	24.1	Pointe Coupee	30.4	Terrebonne	27.7
Bossier	29.3	Iberville	30.4	Rapides	25.7	Union	27.9
Caddo	29.3	Jackson	27.9	Red River	29.3	Vermilion	24.1
Calcasieu	19.3	Jefferson	31.0	Richland	27.9	Vernon	17.8
Caldwell	27.9	Jefferson Davis	17.8	Sabine	29.3	Washington	27.7
Cameron	17.8	Lafayette	20.6	St. Bernard	31.0	Webster	29.3
Catahoula	27.9	Lafourche	27.7	St. Charles	27.7	W. Baton Rouge	26.1
Claiborne	29.3	LaSalle	27.9	St. Helena	30.4	West Carroll	27.9
Concordia	30.4	Lincoln	27.9	St. James	27.7	West Feliciana	30.4
De Soto	29.3	Livingston	26.1	St. John the Baptist	27.7	Winn	29.3

C. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in

excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number; estimated dollar amount of the subcontract; estimated starting and completion dates of the sub-contract; and the geographical area in which the contract is to be performed.

D. As used in this Notice, and in the contract resulting from this solicitation, the "covered area" is *(insert description of the geographical areas where the contract is to be performed, giving the State, parish, and city, if any)*:

4. CERTIFICATION OF NONSEGREGATED FACILITIES

(Applicable to contracts and subcontracts over $10,000)

By the submission of this bid, the bidder, offeror, applicant or subcontractor certifies that he/she does not maintain or provide for his/her establishments, and that he/she does not permit employees to perform their services at any location, under his/her control, where segregated facilities are maintained. He/she certifies further that he/she will not maintain or provide for employees any segregated facilities at any of his/her establishments, and he/she will not permit employees to perform their services at any location under his/her control where segregated facilities are maintained. The bidder, offeror, applicant or subcontractor agrees that a breach of this certification is a violation of the equal opportunity clause of this contract.

As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation and housing facilities provided for employees which are segregated by explicit directive or are, in fact, segregated on the basis of race, color, religion, or national origin because of habit, local custom, or any other reason.

He/she further agrees that (except where he/she has obtained for specific time periods) he/she will obtain identical certification from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the equal opportunity clause; that he/she will retain such certifications in his/her files; and that he/she will forward the following notice to such proposed subcontractors (except where proposed subcontractors have submitted identical certifications for specific time periods).

5. CIVIL RIGHTS

The Contractor shall comply with the provisions of Title VI of the Civil Rights Act of 1964. No person shall, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance.

6. SECTION 109 OF THE HOUSING AND COMMUNITY DEVELOPMENT ACT OF 1974

The Contractor shall comply with the provisions of Section 109 of the Housing and Community Development Act of 1974. No person in the United States shall on the grounds of race, color, national origin, or sex be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity funded in whole or in part with funds made available under this title. Section 109 further provides that discrimination on the basis of age under the Age

Discrimination Act of 1975 or with respect to an otherwise qualified handicapped individual as provided in Section 504 of the Rehabilitation Act of 1973, as amended, is prohibited.

7. <u>SECTION 3 OF THE HOUSING AND URBAN DEVELOPMENT ACT OF 1968 - COMPLIANCE IN EMPLOYMENT AND TRAINING</u>

The work to be performed under this Contract, including services performed under any related subcontract or subrecipient agreement, is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701u (Section 3), 24 CFR §75, and 85 FR 61562, and any directives, benchmarks and programmatic requirements hereafter issued by HUD or OCD in the implementation of Section 3 requirements.

A. Section 3 requires that to the greatest extent feasible, and consistent with existing Federal, state, and local laws and regulations, recipients of CDBG assistance shall ensure that employment and training opportunities arising in connection with Section 3 projects are provided to Section 3 workers within the metropolitan area (or nonmetropolitan county) in which the project is located.

B. Section 3 also requires that to the greatest extent feasible, and consistent with existing Federal, state, and local laws and regulations, recipients covered by this subpart shall ensure contracts for work awarded in connection with Section 3 projects are provided to business concerns that provide economic opportunities to Section 3 workers residing within the metropolitan area (or nonmetropolitan county) in which the project is located.

C. The parties to this contract agree to comply with HUD's regulations in 24 CFR part 75, which implement Section 3. As evidenced by their execution of this contract, the parties to this contract certify that they are under no contractual or other impediment that would prevent them from complying with the part 75 regulations.

D. The contractor agrees, to the greatest extent feasible, take steps to achieve the Section 3 benchmarks established by HUD for Section 3 workers and Targeted Section 3 workers. Section 3 benchmarks will consist of the following two ratios: (i) The number of labor hours worked by Section 3 workers divided by the total number of labor hours worked by all workers on a Section 3 project. (ii) The number of labor hours worked by Targeted Section 3 workers as defined in § 75.21(a), divided by the total number of labor hours worked by all workers on a Section 3 project.

E. The contractor agrees to report in a manner prescribed by the Owner, (i) The total number of labor hours worked; (ii) The total number of labor hours worked by Section 3 workers; and (iii) The total number of labor hours worked by Targeted Section 3 workers.

F. If the contractor fails to achieve the HUD Section 3 benchmarks, the contractor must report in a form prescribed by the Owner on the qualitative nature of its activities and those of its subcontractors. Such qualitative efforts may, for example, include but are not limited to the following:

(1) Outreach efforts to generate job applicants who are Targeted Section 3 workers.

(2) Provided training or apprenticeship opportunities.

(3) Provided technical assistance to help Section 3 workers compete for jobs (*e.g.,* resume assistance, coaching).

(4) Provided or connected Section 3 workers with assistance in seeking employment including: drafting resumes, preparing for interviews, and finding job opportunities connecting residents to job placement services.

(5) Held one or more job fairs.

(6) Provided or referred Section 3 workers to services supporting work readiness and retention (*e.g.,* work readiness activities, interview clothing, test fees, transportation, child care).

(7) Provided assistance to apply for/or attend community college, a four-year educational institution, or vocational/technical training.

(8) Assisted Section 3 workers to obtain financial literacy training and/or coaching.

(9) Engaged in outreach efforts to identify and secure bids from Section 3 business concerns.

(10) Provided technical assistance to help Section 3 business concerns understand and bid on contracts.

(11) Divided contracts into smaller jobs to facilitate participation by Section 3 business concerns.

(12) Provided bonding assistance, guaranties, or other efforts to support viable bids from Section 3 business concerns.

(13) Promoted use of business registries designed to create opportunities for disadvantaged and small businesses.

(14) Outreach, engagement, or referrals with the state one-stop system as defined in Section 121(e)(2) of the Workforce Innovation and Opportunity Act.

G. The contractor agrees to include these Section 3 contract provisions in every subcontract subject to compliance with regulations in 24 CFR part 75 and agrees to take appropriate action, as provided in an applicable provision of the subcontract upon a finding that the subcontractor is in violation of the regulations in 24 CFR part 75. The contractor will not subcontract with any subcontractor where the contractor has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 CFR part 75.

H. Noncompliance with HUD's regulations in 24 CFR part 75 may result in sanctions, termination of this contract for default, and debarment or suspension from future HUD assisted contracts.

8. <u>SECTION 503 OF THE REHABILITATION ACT OF 1973 (29 USC 793)</u>
(Applicable to contracts and subcontracts over $10,000)

A. The contractor will not discriminate against any employee or applicant for employment because of physical or mental disability in regard to any position for which the employee or applicant for employment is qualified. The contractor agrees to take affirmative action to employ and advance in employment individuals with disabilities, and to treat qualified individuals without discrimination on the basis of their physical or mental disability in all employment practices, including the following:

(1) Recruitment, advertising, and job application procedures;

(2) Hiring, upgrading, promotion, award of tenure, demotion, transfer, layoff, termination, right of return from layoff and rehiring;

(3) Rates of pay or any other form of compensation and changes in compensation;

(4) Job assignments, job classifications, organizational structures, position descriptions, lines of progression, and seniority lists;

(5) Leaves of absence, sick leave, or any other leave;

(6) Fringe benefits available by virtue of employment, whether or not administered by the contractor;

(7) Selection and financial support for training, including apprenticeship, professional meetings, conferences, and other related activities, and selection for leaves of absence to pursue training;

(8) Activities sponsored by the Contractor including social or recreational programs;

(9) Any other term, condition, or privilege of employment.

B. The Contractor agrees to comply with the rules, regulations, and relevant orders of the Secretary of Labor issued pursuant to the Act.

C. In the event of the Contractor's noncompliance with the requirements of this clause, actions for noncompliance may be taken in accordance with the rules, regulations, and relevant orders of the Secretary of Labor issued pursuant to the Act.

D. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices in a form to be prescribed by the Director, Office of Federal Contract Compliance Programs, provided by or through the contracting officer. Such notices shall state the rights of applicants and employees as well as the Contractor's obligation under the law to take affirmative action to employ and advance in employment qualified employees and applicants with disabilities. The contractor must ensure that applicants or employees with disabilities are provided the notice in a form that is accessible and understandable to the individual applicant or employee (e.g., providing Braille or large print versions of the notice, or posting a copy of the notice at a lower height for easy viewing by a person using a wheelchair). With respect to employees who do not work at a physical location of the contractor, a contractor will satisfy its posting obligations by posting such notices in an electronic format, provided that the contractor provides computers, or access to computers, that can access the electronic posting to such employees, or the contractor has actual knowledge that such employees otherwise are able to access the electronically posted notices. Electronic notices for employees must be posted in a conspicuous location and format on the company's intranet or sent by electronic mail to employees. An electronic posting must be used by the contractor to notify job applicants of their rights if the contractor utilizes an electronic application process. Such electronic applicant notice must be conspicuously stored with, or as part of, the electronic application.

E. The Contractor will notify each labor organization or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the Contractor is bound by the terms of Section 503 of the Rehabilitation Act of 1973, and is committed to take affirmative action to employ and advance in employment, and shall not discriminate against, individuals with physical or mental disabilities.

F. The Contractor will include the provisions of this clause in every subcontract or purchase order of $10,000 or more unless exempted by rules, regulations, or orders of the Secretary issued pursuant to Section 503 of the Act, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the Director of the Office of Federal Contract Compliance Programs may direct to enforce such provisions, including action for noncompliance.

G. The contractor must, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment and will not be discriminated against on the basis of disability.

9. SECTION 504 OF THE REHABILITATION ACT OF 1973, AS AMENDED

The Contractor agrees that no otherwise qualified individual with disabilities shall, solely by reason of his disability, be denied the benefits, or be subjected to discrimination including discrimination in employment, any program or activity that receives the benefits from the federal financial assistance.

10. AGE DISCRIMINATION ACT OF 1975

The Contractor shall comply with the provisions of the Age Discrimination Act of 1975. No person in the United States shall, on the basis of age, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under, any program or activity receiving federal financial assistance.

11. CERTIFICATION OF COMPLIANCE WITH AIR AND WATER ACTS
(Applicable to contracts and subcontracts exceeding $150,000)

The Contractor and all subcontractors shall comply with the requirements of the Clean Air Act, as amended, 42 USC 7401 et seq., the Federal Water Pollution Control Act, as amended, 33 USC 1251 et seq. Violations must be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA)

In addition to the foregoing requirements, all nonexempt contractors and subcontractors shall furnish to the owner, the following:

A. A stipulation by the Contractor or subcontractors, that any facility to be utilized in the performance of any nonexempt contract or subcontract, is not listed on the List of Violating Facilities issued by the Environmental Protection Agency (EPA) pursuant to 40 CFR Part 15, as amended.

B. Agreement by the Contractor to comply with all the requirements of Section 114 of the Clean Air Act, as amended, (42 USC 1857 c-8) and Section 308 of the Federal Water Pollution Control Act, as amended, (33 USC 1318) relating to inspection, monitoring, entry, reports and information, as well as all other requirements specified in said Section 114 and Section 308, and all regulations and guidelines issued thereunder

C. A stipulation that as a condition for the award of the contract, prompt notice will be given of any notification received from the Director, Office of Federal Activities, EPA, indicating that a facility

utilized, or to be utilized for the contract, is under consideration to be listed on the EPA List of Violating Facilities.

D. Agreement by the Contractor that he will include, or cause to be included, the criteria and requirements in paragraph (1) through (4) of this section in every nonexempt subcontract and requiring that the Contractor will take such action as the government may direct as a means of enforcing such provisions.

12. SPECIAL CONDITIONS PERTAINING TO HAZARDS, SAFETY STANDARDS AND ACCIDENT PREVENTION

A. Lead-Based Paint Hazards
(Include in contracts for construction or rehabilitation of residential structures)

The construction or rehabilitation of residential structures is subject to the HUD Lead-Based Paint regulations, 24 CFR Part 35. The Contractor and subcontractors shall comply with the provisions for the elimination of lead-based paint hazards under Subpart B of said regulations. The Owner will be responsible for the inspections and certifications required under Section 35.14 (f) thereof.

B. Use of Explosives (Modify as Required)

When the use of explosives is necessary for the prosecution of the work, the Contractor shall observe all local, state and federal laws in purchasing and handling explosives. The Contractor shall take all necessary precaution to protect completed work, neighboring property, water lines, or other underground structures. Where there is danger to structures or property from blasting, the charges shall be reduced and the material shall be covered with suitable timber, steel or rope mats.

The Contractor shall notify all owners of public utility property of intention to use explosives at least 8 hours before blasting is done close to such property. Any supervision or direction of use of explosives by the engineer does not in any way reduce the responsibility of the Contractor or his Surety for damages that may be caused by such use.

C. Danger Signals and Safety Devices (Modify as Required)

The Contractor shall make all necessary precautions to guard against damages to property and injury to persons. He shall put up and maintain in good condition, sufficient red or warning lights at night, suitable barricades and other devices necessary to protect the public. In case the Contractor fails or neglects to take such precautions, the Owner may have such lights and barricades installed and charge the cost of this work to the Contractor. Such action by the Owner does not relieve the Contractor of any liability incurred under these specifications or contract.

13. FLOOD DISASTER PROTECTION

This contract is subject to the requirements of the Flood Disaster Protection Act of 1973 (P.L. 93-234). Nothing included as a part of this contract is approved for acquisition or construction purposes as defined under Section 3(a) of said

Act, for use in an area identified by the Secretary of HUD as having special flood hazards which is located in a community not then in compliance with the requirements for participation in the National Flood Insurance Program pursuant to Section 201(d) of said Act; and the use of any assistance provided under this contract for such acquisition for construction in such identified areas in communities then participating in the National Flood Insurance Program shall be subject to the mandatory purchase of flood insurance requirements or Section 102(a) of said Act.

Any contract or agreement for the sale, lease, or other transfer of land acquired, cleared or improved with assistance provided under this Contract shall contain, if such land is located in an area identified by the Secretary as having special flood hazards and in which the sale of flood insurance has been made available under the National Flood Insurance Act of 1968, as amended, 42 U.S.C. 4001 et seq., provisions obligating the transferee and its successors or assigns to obtain and maintain, during the ownership of such land, such flood insurance as required with respect to financial assistance for acquisition or construction purposes under Section 102(a) of Flood Disaster Protection Act of 1973.

14. ACCESS TO RECORDS - MAINTENANCE OF RECORDS

The State of Louisiana, the Department of Housing and Urban Development, the Comptroller General of the United States, or any of their duly authorized representatives, shall have access to any books, documents, papers and records of the Contractor which are directly pertinent to this specific contract, for the purpose of audits, examinations, and making excerpts and transcriptions. All records connected with this contract will be maintained in a central location by the unit of local government and will be maintained for a period of five (5) years after the official date of the State's final closeout of its grant with HUD.

15. INSPECTION

The authorized representative and agents of the State of Louisiana and the Department of Housing and Urban Development shall be permitted to inspect all work, materials, payrolls, records of personnel, invoices of materials, and other relevant data and records.

16. REPORTING REQUIREMENTS

The Contractor shall complete and submit all reports, in such form and according to such schedule, as may be required by the Owner.

17. CONFLICT OF INTEREST

A. No officer or employee of the local jurisdiction or its designees or agents, no member of the governing body, and no other public official of the locality who his/her tenure or for one year thereafter, shall have any interest, direct or indirect, in any contract or subcontract, or the proceeds thereof, for work to be performed. Further, the Contractor shall cause to be incorporated in all subcontracts the language set forth in this paragraph prohibiting conflict of interest.

B. No member of or delegate to Congress, or Resident Commissioner, shall be admitted to any share or part of this contract or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this contract if made with a corporation for its general benefit.

18. ACTIVITIES AND CONTRACTS NOT SUBJECT TO EXECUTIVE ORDER 11246, AS AMENDED
(Applicable to contracts and subcontracts of $10,000 and under)

During the performance of this contract, the Contractor agrees as follows:

A. The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor shall take affirmative action to ensure that applicants for employment are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship.

B. The Contractor shall post in conspicuous places, available to employees and applicants for employment, notices to be provided by Contracting Officer setting forth the provisions of this non-discrimination clause. The Contractor shall state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

C. Contractors shall incorporate foregoing requirements in all subcontracts.

19. PATENTS

A. The Contractor shall hold and save the Owner and its officers, agents, servants, and employees harmless from liability of any nature or kind, including cost and expenses for, or on account of any patented or unpatented invention, process, article, or appliance manufactured or used in the performance of the contract including its use by the Owner, unless otherwise specifically stipulated in the Contract Document.

B. License or Royalty Fees: License and/or Royalty Fees for the use of a process which is authorized by the Owner of the project must be reasonable, and paid to the holder of the patent, or his authorized license, direct by the Owner and not by or through the Contractor.

C. If the Contractor uses any design device or materials covered by letters, patent or copyright, he shall provide for such use by suitable agreement with the owner of such patented or copy-righted design device or material. It is mutually agreed and understood, that without exception the contract prices shall include all royalties or costs arising from the use of such design, device or materials, in any way involved in the work. The Contractor and/or his Sureties shall indemnify and save harmless the Owner of the project from any and all claims for infringement by reason of the use of such patented or copy-righted design, device or materials or any trademark or copy-right in connection with work agreed to be performed under this contract, and shall indemnify the Owner for any cost, expense, or damage which it may be obliged to pay by reason of such infringement at any time during the prosecution of the work or after completion of the work.

20. COPYRIGHT

No materials, to include but not limited to reports, maps, or documents produced as a result of this contract, in whole or in part, shall be available to the Contractor for copyright purposes. Any such materials produced as a result of this contract that might be subject to copyright shall be the property of the Owner and all such rights shall belong to the Owner.

21. TERMINATION FOR CAUSE

If, through any cause, the Contractor shall fail to fulfill in a timely and proper manner his obligations under this contract, or if the Contractor shall violate any of the covenants, agreements, or stipulations of this contract, the Owner shall thereupon have the right to terminate this contract by giving written notice to the Contractor of such termination and specifying the effective date thereof, at least five (5) days before the effective date of such termination. In such event, all finished or unfinished documents, data, studies, surveys, drawings, maps, models, photographs, and reports prepared by the Contractor under this contract shall, at the option of the Owner, become the Owner's property and the Contractor shall be entitled to receive just and equitable compensation for any work satisfactorily completed hereunder. Notwithstanding the above, the Contractor shall not be relieved of liability to the Owner for damages sustained by the Owner by virtue of any breach of the contract by the Contractor, and the Owner may withhold any payments to the Contractor for the purpose of set-off until such time as the exact amount of damages due the Owner from the Contractor is determined.

22. TERMINATION FOR CONVENIENCE

The Owner may terminate this contract at any time by giving at least ten (10) days notice in writing to the Contractor. If the contract is terminated by the Owner as provided herein, the Contractor will be paid for the time provided and expenses incurred up to the termination date.

23. ENERGY EFFICIENCY

The Contractor shall comply with mandatory standards and policies relating to energy efficiency which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (Public Law 94-163).

24. SUBCONTRACTS

A. The Contractor shall not enter into any subcontract with any subcontractor who has been debarred, suspended, declared ineligible, or voluntarily excluded from participating in contacting programs by any agency of the United States Government or the State of Louisiana.

B. The Contractor shall be as fully responsible to the Owner for the acts and omissions of the Contractor's subcontractors, and of persons either directly or indirectly employed by them, as he is for the acts and omissions of persons directly employed by the Contractor.

C. The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the work to bind subcontractor to the Contractor by the terms of the contract documents insofar as applicable to the work of subcontractors and to give the Contractor the same power as regards terminating any subcontract that the Owner may exercise over the Contractor under any provision of the contract documents.

D. Nothing contained in this contract shall create any contractual relation between any subcontractor and the Owner.

25. DEBARMENT, SUSPENSION, AND INELIGIBILITY

The Contractor represents and warrants that it and its subcontractors are not debarred, suspended, or placed in ineligibility status under the provisions of 2 CFR 180 that implement Executive Order 12549, *Debarment and Suspension* (3 CFR Part 1986 Comp., p. 189) and Executive Order 12689, *Debarment and Suspension* (3 CFR Part 1989 Comp., p. 235).

26. PROTECTION OF LIVES AND HEALTH

The Contractor shall exercise proper precaution at all times for the protection of persons and property and shall be responsible for all damages to persons or property, either on or off the worksite, which occur as a result of his prosecution of the work. The safety provisions of applicable laws and building and construction codes, in addition to specific safety and health regulations described by Chapter XIII, Bureau of Labor Standards, Department of Labor, Part 1518, Safety and Health Regulations for Construction, as outlined in the Federal Register, Volume 36, No. 75, Saturday, April 17, 1971, Title 29 - LABOR, shall be observed and the Contractor shall take or cause to be taken, such additional safety and health measures as the Owner may determine to be reasonably necessary.

27. BREACH OF CONTRACT TERMS

Any violation or breach of terms of this contract on the part of the Contractor or the Contractor's subcontractors may result in the suspension or termination of this contract or such other action that may be necessary to enforce the rights of the parties of this contract. The duties and obligations imposed by the contract documents and the rights and remedies available thereunder shall be in addition to and not a limitation of any duties, obligations, rights and remedies otherwise imposed or available by law.

28. PROVISIONS REQUIRED BY LAW DEEMED INSERTED

Each and every provision of law and clause required by law to be inserted in this contract shall be deemed to be inserted herein and the contract shall be read and enforced as though it were included herein, and if through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the application of either party the contract shall forthwith be physically amended to make such insertion or correction.

29. CHANGES

The Owner may, from time to time, request changes in the scope of the services of the Contractor to be performed hereunder. Such changes, including any increase or decrease in the amount of the Contractor's compensation which are mutually agreed upon by and between the Owner and the Contractor, shall be incorporated in written and executed amendments to this Contract.

30. PERSONNEL

The Contractor represents that it has, or will secure at its own expense, all personnel required in performing the services under this Contract. Such personnel shall not be employees of or have any contractual relationship with the Owner.

All the services required hereunder will be performed by the Contractor or under its supervision, and all personnel engaged in the work shall be fully qualified and shall be authorized or permitted under State and local law to perform such services.

No person who is serving sentence in a penal or correctional institution shall be employed on work under this Contract.

31. ANTI-KICKBACK RULES

Salaries of personnel performing work under this Contract shall be paid unconditionally and not less often than once a month without payroll deduction or rebate on any account except only such payroll deductions as are mandatory by law or permitted by the applicable regulations issued by the Secretary of Labor pursuant to the "Anti-Kickback Act" of June 13, 1934 (48 Stat. 948; 62 Stat. 740; 63 Stat. 108; Title 18 U.S.C. 874; and Title 40 U.S.C. 276c). The Contractor shall comply with all applicable "Anti-Kickback" regulations and shall insert appropriate provisions in all subcontracts covering work under this contract to insure compliance by the subcontractors with such regulations, and shall be responsible for the submission of affidavits required of subcontractors thereunder except as the Secretary of Labor may specifically provide for variations of or exemptions from the requirements thereof.

32. ASSIGNABILITY

The Contractor shall not assign any interest in this Contract, and shall not transfer any interest in the same (whether by assignment or novation) without prior written approval of the Owner provided that claims for money due or to become due the Contractor from the Owner under this Contract may be assigned to a bank, trust company, or other financial institution, or to a Trustee in Bankruptcy, without such approval. Notice of any such assignment or transfer shall be furnished promptly to the Owner.

33. INTEREST OF CONTRACTOR

The Contractor covenants that he presently has no interest and shall not acquire any interest direct or indirect in the above described project or any parcels therein or any other interest which would conflict in any manner or degree with the performance of his services hereunder. The Contractor further covenants that in the performance of this Contract no person having any such interest shall be employed.

34. POLITICAL ACTIVITY

The Contractor will comply with the provisions of the Hatch Act (5 U.S.C. 1501 et seq.), which limits the political activity of employees.

35. COMPLIANCE WITH THE OFFICE OF MANAGEMENT AND BUDGET

The parties agree to comply with the regulations, policies, guidelines, and requirements of the Office of Management and Budget, *"Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards"*, 2 CFR Part 200, as they relate to the use of Federal funds under this contract.

36. DISCRIMINATION DUE TO BELIEFS

No person with responsibilities in operation of the project to which this grant relates will discriminate with respect to any program participant or any applicant for participation in such program because of political affiliation or beliefs.

37. CONFIDENTIAL FINDINGS

All of the reports, information, data, etc., prepared or assembled by the Contractor under this Contract are confidential, and the Contractor agrees that they shall not be made available to any individual or organization without prior written approval of the Owner.

38. LOBBYING

The Contractor certifies, to the best of his or her knowledge and belief that:

A. No federally appropriated funds have been paid or will be paid, by or on behalf of the contractor, to any person for influencing or attempting to influence an officer or employee of any agency, a member of Congress, an officer or employee of Congress, or an employee of a member of Congress in connection with the awarding of any federal contract, the making of any federal grant, the making of any federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any federal contract, grant, loan, or cooperative agreement.

B. If any funds other than federally appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a member of Congress, an officer or employee of Congress, or an employee of a member of Congress in connection with this federal contract, grant, loan, or cooperative agreement, the contractor shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

39. CONTRACTING WITH SMALL AND MINORITY FIRMS, WOMEN'S BUSINESS ENTERPRISES, AND LABOR SURPLUS AREA FIRMS

The Contractor will take necessary affirmative steps to assure that minority firms, women's business enterprises, and labor surplus area firms are used in subcontracting when possible. Steps include:

A. Placing qualified small and minority businesses and women's business enterprises on solicitation lists;

B. Assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources;

C. Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority business, and women's business enterprises;

D. Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority business, and women's business enterprises; and

E. Using the services and assistance of the Small Business Administration, and the Minority Business Development Agency of the Department of Commerce.

40. PROCUREMENT OF RECOVERED MATERIALS

A. In accordance with Section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, the Contractor shall procure items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR Part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition. The Contractor shall procure items designated in the EPA guidelines that contain the highest percentage of recovered materials practicable unless the Contractor determines that such items: (1) are not reasonably available in a reasonable period of time; (2) fail to meet reasonable performance standards, which shall be determined on the basis of the guidelines of the National Institute of Standards and Technology, if applicable to the item; or (3) are only available at an unreasonable price.

B. Paragraph A of this clause shall apply to items purchased under this contract where: (1) the Contractor purchases in excess of $10,000 of the item under this contract; or (2) during the preceding Federal fiscal year, the Contractor: (i) purchased any amount of the items for use under a contract that was funded with Federal appropriations and was with a Federal agency or a State agency or agency of a political subdivision of a State; and (ii) purchased a total of in excess of $10,000 of the item both under and outside that contract.

41. PROHIBITION ON CONTRACTING FOR COVERED TELECOMMUNICATIONS EQUIPMENT OR SERVICES

A. Definitions. As used in this clause, the terms backhaul; covered foreign country; covered telecommunications equipment or services; interconnection arrangements; roaming; substantial or essential component; and telecommunications equipment or services have the meaning as defined in FEMA Policy 405-143-1, Prohibitions on Expending FEMA Award Funds for Covered Telecommunications Equipment or Services (Interim), as used in this clause—

B. Prohibitions.

i) Section 889(b) of the John S. McCain National Defense Authorization Act for Fiscal Year 2019, Pub. L. No. 115-232, and 2 C.F.R. § 200.216 prohibit the head of an executive agency on or after Aug.13, 2020, from obligating or expending grant, cooperative agreement, loan, or loan guarantee funds on certain telecommunications products or from certain entities for national security reasons.

ii) Unless an exception in paragraph (c) of this clause applies, the contractor and its subcontractors may not use grant, cooperative agreement, loan, or loan guarantee funds from the Federal Emergency Management Agency to:

(1) Procure or obtain any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology of any system;

(2) Enter into, extend, or renew a contract to procure or obtain any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology of any system;

(3) Enter into, extend, or renew contracts with entities that use covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system; or

(4) Provide, as part of its performance of this contract, subcontract, or other contractual instrument, any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system.

C. Exceptions.

i) This clause does not prohibit contractors from providing—

(1) A service that connects to the facilities of a third-party, such as backhaul, roaming, or interconnection arrangements; or

(2) Telecommunications equipment that cannot route or redirect user data traffic or permit visibility into any user data or packets that such equipment transmits or otherwise handles.

ii) By necessary implication and regulation, the prohibitions also do not apply to:

(1) Covered telecommunications equipment or services that:

i. Are not used as a substantial or essential component of any system; and
ii. Are not used as critical technology of any system.

(2) Other telecommunications equipment or services that are not considered covered telecommunications equipment or services.

D. Reporting requirement.

i) In the event the contractor identifies covered telecommunications equipment or services used as a substantial or essential component of any system, or as critical technology as part of any system, during contract performance, or the contractor is notified of such by a subcontractor at any tier or by any other source, the contractor shall report the information in paragraph (d)(2) of this clause to the recipient or subrecipient, unless elsewhere in this contract are established procedures for reporting the information.

ii) The Contractor shall report the following information pursuant to paragraph (d)(1) of this clause:

(1) Within one business day from the date of such identification or notification: The contract number; the order number(s), if applicable; supplier name; supplier unique entity identifier (if known); supplier Commercial and Government Entity (CAGE) code (if known); brand; model number (original equipment manufacturer number, manufacturer part number, or wholesaler number); item description; and any readily available information about mitigation actions undertaken or recommended.

(2) Within 10 business days of submitting the information in paragraph (d)(2)(i) of this clause: Any further available information about mitigation actions undertaken or recommended. In addition, the contractor shall describe the efforts it undertook to prevent use or submission of covered telecommunications equipment or services, and any additional efforts that will be incorporated to prevent future use or submission of covered telecommunications equipment or services.

iii) Subcontracts. The Contractor shall insert the substance of this clause, including this paragraph, in all subcontracts and other contractual instruments."

42. DOMESTIC PREFERENCES FOR PROCUREMENTS

As appropriate, and to the extent consistent with law, the contractor should, to the greatest extent practicable, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States. This includes, but is not limited to iron, aluminum, steel, cement, and other manufactured products.

For purposes of this clause:

Produced in the United States means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States.

Manufactured products mean items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber

43. FEDERAL LABOR STANDARDS PROVISIONS

The Contractor shall abide by the requirements of the Federal Labor Standards Provisions (form HUD-4010) as follows.

44. AUTHORIZATION

ATTEST:

Lafourche Parish Government

_____

By: Kristi Lumpkin, Grants & Economic Development Director
[*name & title of GRANTEE Representative*]

_____

Date: _____

[name of CONTRACTOR]

_____

By: _____
[*name & title of CONTRACTOR Representative*]

_____

Date: _____

HUD-4010
Federal Labor Standards Provisions

U.S. Department of Housing and Urban Development
Office of Davis-Bacon and Labor Standards

A. APPLICABILITY

The Project or Program to which the construction work covered by this Contract pertains is being assisted by the United States of America, and the following Federal Labor Standards Provisions are included in this Contract pursuant to the provisions applicable to such Federal assistance.

1. Minimum wages and fringe benefits

i. All laborers and mechanics employed or working upon the site of the work (or otherwise working in construction or development of the project under a development statute), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of basic hourly wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. As provided in 29 CFR 5.5(d) and (e), the appropriate wage determinations are effective by operation of law even if they have not been attached to the contract. Contributions made or costs reasonably anticipated for bona fide fringe benefits under the Davis-Bacon Act (40 U.S.C. 3141(2)(B)) on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(v) of these contract clauses; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics must be paid the appropriate wage rate and fringe benefits on the wage determination for the classification(s) of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: *Provided,* That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classifications and wage rates conformed under 29 CFR 5.5(a)(1)(iii)) and the Davis-Bacon poster (WH-1321) must be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

ii. Frequently recurring classifications

A. In addition to wage and fringe benefit rates that have been determined to be prevailing under the procedures set forth in 29 CFR part 1, a wage determination may contain, pursuant to § 1.3(f), wage and fringe benefit rates for classifications of laborers and mechanics for which conformance requests are regularly submitted pursuant to 29 CFR 5.5(a)(1)(iii), provided that:

1. The work performed by the classification is not performed by a classification in the wage determination for which a prevailing wage rate has been determined;
2. The classification is used in the area by the construction industry; and
3. The wage rate for the classification bears a reasonable relationship to the prevailing wage rates contained in the wage determination.

B. The Administrator will establish wage rates for such classifications in accordance with 29 CFR 5.5(a)(1)(iii)(A)(3). Work performed in such a classification must be paid at no less than the wage and fringe benefit rate listed on the wage determination for such classification.

iii. Conformance

A. The contracting officer must require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract be

classified in conformance with the wage determination. Conformance of an additional classification and wage rate and fringe benefits is appropriate only when the following criteria have been met:

1. The work to be performed by the classification requested is not performed by a classification in the wage determination; and
2. The classification is used in the area by the construction industry; and
3. The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

B. The conformance process may not be used to split, subdivide, or otherwise avoid application of classifications listed in the wage determination.

C. If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken will be sent by the contracting officer by email to DBAconformance@dol.gov. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30–day period that additional time is necessary.

D. In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer will, by email to DBAconformance@dol.gov, refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30–day period that additional time is necessary.

E. The contracting officer must promptly notify the contractor of the action taken by the Wage and Hour Division under 29 CFR 5.5 (a)(1)(iii)(C) and (D). The contractor must furnish a written copy of such determination to each affected worker or it must be posted as a part of the wage determination. The wage rate (including fringe benefits where appropriate) determined pursuant to 29 CFR 5.5 (a)(1)(iii)(C) or (D) must be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

iv. Fringe benefits not expressed as an hourly rate

Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor may either pay the benefit as stated in the wage determination or may pay another bona fide fringe benefit or an hourly cash equivalent thereof.

v. Unfunded plans

If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, *Provided,* That the Secretary of Labor has found, upon the written request of the contractor, in accordance with the criteria set forth in 29 CFR 5.28, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

vi. Interest In the event of a failure to pay all or part of the wages required by the contract, the contractor will be required to pay interest on any underpayment of wages.

2. **Withholding**

   i. **Withholding requirements**

   The U. S. Department of Housing and Urban Development may, upon its own action, or must, upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor so much of the accrued payments or advances as may be considered necessary to satisfy the liabilities of the prime contractor or any subcontractor for the full amount of wages and monetary relief, including interest, required by the clauses set forth in 29 CFR 5.5(a) for violations of this contract, or to satisfy any such liabilities required by any other Federal contract, or federally assisted contract subject to Davis-Bacon labor standards, that is held by the same prime contractor (as defined in 29 CFR 5.2). The necessary funds may be withheld from the contractor under this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract that is subject to Davis-Bacon labor standards requirements and is held by the same prime contractor, regardless of whether the other contract was awarded or assisted by the same agency, and such funds may be used to satisfy the contractor liability for which the funds were withheld. In the event of a contractor's failure to pay any laborer or mechanic, including any apprentice or helper working on the site of the work (or otherwise working in construction or development of the project under a development statute) all or part of the wages required by the contract, or upon the contractor's failure to submit the required records as discussed in 29 CFR 5.5(a)(3)(iv), HUD may on its own initiative and after written notice to the contractor, sponsor, applicant, owner, or other entity, as the case may be, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

   ii. **Priority to withheld funds**

   The Department has priority to funds withheld or to be withheld in accordance with 29 CFR 5.5(a)(2)(i) or (b)(3)(i), or both, over claims to those funds by:

   A. A contractor's surety(ies), including without limitation performance bond sureties and payment bond sureties;
   B. A contracting agency for its reprocurement costs;
   C. A trustee(s) (either a court-appointed trustee or a U.S. trustee, or both) in bankruptcy of a contractor, or a contractor's bankruptcy estate;
   D. A contractor's assignee(s);
   E. A contractor's successor(s); or
   F. A claim asserted under the Prompt Payment Act, 31 U.S.C. 3901-3907.

3. **Records and certified payrolls**

   i. **Basic record requirements**

   A. Length of record retention. All regular payrolls and other basic records must be maintained by the contractor and any subcontractor during the course of the work and preserved for all laborers and mechanics working at the site of the work (or otherwise working in construction or development of the project under a development statute) for a period of at least 3 years after all the work on the prime contract is completed.

   B. Information required Such records must contain the name; Social Security number; last known address, telephone number, and email address of each such worker; each worker's correct classification(s) of work actually performed; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in 40 U.S.C. 3141(2)(B) of the Davis-Bacon Act); daily and weekly number of hours actually worked in total and on each covered contract; deductions made; and actual wages paid.

   C. Additional records relating to fringe benefits. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(v) that the wages of any laborer or mechanic include the amount of any

costs reasonably anticipated in providing benefits under a plan or program described in 40 U.S.C. 3141(2)(B) of the Davis-Bacon Act, the contractor must maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits.

D. **Additional records relating to apprenticeship** Contractors with apprentices working under approved programs must maintain written evidence of the registration of apprenticeship programs, the registration of the apprentices, and the ratios and wage rates prescribed in the applicable programs.

ii. **Certified payroll requirements**

A. **Frequency and method of submission** The contractor or subcontractor must submit weekly, for each week in which any DBA- or Related Acts-covered work is performed, certified payrolls to HUD if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the certified payrolls to the applicant, sponsor, owner, or other entity, as the case may be, that maintains such records, for transmission to HUD. The prime contractor is responsible for the submission of all certified payrolls by all subcontractors. A contracting agency or prime contractor may permit or require contractors to submit certified payrolls through an electronic system, as long as the electronic system requires a legally valid electronic signature; the system allows the contractor, the contracting agency, and the Department of Labor to access the certified payrolls upon request for at least 3 years after the work on the prime contract has been completed; and the contracting agency or prime contractor permits other methods of submission in situations where the contractor is unable or limited in its ability to use or access the electronic system

B. **Information required** The certified payrolls submitted must set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i)(B), except that full Social Security numbers and last known addresses, telephone numbers, and email addresses must not be included on weekly transmittals. Instead, the certified payrolls need only include an individually identifying number for each worker (*e.g.*, the last four digits of the worker's Social Security number). The required weekly certified payroll information may be submitted using Optional Form WH-347 or in any other format desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at *https://www.dol.gov/sites/dolgov/files/WHD/legacy/files/wh347.pdf* or its successor website. It is not a violation of this section for a prime contractor to require a subcontractor to provide full Social Security numbers and last known addresses, telephone numbers, and email addresses to the prime contractor for its own records, without weekly submission by the subcontractor to the sponsoring government agency (or the applicant, sponsor, owner, or other entity, as the case may be, that maintains such records).

C. **Statement of Compliance** Each certified payroll submitted must be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor, or the contractor's or subcontractor's agent who pays or supervises the payment of the persons working on the contract, and must certify the following:

1. That the certified payroll for the payroll period contains the information required to be provided under 29 CFR 5.5(a)(3)(ii), the appropriate information and basic records are being maintained under 29 CFR 5.5 (a)(3)(i), and such information and records are correct and complete;
2. That each laborer or mechanic (including each helper and apprentice) working on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly

from the full wages earned, other than permissible deductions as set forth in 29 CFR part 3; and

3. That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification(s) of work actually performed, as specified in the applicable wage determination incorporated into the contract.

D. **Use of Optional Form WH-347** The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 will satisfy the requirement for submission of the "Statement of Compliance" required by 29 CFR 5.5(a)(3)(ii)(C).

E. **Signature** The signature by the contractor, subcontractor, or the contractor's or subcontractor's agent must be an original handwritten signature or a legally valid electronic signature.

F. **Falsification** The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under 18 U.S.C. 1001 and 31 U.S.C. 3729.

G. **Length of certified payroll retention** The contractor or subcontractor must preserve all certified payrolls during the course of the work and for a period of 3 years after all the work on the prime contract is completed.

iii. **Contracts, subcontracts, and related documents** The contractor or subcontractor must maintain this contract or subcontract and related documents including, without limitation, bids, proposals, amendments, modifications, and extensions. The contractor or subcontractor must preserve these contracts, subcontracts, and related documents during the course of the work and for a period of 3 years after all the work on the prime contract is completed.

iv **Required disclosures and access**

A. **Required record disclosures and access to workers** The contractor or subcontractor must make the records required under 29 CFR 5.5(a)(3)(i)–(iii), and any other documents that HUD or the Department of Labor deems necessary to determine compliance with the labor standards provisions of any of the applicable statutes referenced by 29 CFR 5.1, available for inspection, copying, or transcription by authorized representatives of HUD or the Department of Labor, and must permit such representatives to interview workers during working hours on the job.

B. **Sanctions for non-compliance with records and worker access requirements** If the contractor or subcontractor fails to submit the required records or to make them available, or refuses to permit worker interviews during working hours on the job, the Federal agency may, after written notice to the contractor, sponsor, applicant, owner, or other entity, as the case may be, that maintains such records or that employs such workers, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available, or to permit worker interviews during working hours on the job, may be grounds for debarment action pursuant to 29 CFR 5.12. In addition, any contractor or other person that fails to submit the required records or make those records available to WHD within the time WHD requests that the records be produced will be precluded from introducing as evidence in an administrative proceeding under 29 CFR part 6 any of the required records that were not provided or made available to WHD. WHD will take into consideration a reasonable request from the contractor or person for an extension of the time for submission of records. WHD will determine the reasonableness of the request and may consider, among other things, the location of the records and the volume of production.

C. **Required information disclosures** Contractors and subcontractors must maintain the full Social Security number and last known address, telephone number, and email address of each covered worker, and must provide them upon request to HUD if the agency is a party to

the contract, or to the Wage and Hour Division of the Department of Labor. If the Federal agency is not such a party to the contract, the contractor, subcontractor, or both, must, upon request, provide the full Social Security number and last known address, telephone number, and email address of each covered worker to the applicant, sponsor, owner, or other entity, as the case may be, that maintains such records, for transmission to HUD, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or other compliance action.

4. Apprentices and equal employment opportunity

i. Apprentices

A. Rate of pay Apprentices will be permitted to work at less than the predetermined rate for the work they perform when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship (OA), or with a State Apprenticeship Agency recognized by the OA. A person who is not individually registered in the program, but who has been certified by the OA or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice, will be permitted to work at less than the predetermined rate for the work they perform in the first 90 days of probationary employment as an apprentice in such a program. In the event the OA or a State Apprenticeship Agency recognized by the OA withdraws approval of an apprenticeship program, the contractor will no longer be permitted to use apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

B. Fringe benefits Apprentices must be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringe benefits must be paid in accordance with that determination.

C. Apprenticeship ratio The allowable ratio of apprentices to journeyworkers on the job site in any craft classification must not be greater than the ratio permitted to the contractor as to the entire work force under the registered program or the ratio applicable to the locality of the project pursuant to 29 CFR 5.5(a)(4)(i)(D). Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated in 29 CFR 5.5(a)(4)(i)(A), must be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under this section must be paid not less than the applicable wage rate on the wage determination for the work actually performed.

D. Reciprocity of ratios and wage rates Where a contractor is performing construction on a project in a locality other than the locality in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyworker's hourly rate) applicable within the locality in which the construction is being performed must be observed. If there is no applicable ratio or wage rate for the locality of the project, the ratio and wage rate specified in the contractor's registered program must be observed.

ii Equal employment opportunity The use of apprentices and journeyworkers under this part must be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

5 Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

6 **Subcontracts.** The contractor or subcontractor must insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (11), along with the applicable wage determination(s) and such other clauses or contract modifications as the U.S. Department of Housing and Urban Development may by appropriate instructions require, and a clause requiring the subcontractors to include these clauses and wage determination(s) in any lower tier subcontracts. The prime contractor is responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in this section. In the event of any violations of these clauses, the prime contractor and any subcontractor(s) responsible will be liable for any unpaid wages and monetary relief, including interest from the date of the underpayment or loss, due to any workers of lower-tier subcontractors, and may be subject to debarment, as appropriate.

7 **Contract termination: debarment.** A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8 **Compliance with Davis-Bacon and Related Act requirements.** All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

9 Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of eligibility.

i. By entering into this contract, the contractor certifies that neither it nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of 40 U.S.C. 3144(b) or 29 CFR 5.12(a).

ii. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of 40 U.S.C. 3144(b) or 29 CFR 5.12(a).

iii. The penalty for making false statements is prescribed in the U.S. Code, Title 18 Crimes and Criminal Procedure, 18 U.S.C. 1001.

11 **Anti-retaliation** It is unlawful for any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, or to cause any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, any worker or job applicant for:

i. Notifying any contractor of any conduct which the worker reasonably believes constitutes a violation of the DBA, Related Acts, or 29 CFR parts 1, 3, or 5;

ii. Filing any complaint, initiating or causing to be initiated any proceeding, or otherwise asserting or seeking to assert on behalf of themselves or others any right or protection under the DBA, Related Acts, or 29 CFR parts 1, 3, or 5;

iii. Cooperating in any investigation or other compliance action, or testifying in any proceeding under the DBA, Related Acts, or 29 CFR parts 1, 3, or 5; or

iv. Informing any other person about their rights under the DBA, Related Acts, or 29 CFR parts 1, 3, or 5.

B. Contract Work Hours and Safety Standards Act (CWHSSA)

The Agency Head must cause or require the contracting officer to insert the following clauses set forth in 29 CFR 5.5(b)(1), (2), (3), (4), and (5) in full, or (for contracts covered by the Federal Acquisition Regulation) by reference, in any contract in an amount in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses must

be inserted in addition to the clauses required by 29 CFR 5.5(a) or 4.6. As used in this paragraph, the terms "laborers and mechanics" include watchpersons and guards.

1. **Overtime requirements.** No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.
2. **Violation; liability for unpaid wages; liquidated damages.** In the event of any violation of the clause set forth in 29 CFR 5.5(b)(1) the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages and interest from the date of the underpayment. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchpersons and guards, employed in violation of the clause set forth in 29 CFR 5.5(b)(1), in the sum of $31 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in 29 CFR 5.5(b)(1).
3. **Withholding for unpaid wages and liquidated damages**

i. **Withholding process** The U.S Department of Housing and Urban Development or the recipient of Federal assistance may, upon its own action, or must, upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor so much of the accrued payments or advances as may be considered necessary to satisfy the liabilities of the prime contractor or any subcontractor for any unpaid wages; monetary relief, including interest; and liquidated damages required by the clauses set forth in 29 CFR 5.5(b) on this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract subject to the Contract Work Hours and Safety Standards Act that is held by the same prime contractor (as defined in 29 CFR 5.2). The necessary funds may be withheld from the contractor under this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract that is subject to the Contract Work Hours and Safety Standards Act and is held by the same prime contractor, regardless of whether the other contract was awarded or assisted by the same agency, and such funds may be used to satisfy the contractor liability for which the funds were withheld.

ii **Priority to withheld funds** The Department has priority to funds withheld or to be withheld in accordance with 29 CFR 5.5(a)(2)(i) or (b)(3)(i), or both, over claims to those funds by:

- **A.** A contractor's surety(ies), including without limitation performance bond sureties and payment bond sureties;
- **B.** A contracting agency for its reprocurement costs;
- **C.** A trustee(s) (either a court-appointed trustee or a U.S. trustee, or both) in bankruptcy of a contractor, or a contractor's bankruptcy estate;
- **D.** A contractor's assignee(s);
- **E.** A contractor's successor(s); or
- **F.** A claim asserted under the Prompt Payment Act, 31 U.S.C. 3901-3907.

4. ***Subcontracts.*** The contractor or subcontractor must insert in any subcontracts the clauses set forth in 29 CFR 5.5(b)(1) through (5) and a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor is responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in 29 CFR 5.5(b)(1) through (5). In the event of any violations of these clauses, the prime contractor and any subcontractor(s) responsible will be liable for any unpaid wages and monetary relief, including interest from the date of the underpayment or loss,

due to any workers of lower-tier subcontractors, and associated liquidated damages and may be subject to debarment, as appropriate.

5 **Anti-retaliation** It is unlawful for any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, or to cause any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, any worker or job applicant for:

- **i.** Notifying any contractor of any conduct which the worker reasonably believes constitutes a violation of the Contract Work Hours and Safety Standards Act (CWHSSA) or its implementing regulations in 29 CFR part 5;
- **ii.** Filing any complaint, initiating or causing to be initiated any proceeding, or otherwise asserting or seeking to assert on behalf of themselves or others any right or protection under CWHSSA or 29 CFR part 5;
- **iii.** Cooperating in any investigation or other compliance action, or testifying in any proceeding under CWHSSA or 29 CFR part 5; or
- **iv.** Informing any other person about their rights under CWHSSA or 29 CFR part 5.

C. CWHSSA required records clause In addition to the clauses contained in 29 CFR 5.5(b), in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other laws referenced by 29 CFR 5.1, the Agency Head must cause or require the contracting officer to insert a clause requiring that the contractor or subcontractor must maintain regular payrolls and other basic records during the course of the work and must preserve them for a period of 3 years after all the work on the prime contract is completed for all laborers and mechanics, including guards and watchpersons, working on the contract. Such records must contain the name; last known address, telephone number, and email address; and social security number of each such worker; each worker's correct classification(s) of work actually performed; hourly rates of wages paid; daily and weekly number of hours actually worked; deductions made and actual wages paid. Further, the Agency Head must cause or require the contracting officer to insert in any such contract a clause providing that the records to be maintained under this paragraph must be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the (write the name of agency) and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview workers during working hours on the job.

D. Incorporation of contract clauses and wage determinations by reference Although agencies are required to insert the contract clauses set forth in this section, along with appropriate wage determinations, in full into covered contracts, and contractors and subcontractors are required to insert them in any lower-tier subcontracts, the incorporation by reference of the required contract clauses and appropriate wage determinations will be given the same force and effect as if they were inserted in full text.

E. Incorporation by operation of law The contract clauses set forth in this section (or their equivalent under the Federal Acquisition Regulation), along with the correct wage determinations, will be considered to be a part of every prime contract required by the applicable statutes referenced by 29 CFR 5.1 to include such clauses, and will be effective by operation of law, whether or not they are included or incorporated by reference into such contract, unless the Administrator grants a variance, tolerance, or exemption from the application of this paragraph. Where the clauses and applicable wage determinations are effective by operation of law under this paragraph, the prime contractor must be compensated for any resulting increase in wages in accordance with applicable law.

F. HEALTH AND SAFETY

The provisions of this paragraph (F) are applicable where the amount of the prime contract exceeds **$100,000**.

1. No laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his or her health and safety, as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation.
2. The contractor shall comply with all regulations issued by the Secretary of Labor pursuant to 29 CFR Part 1926 and failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act, (Public Law 91-54, 83 Stat 96), 40 U.S.C. § 3701 et seq.
3. The contractor shall include the provisions of this paragraph in every subcontract, so that such provisions will be binding on each subcontractor. The contractor shall take such action with respect to any subcontractor as the Secretary of Housing and Urban Development or the Secretary of Labor shall direct as a means of enforcing such provisions.

SECTION 01010

FEDERAL WAGE DECISION

Lafourche Parish Government
New Clinic for Lady of The Sea General Hosiptal

SECTION 01011

DAVIS-BACON AND LABOR STANDARDS CONTRACTOR GUIDE ADDENDUM

Lafourche Parish Government
New Clinic for Lady of The Sea General Hospital



DAVIS-BACON AND LABOR STANDARDS

CONTRACTOR GUIDE ADDENDUM

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INTRODUCTION

This Guide has been prepared for you as a contractor performing work on construction projects that are assisted by the Department of Housing and Urban Development and subject to Davis-Bacon prevailing wage requirements. This Guide does not address contractor requirements involved in direct Federal contracting where HUD or another Federal agency enters into a procurement contract. In this latter case, the Federal Acquisition Regulations (FAR) are applicable. While the guidance contained in this Guide is generally applicable to any Davis-Bacon covered project, specific questions pertaining to direct Federal contracts should be addressed to the Contracting Officer who signed the contract for the Federal agency.

Our objective here is to provide you with a guide that is simple and non-bureaucratic yet comprehensive, and will help you better understand and comply with Davis-Bacon labor standards. HUD's Office of Davis Bacon and Labor Standards worked closely with the Department of Labor's Wage and Hour Division to make sure that the labor standards provisions in your contract and the specifics of complying with them represent the latest information. It is the Department of Labor that has general administrative oversight of all Federal contracting agencies, such as HUD, which administer the day-to-day responsibilities of enforcing Davis-Bacon provisions in construction contracts that they either fund or assist in funding.

This Guide contains six main chapters. The first chapter includes the laws and regulations associated with Federal labor standards administration and enforcement. The second chapter lists the responsibilities of contractors and of state, tribal, and local contracting agencies that administer HUD programs. The third chapter lists wage basics, including wage decisions, wage classifications, and wage rates, to provide background for the rest of the Guide. The fourth chapter discusses reviewing and reporting payrolls. The fifth chapter delves into additional work classifications and wage rates. The sixth and final chapter discusses sanctions and restitution. For further background, the DBLS Agency Guide may be used as a reference.

Finally, not all HUD construction projects are covered by Davis-Bacon wage rates. For the purpose of this Guide, we are assuming that a determination has already been made that Davis-Bacon wage rates are applicable. Should you wish assistance in determining whether Davis-Bacon wage rates apply to a particular project or if you need other related technical assistance, please consult with the HUD Labor Standards Field staff for your area.

RESOURCE

Visit the Office of Davis Bacon and Labor Standards online: www.hud.gov/program_offices/davis_bacon_and_labor_standards

BASIC DBA DEFINITIONS

See Section 3 in the Agency Guide.



LAWS AND REGULATIONS

The Davis-Bacon Act (DBA)

The Davis-Bacon Act (DBA) requires the payment of prevailing wage rates (determined by the U.S. Department of Labor) to all laborers and mechanics on Federal government and District of Columbia construction projects in excess of $2,000. Construction includes alteration and/or repair, including painting and decorating, of public buildings or public works. Most HUD construction work is not covered by the DBA itself since HUD seldom contracts directly for construction services. Most often, if DB applies to a HUD project is it because of a labor provision contained in one of HUD's "Related Acts" (see 5.9 in the Agency Guide). The Related Acts are often referred to as the Davis-Bacon and Related Acts or DBRA.

The Contract Work Hours and Safety Standards Act (CWHSSA)

CWHSSA requires time and one-half pay for overtime (OT) hours (over 40 in any workweek) worked on a covered project. The CWHSSA applies to both direct federal contracts and to federally-assisted contracts where those contracts require or involve the employment of laborers and mechanics and where federal wage standards (e.g., Davis-Bacon or HUD-determined prevailing wage rates) are applicable. CWHSSA provisions apply to all laborers and mechanics, including watchmen and guards, employed by any contractor or subcontractor. CWHSSA also applies to maintenance laborers and mechanics employed by contractors or subcontractors engaged in the operation of Public Housing Agencies (PHA), Tribally Designated Housing Entities (TDHE), and Indian Housing Agencies (IHA) developments.

Exemptions:

CWHSSA O/T provisions do not apply where the federal assistance is only in the nature of a loan guarantee or insurance.

CWHSSA O/T provisions do not apply to prime contracts of $100,000 or less.

The Copeland Act (Anti-Kickback Act)

The Copeland Act makes it a Federal crime for anyone to require any laborer or mechanic (employed on a Federal or Federally-assisted project) to kickback, (i.e., give up or pay back) any part of their wages. The Copeland Act requires every employer to submit weekly certified payroll reports, and regulates permissible payroll deductions.

The Fair Labor Standards Act (FLSA)

The FLSA governs matters such as federal minimum wage rates and O/T. These standards are generally applicable to any labor performed and may be pre-empted by other (often more stringent) federal standards such as the DBRA prevailing wage requirements and CWHSSA O/T provisions. The authority to administer and enforce FLSA provisions resides solely with DOL.

Davis-Bacon Regulations

DOL has published rules and instructions concerning Davis-Bacon and other labor laws in the Code of Federal Regulations (CFR). These regulations can be found in Title 29 CFR Parts 1, 3, 5, 6, and 7. Part 1 explains how DOL establishes and publishes DBA wage determinations (also referred to as wage decisions) and provides instructions on how to use the determinations. Part 3 describes Copeland Act requirements for payroll deductions and the submission of weekly CPRs. Part 5 covers the labor standards provisions that are in contracts relating to Davis-Bacon Act wage rates and the responsibilities of contractors and contracting agencies to administer and enforce the provisions. Part 6 provides for administrative proceedings enforcing Federal labor standards on construction and service contracts. Finally, Part 7 sets parameters for practice before the Administrative Review Board. These regulations are used as the basis for administering and enforcing the laws.

DOL Regulations are available online: www.ecfr.gov/current/title-29

Construction Contract Provisions and Labor Standards Administration

Labor standards administration involves the activities that take place primarily before construction begins. Administration sets the stage for the compliance activities that occur during the construction phase. The first and sometimes most difficult step is determining whether and to what extent Davis-Bacon wage standards apply to a particular contract or project. The Factors of Labor Standards Applicability (see Appendix II-6) should be helpful. Most HUD-assisted construction work is covered by Davis-Bacon, but there are some exceptions. The best and safest approach is to first assume that Davis-Bacon requirements will be applicable whenever the contract/project involves construction work valued in excess of $2,000, then look more closely to see if there is any reason for non-coverage. Each contract subject to Davis-Bacon labor standards requirements must contain labor standards clauses and a Davis-Bacon wage decision. These documents are normally wound into the contract specifications.

The labor standards clauses

The contract for construction is the vehicle to ensure contractor compliance and Davis-Bacon wage enforcement. Therefore, the bid specifications and/or the contract for each project subject to Davis-Bacon wage rates must contain both a Davis-Bacon wage decision and labor standards clauses. The labor standards clauses describe the responsibilities of the contractor concerning Davis-Bacon wages and obligate the contractor to comply with the Davis-Bacon wage and reporting requirements and with the O/T provisions of the CWHSSA (applicable only when the prime contract is valued at over $100,000). The labor standards clauses also provide for remedies in the event of violations, including the withholding of payments due to the contractor to ensure the payment of wages or liquidated damages that may be found due, and sanctions should violations occur. These contract clauses enable the contract administrator to enforce the Federal labor standards applicable to the project. HUD has standard forms that contain contract clauses. For example, the HUD-92554M, Supplementary Conditions Of The Contract for Construction, which is issued primarily for FHA (Federal Housing Administration) multifamily housing and other construction projects administered by HUD; the HUD-4010, Federal Labor Standards Provisions, which is used for CDBG (Community Development and Block Grant) and HOME (HOME Investment Partnerships Program) projects; and the HUD-5370, General Conditions for Construction Contracts (construction contracts >$150,000) or the HUD-5370-EZ, General Contract Conditions for Small Construction/Development Contracts (construction contracts >$2,000 but ≤$150,000) which are used for Public and Indian Housing projects. These should be wound into the contract specifications or incorporated by specific reference in the bid/contract documents (see Labor Relations Letter 96-03).



Davis-Bacon Wage Decisions

The term "wage decision" includes the original decision and any subsequent decisions that modify, supersede, correct, or otherwise change the provisions of the original decision. The term "wage decision" is used within this Guide to mean the Davis-Bacon wage decision. The terms "wage decision" and "wage determination" are used interchangeably. A wage decision is a schedule of construction work classifications, wage rates, and fringe benefits that represent the minimum rates that must be paid to workers employed in those classifications. Wage decisions are established for defined geographic areas, usually by county or group of counties, and four general characters of construction work.

RESOURCE

The Department of Housing and Urban Development (HUD) one stop forms resource page.
www.hud.gov/program_offices/administration/hudclips/forms

RESOURCE

All current Davis Bacon wage decisions can be accessed online at no cost at www.sam.gov





CONTRACTOR RESPONSIBILITIES

The principal contractor is responsible for the full compliance of all employers (the contractor, subcontractors, and any lower-tier subcontractors) with the labor standards provisions applicable to the project. Because of the contractual relationship between a prime contractor and their subcontractors, subcontractors generally should communicate with the contract administrator only through the prime contractor. (See Contract Administrator Responsibilities, below.)

CONTRACT ADMINISTRATOR RESPONSIBILITIES

The contract administrator is responsible for the proper administration and enforcement of the Federal labor standards provisions on contracts covered by Davis-Bacon requirements. This term is used to represent the person (or persons) who will provide labor standards advice and support to contractors and other project principals (e.g., owner, sponsor, architect), including providing the proper Davis-Bacon wage decision (see 6.1, The Wage Decision) and ensuring that the wage decision and contract clauses are incorporated into the contract for construction. The contract administrator also monitors labor standards compliance (see Section 12, Payroll Compliance Reviews and Corrections, in the Agency Guide) by conducting interviews with construction workers at the job site and reviewing payroll reports, and oversees any enforcement actions that may be required.

The contract administrator could be an employee or agent of HUD, or of a city or county or public housing agency. For HUD projects administered directly by HUD staff, usually FHA-insured multifamily projects, the contract administrator will be the HUD Labor Standards field staff. But many HUD-assisted projects are administered by local contracting agencies such as PHAs, TDHEs, and States, cities and counties under HUD's CDBG and HOME programs.

In these cases, the contract administrator will likely be local agency staff. In either case, the guidance for contractors remains essentially the same.

DOL also has a role in monitoring Davis-Bacon administration and enforcement. In addition, DOL has independent authority to conduct investigations. A DOL investigator or other DOL representative may visit Davis-Bacon construction sites to interview construction workers or review payroll information.

RESOURCE

Program technical guidance

For interpretations of program requirements or handbooks and instructions on the use of forms:

Housing Programs - See our Contact List for help.



WAGE BASICS

The Wage Decision

Davis-Bacon labor standards stipulate the wage payment requirements for skilled workers, operators, truck drivers, and laborers—for example: carpenters, electricians, plumbers, roofers, rollers, screeds, bulldozers, water wagons, dump trucks, and other construction work classifications that may be needed for the project. The Davis-Bacon wage decision that applies to the project contains a schedule of work classifications and wage rates that must be followed.

Remember, the wage decision is contained in the contract specifications along with the labor standards clauses. See 5.12 in the Agency Guide.

The work classifications and wage rates

A Davis-Bacon wage decision is simply a listing of different work classifications and the minimum wage rates that must be paid to anyone performing work in those classifications.

You'll want to make sure that the work classifications you need are contained in the wage decision, and make certain that you know exactly what wage rate(s) you will need to pay. Some wage decisions cover several counties and/or types of construction work (e.g., residential and commercial work) and can be lengthy and difficult to read. The contract administrator (HUD Labor Standards field staff or local agency staff) is available to assist with any trouble reading the wage decision or finding the applicable work classification(s).

To make reading lengthy wage decisions easier, a contract administrator may prepare a Project Wage Sheet (HUD-4720). This sheet is a one-page transcript that will show only the classifications and wage rates for a project. A blank copy of a Project Wage Rate Sheet is provided in the Appendix.

RESOURCE

A fillable version of this form is available online at HUDClips www.hud.gov/program_offices/administration/hudclips/forms Contact the contract administrator monitoring the project for assistance with a Project Wage Rate.

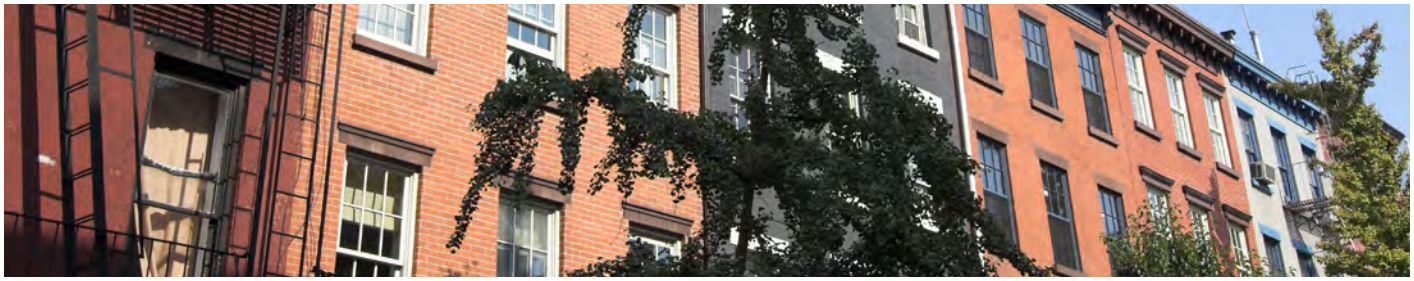
Posting the wage decision, Davis-Bacon poster, and Additional Classifications wages

The prime contractor is responsible for posting a copy of the wage decision (or the Project Wage Rate Sheet), a copy of the DOL Davis-Bacon poster titled Employee Rights Under the Davis-Bacon Act (Form WH-1321), and Additional Classifications wages at the job site in a place that is easily accessible to all the construction workers employed on the project and where the wage decision and poster will not be destroyed by wind, rain, etc. The purpose of this posting is to provide information to the construction laborers and mechanics working on the project about their entitlement to the prevailing wage for their trade, and to advise them whom to contact (the contract administrator) if they have any questions or want to file a complaint.

RESOURCE

The Employee Rights Under the Davis Bacon Act poster replac es the Notice To All Employees. The new poster is available in English and Spanish online at:

www.hud.gov/program_offices/davis_bacon_and_labor_standards/olrmk13.



REVIEWING PAYROLLS

Certified Payroll Reports (CPRs)

To demonstrate compliance with labor standards requirements, each employer shall prepare, certify, and submit payroll reports for each week to the sponsor, applicant, or owner for any contract work that is performed. See 29 CFR § 5.5(a)(3)(ii) for information on CPRs.

CPR format

Employers on an FHA project are required to use the HUD-authorized Electronic Payroll System (EPS) to submit CPR reports. If an approved electronic payroll reporting system is not being used by the LCA,, the employer must ensure that all information from DOL Payroll Form WH-347 is included and that the LSS can reasonably interpret it. Form WH-347 is available online at www.dol.gov/whd/forms/wh347.pdf.

Submission requirements

Each employer shall submit payroll reports beginning with the first week such employer performs work on the site of the work. Employers shall submit reports promptly following the close of each such pay week.

"No Work" payrolls

Employers are not required to submit reports for weeks during which no work was performed at the site of work, provided that the payroll reports are numbered sequentially or that the employer has provided written notice that its work on the project has been suspended.

Weekly payroll certification

Each weekly payroll submitted shall be accompanied by a "Statement of Compliance" that bears the original signature of the owner, executive/corporate officer, or a designee authorized by the owner or officer. The signature must be in ink; pencil is not acceptable. Signature stamps, photocopies, and facsimiles are not acceptable. The employer may utilize the reverse side of the DOL Payroll Form WH-347 as its Statement of Compliance or another document that contains the same language prescribed on the reverse of the WH-347.

False Submissions

The falsification of any of the above certifications may subject the employer to civil or criminal prosecution under § 1001 of Title 18 and § 231 of Title 31 of the United States Code (USC).

Payroll Review and Submission

The prime contractor should review each subcontractor's payroll reports for compliance prior to submitting the reports to the contract administrator. Remember, the prime contractor is responsible for the full compliance of all subcontractors on the contract and will be held accountable for any wage restitution that may be found due to any laborer or mechanic that is underpaid and for any liquidated damages that may be assessed for O/T violations. All the payroll reports for any project must be submitted to the contract administrator through the prime contractor.

An alert prime contractor that reviews subcontractor payroll submissions can detect any misunderstandings early, prevent costly underpayments, and protect itself from financial loss should underpayments occur.

Payroll Retention

Every contractor (including every subcontractor) must keep a complete set of their own payrolls and other basic records—such as employee addresses and full SSNs, time cards, tax records, evidence of fringe benefit payments—for a Davis-Bacon project for at least three years after the project is completed. The prime contractor must keep a complete set of all the payrolls for every contractor (including subcontractors) for at least three years after completion of the project.

Payroll Inspection

In addition to submitting payrolls to the contract administrator, every contractor (including subcontractors) must make their own copy of the payrolls and other basic records available for review or copying to any authorized representative from HUD or DOL.





REPORTING PAYROLLS

Completing a Payroll Report

Each employer shall maintain payroll records with respect to their own workforce employed at the site of the work. The prime contractor shall maintain such records relative to all laborers and mechanics working at the site of the work during the course of the construction work for at least three years following the completion of the work. Such records shall contain:

Project and contractor/subcontractor information

Each payroll must identify the contractor or subcontractor's name and address, the project name and number, and the week ending date. Week dates must be indicated in the spaces provided. Numbering payrolls is optional but strongly recommended.

Employee information

The name and an individually identifying 4-digit number for each laborer and mechanic. Employers must always maintain each employee's address and full Social Security number (SSN) during the construction of the project and for no less than three years following completion. This information must be made available to the prime contractor, HUD, and/or the LCA upon request.

Employers (prime contractors and subcontractors) must maintain the current address and full SSN for each employee and must provide this information upon request to the contracting agency or other authorized representative responsible for Federal labor standards compliance monitoring. Prime contractors may require a subcontractor to provide this information for the prime contractor's records. DOL has modified form WH-347, Payroll, to accommodate these reporting requirements.

Work classification

Each employee must be classified in accordance with the wage decision based on the type of work they perform.

Apprentices or trainees

The first payroll on which any apprentice or trainee appears must be accompanied by a copy of that apprentice's or trainee's registration in a registered or approved program. A copy of the portions of the registered or approved program pertaining to the wage rates and ratios shall also accompany the first payroll on which the first apprentice or trainee appears.

Split classifications

For an employee that worked in a split classification, make a separate entry for each classification of work performed, distributing the hours of work to each classification accordingly, and reflecting the rate of pay and gross earnings for each classification. Deductions and net pay may be based upon the total gross amount earned for all classifications.

Hours worked

The payroll should show only the regular and O/T hours worked on one particular project. The employer must show both the daily and total weekly hours for each employee. If an employee performs work at job sites other than the project for which the payroll is prepared, those "other job" hours should not be reported on the payroll. In these cases, employers should list the employee's name, classification, hours for this project only, the rate of pay and gross earnings for this project, and the gross earned for all projects. Deductions and net pay may be based upon the employee's total earnings (for all projects) for the week.

Rate of pay

Employers must show the basic hourly rate of pay for each employee for one particular project. If the wage decision includes a fringe benefit and the employer does not participate in approved fringe benefit programs, the employer must add the fringe benefit rate to the basic hourly rate of pay, and must list the O/T rate if O/T hours were worked.

Piece-work

For any piece-work employees, the employer must compute an effective hourly rate for each employee each week based upon the employee's piece-work earnings for that week. To compute the effective hourly rate, divide the piece-work earnings by the total number of hours worked, including consideration for any O/T hours.

The effective hourly rate must be reflected on the certified payroll. This hourly rate may be no less than the wage rate (including fringe benefits, if any) on the wage decision for the classification of work performed. It does not matter that the effective hourly rate changes from week to week, only that the rate is no less than the rate on the wage decision for the classification of work performed.

Remember, the O/T rate is computed at one and one-half times the basic rate of pay plus any fringe benefits. For example, if the wage decision requires $10/hour basic plus $5/hour fringe benefits, the O/T rate would be: ($10 x 1.5) + $5 = $20/hour.

Gross wages earned

Show the gross amount of wages earned for work performed on a particular project. Note: Employees with work hours and earnings on other projects may show gross wages for a particular project over gross earnings from all projects (e.g., $425.40/$764.85) and base deductions and net pay on the "all projects" earnings.

Deductions

Show the amounts of any deductions from the gross earnings. "Other" deductions should be identified (e.g., Savings Account or Loan Repayment). Any voluntary deduction (i.e., not required by law or by an order of a proper authority) must be authorized in writing by the employee or provided for in a collective bargaining (union) agreement. A short note signed by the employee is all that is needed and should accompany the first payroll on which the other deduction appears. The note needs to show the type, amount, and frequency of the deduction. A new deduction authorization is required when any of the aforementioned items change.

MORE INFO

Only one employee authorization is needed for recurring (e.g., weekly) "other" deductions. Written employee authorization is not required for income tax and Social Security deductions.



Net pay

Show the net amount of wages paid.

Statement of Compliance

The Statement of Compliance is the certification. It is located on the reverse side of a standard payroll form (WH-347). Employers must be sure to complete the identifying information at the top, particularly if attaching the Statement of Compliance to an alternate payroll form such as a computer payroll. Also, the employer must check either 4(a) or 4(b) if the wage decision contains a fringe benefit. Checking 4(a) indicates that the employer is paying required fringe benefits to approved plans or programs; and 4(b) indicates that the employer is paying any required fringe benefit amounts directly to the employee by adding the fringe benefit rate to the basic hourly rate of pay. If the employer is paying a portion of the required fringe benefit to programs and the balance directly to the employee, the employer must explain those differences in box 4(c).

Signature

For paper payrolls submitted, the payroll is signed with an original signature in ink. The payroll must be signed by a principal of the firm (owner or officer such as the president, treasurer, or payroll administrator) or by an authorized agent (a person authorized by a principal in writing to sign the payroll reports). Signature authorization (for persons other than a principal) should be submitted with the first payroll signed by such an agent. For paper payrolls, signatures in pencil, signature stamps, Xerox copies, PDFs, and other facsimiles are not acceptable.

MORE INFO

Only one Statement of Compliance is required for each employ er's weekly payroll no matter how many pages are needed to re port the employee data.





ADDITIONAL WORK CLASSIFICATION AND WAGE RATES

After contract award, if it is determined that additional work classifications are required because the wage decision lacks all the necessary classifications and wage rates, the prime contractor and, if applicable, its subcontractors employing workers in such classifications shall request an additional work classification and propose a wage rate and fringe benefits for such classification on form SF-1444, Request for Authorization of Additional Classification and Rate. The contractor or subcontractor shall make its request for a final decision through the LSS or LCA, as appropriate, to DOL at whd-cbaconformance_incoming@dol.gov. The LSS/LCA shall assist the employer in preparing the request and, if necessary, provide guidance on the policies and procedures involved.

Note: Additional work classifications and wage rates may be requested only after the effective wage decision "lock-in" date. (See DOL Regulations at 29 CFR Part 5 § 5.5(a)(1)(ii).)

Additional Work Classification and Wage Rate Parameters

Signature

Additional work classifications must be signed by DBLS for FHA-insured projects managed by HUD and signed by the LCA contracting officer for projects managed by LCAs, then forwarded to DOL with the applicable wage decision where:

The requested work classification is used in the area of the project by the construction industry;

The work that will be performed by the requested work classification is not performed by a work classification that is already contained within the applicable wage decision;

The proposed wage rate for the requested work classification bears a reasonable relationship to the wage rates on the wage decision; and

The workers that will be employed in the requested work classification (if it is known who the workers are or will be) or the workers' representatives agree with the proposed wage rate.

General guide

The wage rate and fringe benefits proposed for any classification must be in accordance with the guidance available in All Agency Memorandum 213. The proposed wage rate and fringe benefits should bear a reasonable relationship to the entirety of the rates within the relevant category. There are four basic categories: skilled crafts, laborers, truck drivers, and power equipment operators. Additional classifications proposed for power equipment operators must specify the type(s) of power equipment involved.

Making the Request

Although a request for additional work classification and wage rate may be prompted following an LSS/LCA review, the proposal must originate with the prime contractor/employer that will utilize the work classification. The prime contractor/employer must submit the request in writing. A basic request must identify the contract/project involved, the work classification requested, and the wage rate, including any bona fide fringe benefits proposed. In some cases, it may be necessary for the prime contractor/employer to describe the work that the requested work classification would perform. The prime contractor/employer should use form SF-1444, Request for Authorization of Additional Classification and Rate, to submit the request.

LSS/LCA Review of Request

The LSS/LCA will review the prime contractor/employer's request to determine if it satisfies the approval criteria at 5.12.1.9.2. The LSS/LCA will contact the prime contractor/employer if clarification or additional information is needed to complete the review.

Signing the request, reporting to DOL

If the LSS/LCA review finds that the requested work classifications and wage rate/fringe benefits meet the criteria at 5.12.1.9.2, the LSS/LCA submits the completed SF-1444, related documentation, and the applicable wage decision to the DOL National Office for final decision using DOL's dedicated email address:

whd-cbaconformance_incoming@dol.gov.

Disagreement with the request; referring for DOL decision

If the LSS/LCA review finds that the requested work classification and wage rate/fringe benefits fails to meet the approval criteria or if the parties do not agree on the proper classification or wage rate/fringe benefits for the work described, the LSS/LCA shall prepare an SF-1444 and a written report explaining the results of the review and any issues in dispute among the parties, and shall forward these along with a copy of the applicable wage decision to the DOL National Office for its decision using the same dedicated DOL email address.

DOL decision

DOL regulations permit 30 days for DOL to respond to the SF-1444. DOL will notify the LSS/LCA in writing of its decision.

DOL approval

When DOL approves the requested additional work classification and wage rate/fringe benefits, the LSS/LCA shall provide a copy of the DOL notice of approval to the prime contractor/employer with instructions that the additional work classification and wage rate/fringe benefits must be posted on the job site with the wage decision.



DOL disapproval

When DOL disapproves the requested work classification and wage rate/fringe benefits, DOL will notify the LSS/LCA in writing of the reasons why the request cannot be approved. DOL may also indicate what work classifications/wage rate/fringe benefits could be approved for the work involved if a modified request is submitted.

Notification to the prime contractor/employer

The LSS/LCA will notify the prime contractor/employer in writing of the results of the LSS/LCA review and/or DOL decision and provide a copy of the DOL notice.

Requests for DOL reconsideration

The LSS/LCA, the prime contractor/employer, or other interested parties may request reconsideration of the DOL decision on a requested additional work classification and wage rate/fringe benefits. Such requests must be made in writing accompanied by a full statement of the interested party's views and any supporting wage data or other pertinent information.





SANCTIONS AND RESTITUTION

Introduction

Even in the best of circumstances, things can go wrong. In a Davis-Bacon context, "things going wrong" usually means there's a difference of opinion or a dispute about whether and to what extent underpayments have occurred. These disputes are usually between the contract administrator and one or more employers (the prime contractor and/or a subcontractor). The dispute may involve something simple such as an additional classification request that is pending before DOL, or something as significant as investigative findings following a complaint of underpayment. This chapter discusses some of the things you might expect, and what you can do to make your views known and to lessen any delays in resolving the problem or issue.

Administrative Review on Labor Standards Disputes

The labor standards clauses in the contract and DOL regulations provide for administrative review of issues where there is a difference of views between the contract administrator and any employer. The most common circumstances include:

Additional classifications and wage rates

Additional classification and wage rate requests are sometimes denied by DOL. An employer that is dissatisfied with the denial can request reconsideration by the DOL Wage and Hour Administrator. The employer may continue to pay the wage rate, as requested, until a final decision is rendered on the matter. When the final decision is known, the employer will be required to pay any additional wages that may be necessary to satisfy the wage rate that is established.

Reconsideration

DOL normally identifies the reasons for denial in its response to the request. Any interested person (e.g., the contract administrator, employer, or representatives of the employees) may request reconsideration of the decision on the additional classification request.

The request for reconsideration must be made in writing and must thoroughly address the denial reasons identified by DOL. Employer requests for reconsideration should be made through the contract administrator but may be made directly to DOL. (See DOL Regulations 29 CFR § 1.8.) All requests initiated by or made through the contract administrator or HUD must be submitted through HQLS (Headquarters Office Davis-Bacon and Labor Standards).

Administrative Review Board

Any interested party may request a review of the Administrator's decision on reconsideration by DOL's Administrative Review Board. DOL regulations 29 CFR Part 7 explain the procedures for such reviews. (See also 29 CFR § 1.9.)

Findings of underpayment

Compliance reviews and other follow-up enforcement actions may result in findings of underpayment. The primary goal in every case and at every step in this process is to reach agreements about who may have been underpaid and how much wage restitution may be due, and to promptly deliver restitution to any underpaid workers. The contract administrator will usually work informally with employers to reach such agreements.

Rulings and interpretations unrelated to findings of underpayment

DOL is the authority for rulings and interpretations unrelated to findings of underpayments. This includes disputes concerning the prevailing wage rates as determined by DOL, DBRA applicability, character of work decisions, and interpretation and application of DOL regulations at 29 CFR Parts 1, 3, and 5. These and other such matters must be referred to the DOL Wage and Hour Administrator for their ruling and/or interpretation per 29 CFR § 5.13. Any request for a ruling or an interpretation from the DOL Administrator via DBLS must be submitted through HQLS with a copy to the local LSS.

Disputes concerning findings of underpayment

Underpayments usually occur when a contractor or subcontractor does not properly pay wages according to the approved wage determination and it has been identified as part of a Davis-Bacon and DBLS enforcement action. There may be other situations that also create underpayments, and they can originate from the employer, prime contractor, or any other interested party. Any underpayment decision by DBLS will include a formal decision letter with a Notice of Right to Appeal.

DOL review

DOL will review the contract administrator's report and the arguments against the findings presented in the hearing request. DOL may affirm or modify the findings based upon the materials presented. You will be notified in writing by DOL of the results of its review. If DOL concludes that violations have occurred, you will be given an opportunity to correct any underpayments or to request a hearing before a DOL ALJ. (See DOL Regulations 29 CFR § 5.11 (b) and 29 CFR Part 6, Rules of Practice for Administrative Proceedings.)

Administrative Review Board

Contractors and/or subcontractors may request a review by the Administrative Review Board of the decision(s) rendered by the DOL ALJ in the administrative hearing process. See DOL regulations 29 CFR Part 7 for more information about this proceeding.

Withholding

The contract administrator shall cause the withholding of payments due to the prime contractor to ensure the payment of wages that are believed to be due and unpaid (e.g., if wage underpayments or other violations are not corrected within 30 days after written notification to the prime contractor). DOL may also direct the withholding of contract payments for alleged wage underpayments. Withholding is serious and is not taken unless warranted. If withholding is deemed necessary, the contractor will be notified in writing. Only the amounts needed to meet the contractor's (and/or subcontractors') liability shall be withheld.



Deposits and Escrows

In some situations, certain labor standards issues are not or cannot be resolved in time to meet project closeout schedules. In order to permit a final closing/closeout to proceed while certain labor issues are outstanding, a deposit account (HUD-administered projects, e.g. multifamily housing-insured and grant programs) or an escrow account (LCA-administered projects, e.g., CDBG, HOME, HOPE VI (Housing Opportunities for People Everywhere)) may be established as a guarantee to ensure the payment of any wages that have been or may be found due to workers that were employed in the construction of the project. Deposit and escrow accounts may also hold fringe benefits payments that are due to plans or programs and/or liquidated damages that are assessed for violations of CWHSSA O/T provisions. The deposit or escrow account is controlled by the contract administrator. When a final decision is rendered, the contract administrator makes disbursements from the account in accordance with the decision. Deposit/escrow accounts are established for one or more of the following reasons:

MORE INFO

Remember, the prime contractor is responsible and will be held liable for any wage restitution that is due to any worker employed in the construction of the project, including workers employed by subcontractors and any lower-tier subcontractors. See 3.2, Responsibilities of the Principal Contractor, and 12.4, Restitution for Underpayment of Wages, in the Agency Guide.

Where the parties have agreed to amounts of wage restitution that are due, but the employer hasn't furnished evidence yet that all the underpaid workers have received their back wages (e.g., unfound workers)

The amount of the deposit is equal to the total gross amount of restitution due to workers lacking payment evidence. As these workers are paid and proper documentation is provided to the contract administrator, amounts corresponding to the documented payments are returned to the depositor. Amounts for any workers who cannot be located are held in the deposit/escrow account for three years and disposed as described in Section 11.4.1 of this Guide;

Sometimes, wage restitution cannot be paid to an affected employee because, for example, the employee has moved and cannot be located. After wage restitution has been paid to all the workers who could be located, the employer must submit a list of any workers who could not be found and paid (unfound workers). See 12.4.6 in the Agency Guide for more information.

Where underpayments are suspected or alleged and an investigation has not yet been completed

The deposit is equal to the amount of wage restitution and any liquidated damages, if applicable, that are estimated to be due. If the final determination of wages due is less than the amount estimated and placed in the escrow account, the escrow will be reduced to the final amount and the difference will be returned to the depositor. If the parties agree to the investigative findings, the amounts due to the workers will be paid by the employer. As these workers are paid and proper



documentation is provided to the contract administrator, the gross amounts corresponding to the documented payments are returned to the depositor;

If the employer is unable to make the payments to the workers (e.g., lacks the funds necessary), the contract administrator may make disbursements directly to the workers in the net amounts calculated by the employer. The amounts withheld from the workers for tax deduction will be returned to the employer as payments to workers are made. The employer shall be responsible for reporting and transmitting withholdings to the appropriate agencies.

If the employer is not cooperating in the resolution, the contract administrator shall make disbursements to the workers in accordance with the schedule of wages due. Amounts for unfound workers will be retained as described in Section 13.4.6 in the Agency Guide.

If the parties do not agree and an administrative hearing is requested, the escrow will be maintained.

MORE INFO

Remember, if you have any questions or need assistance concerning labor standards requirements, help is always available. Contact the contract administrator for the project you're working on or the HUD Field Labor Standards staff in your area.

Where the parties are waiting for the outcome of an administrative hearing that has been or will be requested contesting a final determination of wages due

The deposit shall be equal to the amount of wage restitution and liquidated damages, if applicable, that have been determined due. Once a final decision is rendered, disbursements from the escrow account are made in accordance with the decision.

Administrative Sanctions

Contractors and/or subcontractors that violate the labor standards provisions may face administrative sanctions imposed by HUD and/or DOL.

DOL debarment

Contractors and/or subcontractors that are found by the Secretary of Labor to be in aggravated or willful violation of the labor standards provisions of the DBRA will be ineligible (debarred) to participate in any DBRA or Davis-Bacon Act contracts for up to three years. Debarment includes the contractor or subcontractor and any firm, corporation, partnership, or association in which the contractor or subcontractor has a substantial interest. Debarment proceedings can be recommended by the contract administrator or initiated by DOL. Debarment proceedings are described in DOL regulations 29 CFR § 5.12.

HUD sanctions

HUD sanctions may include Limited Denials of Participation (LDPs), debarments, and suspensions.



Limited Denial of Participation

HUD may issue to the employer an LDP, which prohibits the employer from further participation in HUD programs for a period of up to one year. The LDP is usually effective for the HUD program in which the violation occurred and for the geographic jurisdiction of the issuing HUD Office. HUD regulations concerning LDPs are found at 24 CFR §§ 24.700-24.714.

Debarment and suspensions

In certain circumstances, HUD may initiate its own debarment or suspension proceedings against a contractor and/or subcontractor in connection with improper actions regarding Davis-Bacon obligations. For example, HUD may initiate debarment where a contractor has been convicted for making false statements (such as false statements on certified payrolls or other prevailing wage certifications), or initiate suspension where a contractor has been indicted for making false statements. HUD regulations concerning debarment and suspension are found at 24 CFR Part 24.

Falsification of Certified Payroll Reports

Cases that involve certified payroll falsification may be referred to DOL for its investigation at the outset or referred to DOL for administrative review/hearings or other sanctions.

All referrals suggesting consideration for criminal prosecution must be submitted through the established hierarchy:



States may submit any such recommendation to DOL directly.

MORE INFO

Remember, if you have any questions or need assistance concerning labor standards requirements, help is always available. Contact the contract administrator for the project you're working on or the HUD Field Labor Standards staff in your area.



SECTION 01020

SECTION 3 GENERAL INFORMATION

Lafourche Parish Government
New Clinic for Lady of The Sea General Hospital

This Construction Contract includes the requirement to ensure that employment opportunities be directed to low – and very low income persons, particularly those who are recipients of government assistance for housing. These requirements are included in Section 3 of the Housing and Urban Development Act of 1968; and are known as "Section 3 Provisions".

The rules and requirements for adherence with Section 3 will impact the obligation and reporting requirements of you as the prime contractor, as well as all of your subcontractors. Section 3 regulations:

1. Establishes a benchmark of twenty-five (25) percent of the total labor hours on the project (worked by existing employees and new employees) must be performed by Section 3 Workers. A **Section 3 Worker** must meet one of the following criteria:
    a. Household income is below HUD's income limits (worker's self-certification); **or**
    b. Participation in a means-tested program such as public housing or Section 8 assisted housing (worker's self-certification); **or**
    c. Employment by a Section 3 Business Concern.

2. Establishes a benchmark of five (5) percent of the total labor hours on the project (worked by existing employees and new employees) must be performed by Targeted Section 3 Workers. In addition to meeting the criteria for a Section 3 Worker, **Targeted Section 3 Worker** must also meet one of the following criteria:
    a. Employment by a Section 3 Business Concern; **or**
    b. Live within a one (1) mile radius of the project site; **or**
    c. Participate in a YouthBuild program.

Contractors and subcontractors must document efforts to comply with Section 3 and meet the benchmarks stated above though the compilation and maintenance of a "good faith efforts" file. It should contain memoranda, correspondence, advertisements, etc., illustrating your attempts to reach eligible persons and businesses.

SECTION 01021

SECTION 3 FREQUENTLY ASKED QUESTIONS

Lafourche Parish Government
New Clinic for Lady of The Sea General Hospital

(Published: February 10, 2025)

"Best Efforts" and "To the Greatest Extent Feasible"

FREQUENTLY ASKED QUESTIONS

for

SECTION 3

Published: February 10, 2025

The following is a guidance document published by the Department of Housing and Urban Development Office of Field Policy and Management for the purpose of providing answers to frequently asked questions about Section 3 of the HUD Act of 1968 (12 U.S.C § 1701u) and its associated regulations (24 C.F.R. Part 75). This document is intended to provide guidance for Section 3 funding recipients, subrecipients, contractors, subcontractors, workers, and other stakeholders.

This guidance document covers questions in several topic areas and is divided into parts that contain questions on that part's topic.

I. GENERAL QUESTIONS REGARDING SECTION 3:

1. What is Section 3?

2. What Do "Best Efforts" and "to the Greatest Extent Feasible" Mean?

3. What Does "Section 3 Worker" Mean?

4. What Does "Targeted Section 3 Worker" Mean?

5. What Does "Section 3 Business Concern" mean?

6. How are low-income and very low-income determined?

7. What is YouthBuild?

8. As a funding recipient, what are my Section 3 reporting goals?

9. What is a Section 3 project?

10. Who is considered a recipient of Section 3 funding?

11. What are funding thresholds and how do they apply to Section 3 covered financial assistance?

12. Which recipient agencies (or sources of HUD financial assistance) are required to comply with Section 3?

13. Can a non-profit organization be considered a business concern for the purposes of Section 3?

14. What is a “Service Area” or “Neighborhood of the project”?

15. What if my agency does not meet all benchmark goals for employment or contracting?

16. My agency has met all benchmark goals for employment and contracting, does this mean that we are considered in compliance with Section 3?

II. APPLICABILITY:

1. What HUD assistance does Section 3 apply to?

2. Do the requirements of Section 3 apply to grantees on a per project basis?

3. If a project is funded with non-HUD assistance, do the requirements of Section 3 still apply?

4. What recordkeeping responsibilities do contractors/subcontractors have if they receive Section 3 covered contracts?

5. Do the Section 3 requirements apply to material only contracts?

6. Do the Section 3 requirements apply to Section 8 project-based rental assistance contracts?

7. Are maintenance projects covered by Section 3?

8. Does the reduction and abatement of lead-based paint hazards constitute housing rehabilitation?

9. Are demolition projects covered by the requirements of Section 3?

10. Are professional service contracts required to be reported under Section 3?

11. Does Section 3 apply to labor hours by a CDBG-Entitlement recipient?

12. Does Section 3 apply to labor hours by a Public Housing Authority?

III. CONSISTENCY WITH OTHER LAWS:

1. Are recipients required to comply with Federal/state/local laws in addition to Section 3

2. What is the relationship between Section 3 and Davis Bacon requirements?

3. What does the new rule mean for Tribes and Tribally Designated Housing Entities?

IV. RECIPIENT RESPONSIBILITIES:

1. What are the responsibilities of recipient agencies under Section 3?

2. What are the reporting requirements for legacy contracts entered into under the old Part 135 rule?

3. What are the reporting requirements for Section 3 projects for which assistance or funds are committed during the transition period?

4. What is the reporting timeline for Public Housing Authorities and other recipients of public housing financial assistance?

5. What are the reporting requirements for Public Housing Authorities and other recipients of public housing financial assistance during the transition period?

6. What are good strategies for targeting Section 3 workers and businesses?

7. Are funds provided to recipients so that they can comply with the requirements of Section 3?

8. Are Section 3 workers or business concerns guaranteed employment or contracting opportunities under Section 3?

9. Are recipients, developers, and contractors required to provide long- term employment opportunities, and not simply seasonal or temporary employment?

10. When might a recipient agency be exempt from the quantitative reporting requirements of Section 3?

11. Are recipients required to request developers or contractors to make payments into Section 3 training or implementation funds?

V. SECTION 3 CERTIFICATION:

1. How can a prospective Section 3 worker or business concern certify that they meet the eligibility requirements?

2. What documentation must be maintained by HUD recipients, contractors and subcontractors certifying that low- and very-low individuals and business concerns meet the regulatory definitions under Section 3?

3. What are examples of acceptable evidence to determine eligibility as a Section 3 worker?

4. What are examples of acceptable evidence for determining eligibility as a Section 3 business concern?

5. Are all public housing residents considered Section 3 workers regardless of their income?

6. Does qualifying as a Section 3 businesses mean that the business will be selected if it meets the technical requirements of the bid, regardless of bid price?

7. Does a business have to be incorporated to be considered a Section 3 eligible business?

VI. ECONOMIC OPPORTUNITIES NUMERICAL BENCHMARKS:

1. How can low- and very low-income persons and businesses locate recipient agencies that are required to comply with Section 3 in their area?

2. How can I find Section 3 business concerns in my area?

3. Do the benchmark requirements only count toward new hires?

4. Should PHA's report on staff hours?

5. What category of PHA Staff should be included?

6. Are recipient agencies required to meet the Section 3 benchmarks, or are they optional?

7. Will there be changes to the benchmark requirements?

8. What is considered "other" public construction?

9. What is the meaning of the safe harbor determination?

VII. SECTION 3 COMPLAINTS:

1. How should complaints be made?

2. Where else can I file complaints alleging denied employment and contracting opportunities?

I. GENERAL QUESTIONS REGARDING SECTION 3:

1. What is Section 3?

Section 3 is a provision of the Housing and Urban Development Act of 1968. The purpose of Section 3 is to ensure that employment and other economic opportunities generated by certain HUD financial assistance shall, to the greatest extent feasible, and consistent with existing Federal, State, and local laws and regulations, be directed to low- and very low-income persons, particularly those who are recipients of government assistance for housing, and to business concerns which provide economic opportunities to low- and very low-income persons.

2. What Do "Best Efforts" and "to the Greatest Extent Feasible" Mean?

"Best efforts" and "greatest extent feasible" are statutory terms, used in the statute in different contexts. As such, HUD uses both terms to track compliance, and there are many ways to interpret the language. Traditionally, HUD has used the terms interchangeably, as referenced in

the statute, and will continue to be consistent with the statutory language. *See* 12 U.S.C. 1701u(b)-(d). These terms are integral to the statutory intent and provide flexibility, rather than administrative burden, to grantees or recipients of HUD funding.

HUD acknowledges that some perceive "best efforts" to be the more rigorous standard, while others perceive "greatest extent feasible" to be the more rigorous standard. HUD has determined not to define the difference between these two terms but rather to increase the emphasis on outcomes as a result of these efforts. A recipient's reported results will be compared to the outcome metrics defined in the benchmark notice. HUD program staff will evaluate the level of effort expended by those recipients that fail to meet the benchmark safe harbor, and thus will ensure that the statutory terms are being properly enforced. HUD included a list of examples in the regulation at 24 CFR §§ 75.15 and 75.25, including engagement in outreach efforts to generate job applicants who are Targeted Section 3 workers, providing training or apprenticeship opportunities, and providing technical assistance to help Section 3 workers compete for jobs (e.g., resume assistance, coaching).

3. What Does "Section 3 Worker" Mean?

A Section 3 worker is any worker who currently fits, or when hired within the past five years fit, at least one of the following categories, as documented:

1. The worker's income for the previous or annualized calendar year is below the income limit established by HUD (see Question 6 of this part I of these FAQs, below);
2. The worker is employed by a Section 3 business concern (see Question 5 of part I, below); or
3. The worker is a YouthBuild participant.

4. What Does "Targeted Section 3 Worker" Mean?

A Section 3 targeted worker for Public Housing Financial Assistance projects is a Section 3 worker who:

(1) is employed by a Section 3 business concern; or
(2) currently fits or when hired fit at least one of the following categories, as documented within the past five years:
  (i) A resident of public housing or Section 8-assisted housing;
  (ii) A resident of other public housing projects or Section 8-assisted housing managed by the PHA that is providing the assistance; or
  (iii) A YouthBuild participant.

A Section 3 targeted worker for Housing and Community Development Financial Assistance projects is a Section 3 worker who:

(1) is employed by a Section 3 business concern; or

(2) currently fits or when hired fit at least one of the following categories, as documented within the past five years:
   (i) Living within the service area or the neighborhood of the project, as defined in 24 CFR § 75.5; or
   (ii) A YouthBuild participant.

5. What Does "Section 3 Business Concern" mean?

A Section 3 business concern is a business that meets at least one of the following criteria, documented within the last six-month period:

1. At least 51 percent owned and controlled by low- or very low-income persons;
2. Over 75 percent of the labor hours performed for the business over the prior three-month period are performed by Section 3 workers; or
3. A business at least 51 percent owned and controlled by current public housing residents or residents who currently live in Section 8-assisted housing.

6. How are low-income and very low-income determined?

Low- and very low-income limits are defined in Section 3(b)(2) of the Housing Act of 1937 and are determined annually by HUD. These limits are typically established at 80 percent and 50 percent of the area median individual income. HUD income limits may be obtained from: https://www.huduser.gov/portal/datasets/il.html.

7. What is YouthBuild?

YouthBuild is a community-based pre-apprenticeship program that provides job training and educational opportunities for at-risk youth ages 16-24 who have previously dropped out of high school.

YouthBuild participants learn vocational skills in construction, as well as in other in-demand industries that include health care, information technology, and hospitality. Youth also provide community service through the required construction or rehabilitation of affordable housing for low-income or homeless families in their own neighborhoods.

The Division of Youth Services within the Employment and Training Administration's Office of Workforce Investment at the U.S. Department of Labor administers the YouthBuild program. Each year, more than 6,000 youth participate in approximately 210 YouthBuild programs in more than 40 states. More information can be found here: https://www.dol.gov/agencies/eta/youth/youthbuild.

8. As a funding recipient, what are my Section 3 reporting goals?

Your Section 3 reporting goals depend on the type of assistance you are receiving, whether public housing financial assistance or housing and community development financial assistance.

For public housing financial assistance, the benchmark for Section 3 workers is set at *25 percent* or more of the total number of labor hours worked by all workers employed with public housing financial assistance in the PHA's or other recipient's fiscal year. The benchmark for Targeted Section 3 workers is set at *5 percent* or more of the total number of labor hours worked by all workers employed with public housing financial assistance in the PHA's or other recipient's fiscal year. This means that the *5 percent* is included as part of the *25 percent* threshold.

For housing and community development financial assistance projects, the benchmark for Section 3 workers is set at *25 percent* or more of the total number of labor hours worked by all workers on a Section 3 project. The benchmark for Targeted Section 3 workers is set at *5 percent* or more of the total number of labor hours worked by all workers on a Section 3 project. This means that the *5 percent* is included as part of the *25 percent* threshold.

9. What is a Section 3 project?

Section 3 projects are housing rehabilitation, housing construction, and other public construction projects assisted under HUD programs that provide housing and community development financial assistance when the total amount of assistance to the project exceeds a threshold of $200,000. The threshold is $100,000 where the assistance is from the Lead Hazard Control and Healthy Homes programs, as authorized by Sections 501 or 502 of the Housing and Urban Development Act of 1970 (12 U.S.C. 1701z–1 or 1701z–2), the Lead-Based Paint Poisoning Prevention Act (42 U.S.C 4801 *et seq.*,; and/or the Residential Lead-Based Paint Hazard Reduction Act of 1992 (42 U.S.C. 4851 *et seq.*). (See Question 12 of this part I of these FAQs for more detail regarding Lead Hazard Control and Healthy Homes programs.)

The project is the site or sites together with any building(s) and improvements located on the site(s) that are under common ownership, management, and financing. The requirements of Part 75 apply to an entire Section 3 project, regardless of whether the project is fully or partially assisted under HUD programs that provide housing and community development financial assistance.

10. Who is considered a recipient of Section 3 funding?

A recipient is any entity that receives directly from HUD public housing financial assistance or housing and community development assistance that funds Section 3 projects, including, but not limited to, any State, local government, instrumentality, PHA, or other public agency, public or private nonprofit organization. It does not include contractors or any intended beneficiary under the HUD program to which Section 3 applies, such as a homeowner or a Section 3 worker.

11. What are funding thresholds and how do they apply to Section 3 covered financial assistance?

Funding thresholds are minimum dollar amounts that trigger Section 3 requirements. There are no thresholds for public housing programs. The requirements of Section 3 apply to all programs

receiving public housing financial assistance regardless of the amount of assistance received from HUD. Section 3 also applies to the entirety of a mixed-finance development project as described in 24 CFR 905.604, regardless of whether the project is fully or partially assisted with public housing financial assistance.

Section 3 projects are housing rehabilitation, housing construction, and other public construction projects assisted under HUD programs that provide housing and community development financial assistance when the total amount of assistance to the project exceeds a threshold of $200,000 (Lead Hazard Control and Healthy Homes (LHCHH) assistance is not included in calculating whether the assistance exceeds the $200,000 threshold).

The threshold is $100,000 when the assistance is from the Lead Hazard Control and Healthy Homes programs, as authorized by Sections 501 or 502 of the Housing and Urban Development Act of 1970, the Lead-Based Paint Poisoning Prevention Act, and the Residential Lead-Based Paint Hazard Reduction Act of 1992. LHCHH programs require Section 3 compliance if there is over $100,000 of LHCHH funding for the project (neither HUD public housing financial assistance nor HUD housing and community development financial assistance is included in calculating whether the assistance exceeds the $100,000 threshold). Recipients of LHCHH funding will also be required to comply with Section 3 regulations and report on the entirety of the project when the total amount of HUD housing and community development financial assistance to the project exceeds $200,000 (LHCHH funding is not included in calculating whether the total assistance exceeds the $200,000 threshold), or if any public housing financial assistance is provided.

12. Which recipient agencies (or sources of HUD financial assistance) are required to comply with Section 3?

For public housing financial assistance, Public Housing Authorities (PHAs), regardless of size or number of public housing units, are required to comply with Section 3 and its reporting requirements. However, small PHAs (fewer than 250 units) are permitted to report qualitatively as permitted under 24 CFR § 75.15(d). Some examples of those qualitative efforts are listed in the answer to Question 15.

As previously stated, Section 3 also applies to projects with more than $200,000 in funding from housing and community development financial assistance programs. The following is a list of examples of such funds:

- Community Development Block Grant (CDBG)
- HOME Investment Partnership
- Housing Trust Fund (HTF)
- Neighborhood Stabilization Program Grants (NSP 1, 2 & 3)
- Housing Opportunities for Persons with AIDS (HOPWA)
- Emergency Solutions Grants (ESG)

- University Partnership Grants
- Economic Stimulus Funds
- 202/811 Grants
- Lead Hazard Control Grants ($100,000 threshold; see Question 12, above, in this part I of these FAQs)
- Healthy Homes Production Grants ($100,000 threshold; see Question 12, above, in this part I)
- Rental Assistance Demonstration (RAD) (see most recent RAD Notice, found through HUD's RAD website, www.hud.gov/rad/)

*Note: The requirements of Section 3 typically apply to recipients of HUD funds that will be used for housing construction, rehabilitation, or other public construction. Contact your local HUD field office to determine applicability to a particular project/activity.

13. Can a non-profit organization be considered a business concern for the purposes of Section 3?

Yes. A non-profit organization can be a business concern. Non-profit organizations must meet the criteria of a Section 3 business concern as defined at 24 CFR § 75.5 in order to receive Section 3 preference. See response to Question 5 above.

14. What is a "Service Area" or "Neighborhood of the project"?

"Service area" or the "neighborhood of the project" means an area within one mile of the Section 3 project or, if fewer than 5,000 people live within one mile of a Section 3 project, within a circle centered on the Section 3 project that is sufficient to encompass a population of 5,000 people according to the most recent U.S. Census.

15. What if my agency does not meet all benchmark goals for employment or contracting?

If reporting indicates that the agency has not met the Section 3 benchmarks, the agency must report in a method prescribed by HUD program offices on the qualitative nature of its activities and those its contractors and subcontractors pursued per 24 CFR § 75.15(b) and § 75.25(b).

Such qualitative efforts may, for example, include but are not limited to the following:

- Engaged in outreach efforts to generate job applicants who are Targeted Section 3 workers.
- Provided training or apprenticeship opportunities.
- Provided technical assistance to help Section 3 workers compete for jobs (e.g., resume assistance, coaching).
- Provided or connected Section 3 workers with assistance in seeking employment including: drafting resumes, preparing for interviews, and finding job opportunities connecting residents to job placement services.
- Held one or more job fairs.

- Provided or referred Section 3 workers to services supporting work readiness and retention (e.g., work readiness activities, interview clothing, test fees, transportation, childcare).
- Provided assistance to apply for/or attend community college, a four-year educational institution, or vocational/technical training.
- Assisted Section 3 workers to obtain financial literacy training and/or coaching.
- Engaged in outreach efforts to identify and secure bids from Section 3 business concerns.
- Provided technical assistance to help Section 3 business concerns understand and bid on contracts.
- Divided contracts into smaller jobs to facilitate participation by Section 3 business concerns.
- Provided bonding assistance, guaranties, or other efforts to support viable bids from Section 3 business concerns.
- Promoted use of business registries designed to create opportunities for disadvantaged and small businesses.
- Outreach, engagement, or referrals with the state one-stop system as defined in Section 121(e)(2) of the Workforce Innovation and Opportunity Act

16. My agency has met all benchmark goals for employment and contracting, does this mean that we are considered in compliance with Section 3?

Yes. Recipients will be considered to have complied with Section 3 requirements, in the absence of evidence to the contrary, if they meet all benchmark goals and certify compliance with prioritization requirements found in 24 CFR § 75.9 or §75.19. However, if subsequent HUD enforcement activities reveal that the recipient has failed to comply with the recipient responsibilities set forth at 24 CFR §75.13 or §75.23, this compliance determination may be rescinded.

II. APPLICABILITY:

1. What HUD assistance does Section 3 apply to?

Section 3 applies to both:

a. Public Housing Financial Assistance –
   i. Development assistance provided pursuant to Section 5 of the United States Housing Act of 1937 (the 1937 Act);
   ii. Operations and management assistance provided pursuant to Section 9(e) of the 1937 Act;
   iii. Development, modernization, and management assistance provided pursuant to Section 9(d) of the 1937 Act; and

iv. The entirety of a mixed-finance development project as described in 24 CFR 905.604, regardless of whether the project is fully or partially assisted with public housing financial assistance as defined in subsections (i) through (iii).

b. Housing and Community Development Financial Assistance expended for housing rehabilitation, housing construction, or other public construction. See Question #2 below for applicability thresholds.

2. Do the requirements of Section 3 apply to grantees on a per project basis?

Yes, for housing and community development financial assistance projects. Section 3 projects are housing rehabilitation, housing construction, and other public construction projects assisted under HUD programs that provide housing and community development financial assistance when the total amount of assistance to the project exceeds a threshold of $200,000. The threshold is $100,000 where the assistance is from the Lead Hazard Control and Healthy Homes programs. See Question 12 of part I of these FAQs.

Section 3 applies to all public housing financial assistance funds, regardless of the amount of assistance from HUD.

3. If a project is funded with non-HUD assistance, do the requirements of Section 3 still apply?

Section 3 applies to projects that are fully or partially funded with HUD financial assistance. Projects that are financed with state, local or private matching or leveraged funds used in conjunction with HUD funds are covered by Section 3 if the amount of HUD funding for the project exceeds the regulatory thresholds (listed in Section I, Question #11).

For RAD projects, Section 3 applies regardless of what money is used to pay for repairs. Per the RAD Notice, “While most RAD conversions do not utilize funding covered by Section 3, HUD has established the alternative requirement that any Work required by the conversion after the RAD Closing that involves housing rehabilitation or housing construction is subject to the Section 3 requirements applicable to housing and community development activities as set forth in 12 U.S.C. 1701u(c)(2) and (d)(2) and the regulations derived from such provisions except that, with the exception of transactions receiving HUD housing and community development assistance, such as CDBG (24 CFR part 570) or HOME (24 CFR part 92), first priority for employment and other economic opportunities shall be given to residents of public housing or Section 8 assisted housing. Otherwise, the receipt of Section 8 rental assistance does not, in itself, trigger the applicability of Section 3.”

4. What recordkeeping responsibilities do contractors/subcontractors have if they receive Section 3 covered contracts?

Recordkeeping requirements for recipients are found at 24 CFR § 75.31. Recipients are required to maintain documentation to demonstrate compliance with the regulations and are responsible

for requiring their contractors/subcontractors to maintain or provide any documentation that will assist recipients in demonstrating compliance, including documentation that shows hours worked by Section 3 workers, Targeted Section 3 workers, and any qualitative efforts to comply with Section 3. Examples of documentation can be found in 24 CFR §75.31.

5. Do the Section 3 requirements apply to material only contracts?

No. Section 3 does not apply to material only contracts or those that do not require any labor. For example, a contract for office or janitorial supplies would not be covered by Section 3. In this example, Section 3 would be encouraged but not required. However, a contract to replace windows that includes the removal of existing windows and the installation of new windows would be covered due to the involvement of labor.

6. Do the Section 3 requirements apply to Section 8 project-based rental assistance contracts?

No. Section 8 project-based voucher or project-based rental assistance housing assistance payment contracts, are not covered by the statute, including properties converted through the Rental Assistance Demonstration (RAD).

7. Are maintenance projects covered by Section 3?

Yes, but only for PIH funded programs administered by Public Housing Authorities.

8. Does the reduction and abatement of lead-based paint hazards constitute housing rehabilitation?

No, reduction and abatement of lead-based paint hazards focuses on mitigating lead paint hazards only, not conducting general rehabilitation activities.

9. Are demolition projects covered by the requirements of Section 3?

Yes. Recipients of assistance covered by Section 3 should, where feasible, comply with Section 3 benchmarks.

10. Are professional service contracts required to be reported under Section 3?

No, professional service contracts for non-construction services that require an advanced degree or professional licensing are not required to be reported as a part of total Section 3 labor hours. However, this exclusion does not cover all non-construction services.

However, professional services staff labor hours are permitted to be reported and PHAs will be given credit for reporting opportunities created for professional services by including professional services labor hours in the numerator, and not in the denominator, of the reported outcome ratios. The reporting structure in the rule allows a recipient to count any work performed by a professional services Section 3 worker or Targeted Section 3 worker as Section 3 labor hours and as Targeted Section 3 labor hours (i.e., in the numerator of the calculation), even

when the professional services as a whole are not counted in the baseline reporting (i.e., in the denominator of the calculation). The effect of this reporting structure is to give a recipient a bonus if they are able to report Section 3 hires in the professional services context.

11. Does Section 3 apply to labor hours by a CDBG-Entitlement recipient?

Yes. If the recipient intends to use its HUD grant to perform housing construction, rehabilitation, or other public construction and the total HUD assistance to the project exceeds $200,000, then Section 3 applies to the project.

12. Does Section 3 apply to labor hours by a Public Housing Authority?

Yes. Section 3 applies to all Public Housing capital, operating, or development funds.

III. CONSISTENCY WITH OTHER LAWS:

1. Are recipients required to comply with Federal/state/local laws in addition to Section 3?

Yes. Compliance with Section 3 shall be achieved, to the greatest extent feasible, consistent with existing Federal, state and local laws and regulations. Accordingly, recipients of Section 3-covered assistance are required to develop strategies for meeting both the regulatory requirements at 24 CFR part 75 and any other applicable statutes or regulations.

2. What is the relationship between Section 3 and Davis Bacon requirements?

Compliance with Section 3 must be achieved consistent with the requirements of Davis-Bacon. Certain construction contracts are subject to compliance with the requirement to pay prevailing wages determined under the Davis-Bacon Act (40 U.S.C. 3141 et seq.) and implementing U.S. Department of Labor regulations in 29 CFR Part 5. Additionally, certain HUD-assisted rehabilitation and maintenance activities on public housing projects are subject to compliance with the requirement to pay prevailing wage rates, as determined or adopted by HUD, to laborers and mechanics employed in this work. (24 CFR § 965.101).

3. What does the new rule mean for Tribes and Tribally Designated Housing Entities?

After the Section 3 new rule went into effect on November 30, 2020, Tribes and Tribally Designated Housing Entities under the Indian Housing Block Grant and Indian Community Development Block Grant programs are no longer required comply with Section 3 requirements.

The new rule at 24 CFR part 75 provides that contracts, subcontracts, grants, or subgrants subject to Section 7(b) of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 5307(b)) or subject to tribal preference requirements as authorized under 101(k) of the Native American Housing Assistance and Self-Determination Act (25 U.S.C. 4111(k)) must provide preferences in employment, training, and business opportunities to Indians and Indian organizations, and are therefore not subject to the requirements of 24 CFR Part 75.

IV. RECIPIENT RESPONSIBILITIES:

1. What are the responsibilities of recipient agencies under Section 3?

Recipients are required to ensure their own compliance and the compliance of their contractors/subcontractors with the Section 3 regulations, as outlined at 24 CFR part 75. These responsibilities include but are not limited to the following:

Designing and implementing procedures to comply with the requirements of Section 3: Recipient agencies must take an ***active role*** in ensuring Section 3 compliance. The first step is implementing procedures to ensure that all parties, including residents, businesses, contractors, and subcontractors, comply with Section 3 and maintain records verifying that compliance.

Facilitating the training and employment of Section 3 workers: The recipient agency must act as a facilitator, connecting Section 3 workers to training and employment opportunities.

Facilitating the award of contracts to Section 3 business concerns: The recipient agency must also work to link developers and contractors with capable Section 3 business concerns. Additionally, recipient agencies, when necessary, may direct Section 3 business concerns to organizations that provide capacity-building training.

Ensuring Contractor and Subcontractor Awareness of and Compliance with Section 3 Benchmarks and responsibilities: The recipient agency is responsible for ensuring that contractors and subcontractors are aware of, and in compliance with, Section 3 requirements.

Ensuring Compliance and Meeting Numerical Benchmarks: Recipient agencies shall ensure compliance with Section 3 by assessing the hiring and subcontracting needs of contractors; regularly monitoring contractor compliance; assisting and actively cooperating with the Secretary of HUD in obtaining the compliance of contractors; penalizing non-compliance; providing incentives for good performance; and refraining from entering into contracts with any contractor that previously failed to comply with the requirements of Section 3.

Reporting Requirements: Recipient agencies must document all actions taken to comply with the requirements of Section 3 and report these activities either through the Section 3 Reporting tool (currently under development- a notice will be issued when it is authorized for use), for Public Housing financial assistance, or any reporting system designated by program areas overseeing other funding. HUD financial assistance recipients must maintain their own record keeping for Section 3 requirements while reporting tools are not yet available.

2. What are the reporting requirements for legacy contracts entered into under the old Part 135 rule?

On and after November 30, 2020, Section 3 regulations codified at 24 CFR Part 135 (the old rule) have not applied and will not apply to new grants, commitments, contracts, or projects.

Contracts executed or projects for which assistance or funds were committed prior to November 30, 2020 are still required to adhere to the requirements of the old rule. Recipients of such assistance or funds will still be expected to maintain records of Section 3 statutory, regulatory, and contractual compliance but will no longer be required to report Section 3 compliance to HUD in the decommissioned Section 3 Performance Evaluation And Registration System (SPEARS).

HUD does not require funding recipients to change or alter contracts that were in place prior to the new Section 3 requirements becoming effective on November 30, 2020.

3. What are the reporting requirements for Section 3 projects for which assistance or funds are committed during the transition period?

Projects for which assistance or funds are committed between November 30, 2020 and July 1, 2021 are subject to the new Section 3 regulations found in 24 CFR part 75, and HUD expects that funding recipients will begin following this final rule's requirements for new grants, commitments, and contracts. Recipients will be expected to maintain records of statutory, regulatory, and contractual compliance with Section 3 for these projects but will not be required to report to HUD on the requirements found in 24 CFR part 75.

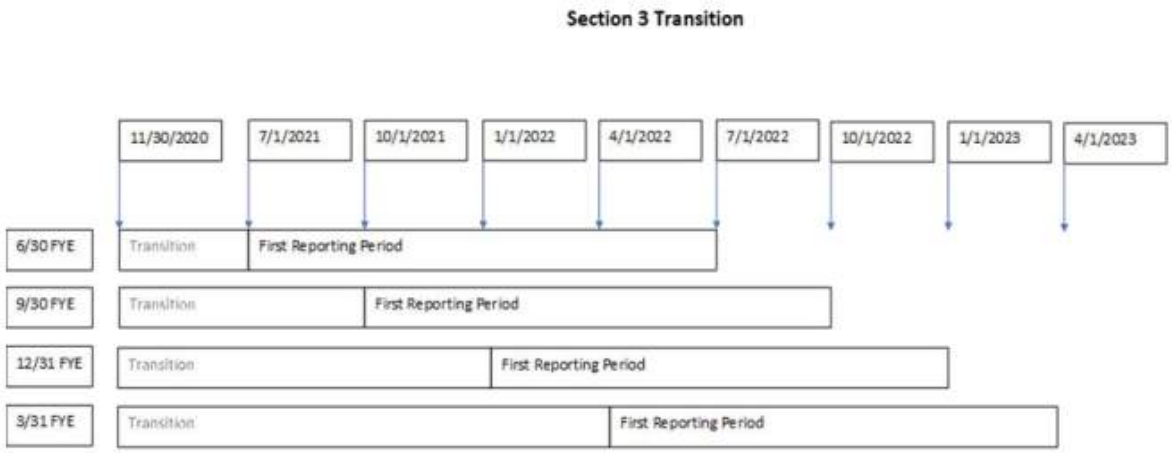
During the transition period between November 30, 2020 and July 1, 2021, recipients are expected to plan and revise processes, systems, and documents to comply with the new rule's requirements. During this time, funding recipients are still required to comply with Section 3's statutory requirements by ensuring that, to the greatest extent feasible, recipients continue to direct economic opportunities generated by certain HUD financial assistance to low- and very low-income persons and businesses that provide economic opportunities to low- and very low-income persons.

Recipients and employers should use this time to update policies and procedures for tracking labor hours and other requirements to ensure compliance with the new rules for projects for which funds are committed on or after July 1, 2021.

4. What is the reporting timeline for Public Housing Authorities and other recipients of public housing financial assistance?

As of November 30, 2020, PHAs' requirement to report their Section 3 activities and efforts starts 60 days after the end of their first fiscal year that begins after July 1, 2021. Please see the charts below for examples of PHA reporting schedules:

Fiscal Year End	New Reporting Period Begins	New Reporting Period Ends
6/30/21	7/1/21	6/30/22
9/30/21	10/1/21	9/30/22
12/31/21	1/1/22	12/13/22
3/31/22	4/1/22	3/31/23



5. What are the reporting requirements for Public Housing Authorities and other recipients of public housing financial assistance during the transition period?

All recipients of public housing financial assistance are required to follow the new Section 3 regulations found in 24 CFR part 75 beginning on November 30, 2020, and HUD expects that funding recipients and employers will begin following this final rule's requirements for new grants, commitments, and contracts on and after this date. Recipients will be expected to maintain records of statutory, regulatory, and contractual compliance with Section 3.

The Section 3 Reporting System is not yet available. The Office of Public and Indian Housing will issue a notice when it is ready as they are the HUD office which monitors Section 3 compliance for Public Housing Authorities. The most recent guidance related to PHA reporting on Section 3 can be found in this December 20, 2022 notice.

During the transition period between November 30, 2020 and a PHA or other recipient's required reporting start date, employers and grantees are expected to plan and revise processes, systems, and documents to comply with the new rule's requirements. During this time, PHAs and other recipients are still required to comply with Section 3's statutory requirements by ensuring that, to the greatest extent feasible, PHA's continue to direct economic opportunities generated by certain HUD financial assistance to low- and very low-income persons, tenants of public and assisted housing, and businesses that provide economic opportunities to low- and very low-income persons.

6. What are good strategies for targeting Section 3 workers and businesses?

In order to successfully target Section 3 workers and businesses for employment and contracting opportunities, recipients must establish and maintain an effective Section 3 program. HUD has found that hiring a Section 3 coordinator or assigning one individual the responsibility of coordinating all Section 3 related activities is instrumental in reaching Section 3's employment and contracting goals.

It is recommended that recipient agencies establish procedures to certify Section 3 workers and Section 3 business concerns for employment and contracting opportunities. Thereafter, they should maintain a list of eligible workers and businesses by skill, capacity or interest and contact them on a periodic basis when employment and contracting opportunities are available. Refer to the Section 3 regulations at 24 CFR § 75.15(b) and § 75.25(b) for a listing of qualitative efforts.

7. Are funds provided to recipients so that they can comply with the requirements of Section 3?

No. Funding has not been appropriated for Section 3 compliance. Section 3 requirements are only triggered when the normal expenditure of covered funds results in employment, training, or contracting opportunities.

8. Are Section 3 workers or business concerns guaranteed employment or contracting opportunities under Section 3?

Section 3 is not an entitlement program; therefore, employment and contracts are not guaranteed. Low and very low-income individuals and Section 3 business concerns must be able to demonstrate that they have the ability or capacity to perform the specific job or successfully complete the contract that they are seeking.

9. Are recipients, developers, and contractors required to provide long- term employment opportunities, and not simply seasonal or temporary employment?

Recipients, developers, and contractors are required, to the greatest extent feasible, to direct employment opportunities to low- and very low-income persons, including seasonal and temporary employment opportunities. Benchmark goals include the calculation of all Section 3 worker and Targeted Section 3 Worker labor hours as a percentage of all labor hours worked on a project.

Recipients, developers, and contractors are encouraged to provide long-term employment to ensure that they meet the benchmark goals.

10. When might a recipient agency be exempt from the quantitative reporting requirements of Section 3?

A Small Public Housing Agency (less than 250 units) may elect to not report on labor hours. If the agency does elect not to report on labor hours, it is required to report solely on qualitative efforts as permitted in 24 CFR § 75.15(d).

11. Are recipients required to request developers or contractors to make payments into Section 3 training or implementation funds?

No. Recipients are not required to request contractors to make payments into a fund.

V. SECTION 3 CERTIFICATION:

1. How can a prospective Section 3 worker or business concern certify that they meet the eligibility requirements?

The individual or business must contact the agency or developer from which they are seeking employment or contracting opportunities (e.g., the PHA, city, or local government). They should identify themselves as a Section 3 worker, Targeted Section 3 worker, or Section 3 business concern and provide whatever documentation that the recipient agency requires under their certification procedures. Prospective Section 3 workers and business concerns may self-certify that they meet the requirements as defined in the regulations. HUD recipients, contractors and subcontractors may also establish their own system to certify Section 3 workers and business concerns.

2. What documentation must be maintained by HUD recipients, subrecipients, contractors, and/or subcontractors certifying that low- and very-low individuals and business concerns meet the regulatory definitions under Section 3?

There are many ways that a worker can be certified as either a Section 3 Worker or Targeted Section 3 Worker under 24 CFR part 75:

For a worker to qualify as a *Section 3 worker*, one of the following must be maintained:

(i) A worker's self-certification that their income is below the income limit from the prior calendar year;
(ii) A worker's self-certification of participation in a means-tested program such as public housing or Section 8-assisted housing;
(iii) Certification from a PHA, or the owner or property manager of project-based Section 8- assisted housing, or the administrator of tenant-based Section 8-assisted housing that the worker is a participant in one of their programs;
(iv) An employer's certification that the worker's income from that employer is below the income limit when based on an employer's calculation of what the worker's wage rate would translate to if annualized on a full-time basis; or
(v) An employer's certification that the worker is employed by a Section 3 business concern.

For a worker to qualify as a *Targeted Section 3 worker*, one of the following must be maintained:

For Public Housing Financial Assistance projects:

(i) A worker's self-certification of participation in public housing or Section 8-assisted housing programs;
(ii) Certification from a PHA, or the owner or property manager of project-based Section 8- assisted housing, or the administrator of tenant-based Section 8-assisted housing that the worker is a participant in one of their programs;

(iii) An employer's certification that the worker is employed by a Section 3 business concern; or

(iv) A worker's certification that the worker is a YouthBuild participant.

For Housing and Community Development Financial Assistance projects:

(i) An employer's confirmation that a worker's residence is within one mile of the work site or, if fewer than 5,000 people live within one mile of a work site, within a circle centered on the work site that is sufficient to encompass a population of 5,000 people according to the most recent U.S. Census;

(ii) An employer's certification that the worker is employed by a Section 3 business concern; or

(iii) A worker's self-certification that the worker is a YouthBuild participant.

The documentation must be maintained for the time period required for record retentions in accordance with applicable program regulations or, in the absence of applicable program regulations, in accordance with 2 CFR § 200.334, Retention Requirements for Records (www.ecfr.gov/cgibin/retrieveECFR?n=se2.1.200_1334), which provides for retaining records for at least three years, as described in detail in that regulation.

A PHA or recipient may report on Section 3 workers and Targeted Section 3 workers for five years from when their certification as a Section 3 worker or Targeted Section 3 worker is established.

3. What are examples of acceptable evidence to determine eligibility as a Section 3 worker?

HUD does not prescribe that any specific forms of evidence to establish Section 3 eligibility. Acceptable documentation includes, but is not limited to the following:

- Proof of residency in a public housing project; or
- Evidence of participation in the YouthBuild program.

4. What are examples of acceptable evidence for determining eligibility as a Section 3 business concern?

HUD does not prescribe that any specific forms of evidence be required to establish Section 3 eligibility. The business seeking the preference must be able to demonstrate that they meet one of the following criteria:

1. At least 51 percent owned and controlled by low- or very low-income persons;
2. Over 75 percent of the labor hours performed for the business over the prior three-month period are performed by Section 3 workers; or
3. A business at least 51 percent owned and controlled by current public housing residents or residents who currently live in Section 8-assisted housing.

5. Are all public housing residents considered Section 3 workers regardless of their income?

No. To qualify as a Section 3 Worker, an individual must meet one of the following criteria:

1. The worker's income for the previous or annualized calendar year is below the income limit established by HUD;
2. The worker is employed by a Section 3 business concern; or
3. The worker is a YouthBuild participant.

6. Does qualifying as a Section 3 businesses mean that the business will be selected if it meets the technical requirements of the bid, regardless of bid price?

No. As provided in 2 CFR 200.318, contract awards shall only be made to responsible contractors possessing the ability to perform under the terms and conditions of the proposed contract. In order to meet the requirements of Section 3 and Federal and state procurement laws, recipient agencies must develop procedures that are consistent with all applicable regulations.

7. Does a business have to be incorporated to be considered a Section 3 eligible business?

No. A Section 3 business concern can be any type of business, such as a sole proprietorship, partnership, or a corporation, properly licensed and meeting all legal requirements to perform the contract under consideration.

VI. ECONOMIC OPPORTUNITIES NUMERICAL BENCHMARKS:

1. How can low- and very low-income persons and businesses locate recipient agencies that are required to comply with Section 3 in their area?

To find local recipients' agencies, Section 3 residents or businesses should contact their local HUD office. To find your closest office, visit: www.hud.gov/localoffices.

2. How can I find Section 3 business concerns in my area?

The Section 3 Business Registry is unavailable. One may use the Small Business Administration's Dynamic Small Business Search to find nearby small businesses. Please contact your local HUD field office for possible local business registries and the most recent list of Section 3 registered businesses, dated August 28, 2023.

3. Do the benchmark requirements only count toward new hires?

No, the rule does not apply to only new hires, but if someone is currently on staff and qualifies as a Section 3 resident under 24 CFR part 135, they will need to re-certify as either a Section 3 worker or Targeted Section 3 worker under 24 CFR part 75.

4. Should PHA's report on staff hours?

Yes, but not all PHA staff qualify as Section 3 workers. Only PHA staff that meet the definition of a Section 3 worker or Targeted Section 3 worker would qualify to be counted toward total

Section 3 or Targeted Section 3 labor hours. Once a PHA determines that a Section 3 worker or Targeted Section 3 worker is hired or currently employed, the PHA would just report those hours as the numerator over the total labor hours funded with public housing financial assistance as the denominator.

5. What category of PHA Staff should be included?

Both salaried and hourly workers need to be reported. There is a limited good faith assessment exception for PHAs and other recipient employers of hourly and salaried workers that are not subject to requirements specifying time and attendance reporting and do not have systems already in place to track labor hours. This exception is to address employers that do not already track labor hours without making changes in time and attendance or payroll.

6. Are recipient agencies required to meet the Section 3 benchmarks, or are they optional?

The Section 3 benchmarks are minimum targets that must be reached in order for the Department to consider a recipient in compliance. Recipient agencies are required to make best efforts, or to the greatest extent feasible, to achieve the benchmarks required for the number of labor hours performed by both Section 3 workers and Targeted Section 3 workers. If an agency fails to fully meet the Section 3 benchmarks, they must adequately document the efforts taken to meet the numerical goals (see Question #9 for a discussion of safe harbor.)

7. Will there be changes to the benchmark requirements?

The Secretary of Housing and Urban Development is required in the Benchmark Notice published in the Federal Register to review and update the Benchmarks by Federal Register notice no less frequently than once every three years.

8. What is considered "other" public construction?

Other public construction includes infrastructure work, such as extending water and sewage lines, sidewalk repairs, site preparation, and installing conduits for utility services.

9. What is the meaning of the safe harbor determination?

Recipients will be considered to have complied with the Section 3 requirements and met the safe harbor, in the absence of evidence to the contrary, if they certify that they have followed the required prioritization of effort and met or exceeded the applicable Section 3 benchmarks.

If a recipient agency or contractor does not meet the benchmark requirements but can provide evidence that they have made a number of qualitative efforts to assist low- and very low-income persons with employment and training opportunities, the recipient or contractor is considered to be in compliance with Section 3, absent evidence to the contrary (i.e., evidence or findings obtained from a Section 3 compliance review).

VII. SECTION 3 COMPLAINTS:

1. How should complaints be made?

Complaints alleging failure of compliance with this part may be reported to the HUD program office responsible for the public housing financial assistance or the Section 3 project, or to the local HUD field office. These offices can be found through the HUD website, www.hud.gov/.

2. Where else can I file complaints alleging denied employment and contracting opportunities?

You may be eligible to bring complaints under other federal laws. The U.S. Equal Employment Opportunity Commission (EEOC) is responsible for enforcing federal laws that make it illegal to discriminate against a job applicant or an employee because of the person's race, color, religion, sex (including pregnancy), national origin, age (40 or older), disability or genetic information (medical history or predisposition to disease). For more information about your rights, please contact EEOC at: www.EEOC.gov.

The Department of Labor Office of Federal Contract Compliance Programs (OFCCP) enforces, for the benefit of job seekers and wage earners, the contractual promise of affirmative action and equal employment opportunity required of those who do business with the Federal government. More information about the services they provide can be obtained at: http://www.dol.gov/ofccp/.

SECTION 01022

CERTIFICATION OF **PRIME CONTRACTOR** REGARDING SECTION 3 AND SEGREGATED FACILITIES

Lafourche Parish Government
New Clinic for Lady of The Sea General Hospital

Name of Prime Contractor	Project Name

The undersigned hereby certifies that:

a) Section 3 provisions are included in the Contract;

b) To the greatest extent feasible economic opportunities, most importantly employment, generated by this project shall be directed to low- and very low-income persons, particularly those who are recipients of government assistance for housing or residents of Kristi Lumpkin.

c) No segregated facilities will be maintained as required by Title VI of the Civil Rights Act of 1964.

Typed Name and Title of Authorized Representative	Company (Prime Contractor)
Signature of Authorized Representative	Date

SECTION 01023

CERTIFICATION OF **SUBCONTRACTOR** REGARDING SECTION 3 AND SEGREGATED FACILITIES

Lafourche Parish Government
New Clinic for Lady of The Sea General Hospital

Name of Subcontractor	Project Name

The undersigned hereby certifies that:

a) Section 3 provisions are included in the Contract;

b) To the greatest extent feasible economic opportunities, most importantly employment, generated by this project shall be directed to low- and very low-income persons, particularly those who are recipients of government assistance for housing or residents of Kristi Lumpkin.

c) No segregated facilities will be maintained as required by Title VI of the Civil Rights Act of 1964.

Typed Name and Title of Authorized Representative	Company (Prime Contractor)
Signature of Authorized Representative	Date

SECTION 01024

CONTRACTOR SECTION 3 PLAN

Lafourche Parish Government
New Clinic for Lady of The Sea General Hospital

Woodward Construction, Contractor, agrees to ensure, to the greatest extent feasible, that economic opportunities, most importantly employment, generated by CDBG financial assistance shall be directed to low- and very low-income persons, particularly those who are recipients of government assistance for housing or residents of the community in which the CDBG financial assistance is spent.

Goals

To the greatest extent feasible, and consistent with existing Federal, state, and local laws and regulations, the Contractor agrees to comply with the employment and training, and contract prioritization efforts of 24 CFR 75.19. The goals of this Plan are, where feasible, to:

- Provide employment opportunities and training to Section 3 workers, participants in YouthBuild programs.
- Provide contacting opportunities to qualified Section 3 business concerns.
- Give priority for employment opportunities and training to Section 3 workers residing within the service area of the project and participants in YouthBuild Programs.

On this project, the Contractor and its subcontractors will collectively strive to meet the following Section 3 minimum labor hour benchmarks:

Labor Hour Standard	Ratio Formula	Minimum %
Section 3 Workers	Section 3 Worker Hours ÷ Total Labor Hours	25%
Targeted Section 3 Workers	Targeted Section 3 Worker Hours ÷ Total Labor Hours	5%

Reporting

To document the Contractor's and subcontractor's efforts to achieve the benchmarks and comply with the reporting requirements set forth in 24 CFR 75.25(a), the Contractor and its subcontractors will complete and submit the following certifications and reports[1] as applicable:

- Section 3 Employee Data Form and Self-Certification.
- Section 3 Business Concern Contractor/Subcontractor Certification.
- Section 3 Activity and Good Faith Efforts Report (quarterly).
- Section 3 Employee Roster-Job specific
- Section 3 Utilization Report (final)

Contract Provisions

In compliance with 24 CFR 75.27, the Contractor will include contract provisions in all subcontract agreements that require the subcontractor to meet the requirements of 24 CFR 75.19 as outlined above.

The undersigned declares that the Contractor agrees to implement this Section 3 Plan for the above-named Section 3 covered project.

Printed Name and Title	Authorized Signature	Date

[1] The Contractor may substitute an internal computer-generated employee registry in lieu of completing a specific form or report provided it includes the worker's name, worker's address, employer, hours worked and indicates Section 3/targeted Section 3 Status.

SECTION 01025

SECTION 3 WORKER SELF CERTIFICATION

Lafourche Parish Government
New Clinic for Lady of The Sea General Hospital

To be completed by Employee:

Employee General Information

1. Name of Employer _____
2. Name of Employee _____
3. Street Address of Employee _____
4. City and Zip Code of Employee _____
5. Phone Number and Email _____
6. Date of Employment _____

The purpose of this form is to comply with Section 3 of the HUD Act of 1968 employer certification requirements listed in 24 CFR § 75.31. To qualify as a Section 3 worker, any United States legal resident's annual income must not exceed the HUD income limits for the year before the worker was hired, or the individual's current income annualized on a full-time basis for the year must be below the HUD income limit. Additionally, an individual can qualify as a Section 3 worker if they are a YouthBuild participant or employee of a Section 3 Business concern.

SECTION 3 WORKER QUALIFICATIONS

To qualify as a Section 3 Worker, you must meet **one** of the following requirements **OR** have your employer certify that you are employed by a Section 3 Business Concern.

• Income for the previous calendar year is below the income limit* • A participant in a means-tested program such as public housing or Section 8-assisted housing • A YouthBuild Participant*	Income limit $XX,XXX

* Currently or at the time of hire if hired within the past 5 years

Income Limit is the HUD 80% One Person Income Limit for Parish for which employee resides. Income limits may be obtained at: Income Limits | HUD USER

☐ I meet at least one of the requirements in the box above and therefore qualify to be counted as a Section 3 Worker under 24 CFR § 75.

TARGETED SECTION 3 WORKER QUALIFICATIONS

If applicable, please indicate which requirement you meet to be considered a Targeted Section 3 worker in the box below. If you select "Living within the service area or neighborhood of the project," that selection will have to be confirmed by your employer. If you do not meet any of these requirements or do not know if you meet any of the requirements listed below, you may leave this section blank.

___ Living within the service area or neighborhood of the project (requires employer confirmation)*

___ YouthBuild participant*

*Currently or at the time of hire if hired within the past 5 years

Service area or the neighborhood of the project means an area within one mile of the Section 3 project or, if fewer than 5,000 people live within one mile of a Section 3 project, within a circle centered on the Section 3 project that is sufficient to encompass a population of 5,000 people according to the most recent U.S. Census.

☐ In addition to qualifying as a Section 3 Worker, I meet at least one of the requirements in the box above and therefore qualify to be counted as a Targeted Section 3 Worker under 24 CFR § 75.

I/We, the undersigned, certify under penalty of perjury that the information provided above is true and correct and certifies that the worker identified above meets the definition of a Section 3 worker. WARNING: Anyone who knowingly submits a false claim or makes a false statement is subject to criminal and/or civil penalties, including confinement for up to 5 years, fines, and civil and administrative penalties. (18 U.S.C. §§ 287, 1001, 1010, 1012; 31 U.S.C. §3729, 3802)

_____ _____

Signature Date

SECTION 01026

SECTION 3 WORKER EMPLOYER CERTIFICATION FORM

Lafourche Parish Government
New Clinic for Lady of The Sea General Hospital

To be completed by Employer:

A. Employer General Information

1. Name of Employer _____
2. Street Address of Employer _____
3. City and Zip Code of Employer _____
4. Phone Number and Email _____

The purpose of this form is to comply with Section 3 of the HUD Act of 1968 employer certification requirements listed in 24 CFR § 75.31. To qualify as a Section 3 worker, the United States legal resident's annual income must not exceed the HUD income limits for the year before the worker was hired, or the individual's current income annualized on a full-time basis for the year must be below the HUD income limit. Additionally, an individual can qualify as a Section 3 worker and Targeted Section 3 worker, if an employee of a Section 3 Business Concern. To qualify as a Targeted Section 3 worker, an employer can confirm that the employee lives within the service area or neighborhood of the project.

B. Employee General Information

1. Name of Employee _____
2. Street Address of Employee _____
3. City and Zip Code of Employee _____
4. Phone Number and Email _____

SECTION 3 WORKER AND TARGETED SECTION 3 WORKER QUALIFICATIONS

Please indicate which of the following is true for the worker listed above: (Select ALL that apply)

___ Worker's income from your employment is below the income limit based on a calculation of what the worker's wage rate would translate to if annualized on a full-time basis* ___ Worker is employed by a Section 3 Business Concern (Select if your business qualifies as a Section 3 Business Concern) ___ Worker's residence is within the service area or neighborhood of the project *	Income Limit $XX,XXX

*Currently or at the time of hire if hired within the past 5 years

Income Limit is the HUD 80% One Person Income Limit for Parish for which employee resides. Income limits may be obtained at: Income Limits | HUD USER

Service area or the neighborhood of the project means an area within one mile of the Section 3 project or, if fewer than 5,000 people live within one mile of a Section 3 project, within a circle centered on the Section 3 project that is sufficient to encompass a population of 5,000 people according to the most recent U.S. Census.

I/We, the undersigned, certify under penalty of perjury that the information provided above is true and correct and certifies that the worker identified above meets the definition of a Section 3 worker. WARNING: Anyone who knowingly submits a false claim or makes a false statement is subject to criminal and/or civil penalties, including confinement for up to 5 years, fines, and civil and administrative penalties. (18 U.S.C. §§ 287, 1001, 1010, 1012; 31 U.S.C. §3729, 3802)

_____ _____

Employer Signature Date

SECTION 01027

SECTION 3 BUSINESS CONCERN CONTRACTOR/SUBCONTRACTOR CERTIFICATION

Lafourche Parish Government
New Clinic for Lady of The Sea General Hospital

Name of Business:_____

Name of Business Owner:_____

Address of Business:_____

Phone Number:_____

Email Address:_____

Type of Business: ____ Corporation ____ Partnership ____ Sole Proprietorship ____ Joint Venture

The undersigned hereby certifies that **(select any that apply):**

_____ The business is at least 51% owned and controlled by low or very low income persons; **or**

_____ Over 75% of the labor hours performed for the business over the previous 3 month period are preformed by Section 3 workers; **or**

_____ The business is at least 51% owned and controlled by current resident of public housing or Section 8 assisted housing.

Business Concern Affirmation

I affirm and certify that the above statements are true, complete, and correct to the best of my knowledge and belief. I understand that businesses who misrepresent themselves as Section 3 business concerns and report false information may have their contracts terminated as default and be barred from ongoing and future considerations for contracting opportunities. I hereby certify, under penalty of law, that all information provided is correct to the best of my knowledge.

_____
Name & Title of Company Representative (Print or Type)

_____ _____
Signature Date

FOR ADMINISTRATIVE USE ONLY

Qualifies as Section 3 Business Concern: _____ Yes _____ No
By: _____ Date: _____

*This certification expires six (6) months after date of signature.

SECTION 01028

SECTION 3 ACTIVITY AND GOOD FAITH EFFORTS MONTHLY REPORT

Lafourche Parish Government
New Clinic for Lady of The Sea General Hospital

General Contractor: _____

Subcontractor (If applicable): _____

Reporting Period: _____ **Report Type: Monthly**

Contractors are required to submit monthly activity reports to grantee's Section 3 Coordinator _____ [Coordinator's email address] by the ____ day of each month.

Contractor Section 3 Point of Contact: _____

Phone: _____ Email: _____

Section 3 Goals

Section 3 is a provision of the Housing and Urban Development (HUD) Act of 1968 that helps foster local economic development, neighborhood economic improvement, and individual self-sufficiency. The Section 3 program requires recipients of certain HUD financial assistance to provide job training, employment, and contracting, to the greatest extent feasible, for low- or very low-income residents in connection with projects andactivities in their neighborhoods. Section 3 is race and gender-neutral and is NOT the same as WBE/MBE.

Projects over $200,000 trigger Section 3. When triggered, best efforts must be made to extend Section 3 opportunities to verified Section 3 residents and business concerns to meet these *minimum* numeric goals:

1. Twenty-five percent (25%) of the total hours on a Section 3 project worked by Section 3 workers; and
2. Five percent (5%) of the total hours on a Section 3 project worked by Targeted Section 3 workers.

Programmatic Responsibilities

Contractors and/or Subcontractors are expected to meet the minimum goals listed above, to the greatest extent feasible. All efforts to utilize Section 3 businesses and workers should be documented.

PART 1: SECTION 3 COMPLIANCE (See Sample Labor Hour Tracker for example of information to be compiled for reporting – Page 6 of 7)		
I. SECTION 3 HOURS WORKED – *Report the number of Section 3 hours for this reporting period.*		
A. Total hours worked this period by all workers	B. Number of Section 3 hours worked this period	% Section 3 hours (Divide column B by column A)
II. TARGETED SECTION 3 HOURS WORKED – *Report the number of targeted Section 3 hours for this reporting period*		
A. Total hours worked this period by all workers	B. Number of targeted Section 3 hours worked this period	% Targeted Section 3 hours (Divide column B by column A)

PART 2: SUBCONTRACTOR INFORMATION

- ☐ This project WILL NOT utilize subcontractors.
- ☐ This project MAY utilize the following subcontractors:

No.	Sect3 Bus.	Subcontractor Name	Subcontractor Address and Phone Number	Trade	Subcontract Amount
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					

PART 3: PERMANENT EMPLOYEES (On This Project Only)

Please list all current permanent employees (both full and part-time) employed by your company (or local/regional office) as of the signature date on Section 001020 – Certification of Prime Contractor Regarding Section 3 and Segregated Facilities, as well as employees of all subcontractors working on this project. Use additional sheets as necessary. A computer-generated employee registry can be provided in lieu of this form if it includes the worker's name, employer and job category and indicates Section 3/targeted Section 3 status.

No.	Name of Worker	Employer	Job Category/Trade	Section 3 Worker (Y/N)	Targeted Section 3 Worker (Y/N)
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					

PART 4: DOCUMENTATION OF QUALITATIVE EFFORTS

Describe efforts to provide Sec 3 Workers and Section 3 Business Concerns with first consideration for employment and contracting opportunities, and all outreach activities performed. If no activity, explain why*

1. Describe all efforts made to direct the employment and other economic opportunities generated by HUD financial assistance for housing and community development programs, to the greatest extent feasible, to Section 3 workers. Attach additional pages if needed.

   Attach supporting documentation such as:

   - Copies of all publications, notices, pictures of posted notices, and other outreach materials.
   - List of all Section 3 workers that responded to your responded to your outreach efforts (e.g., submitted job applications, phone logs, etc.); were any of them hired? If not, please explain why.

2. Describe all efforts made to notify Section 3 businesses of any subcontracting opportunities generated by HUD financial assistance for this project, to the greatest extent feasible. Attach additional pages if needed.

   Attach supporting documentation such as:

   - Section 3 Business List used in any solicitation.
   - List of Section 3 business included in any solicitation and documentation of efforts (emails, letters, phone, logs, etc.).
   - List of Section 3 businesses that responded to your solicitation and/or outreach efforts; were any ofthem hired? If not, please explain why.
   - Copies of all publications, notices, pictures of posted notices, and any other outreach material utilized.

.

3. Describe all additional qualitative efforts made to comply with Section 3 requirements. See below for examples. Attach all applicable supporting documentation.

4. If there are employment opportunities associated with your project, include a draft of the proposed signage. Section 3 signage should be posted at the construction site. Signage must be large enough to be visible from the street. The sign must (a) identify the name of the project, (b) state the project is a HUD Section 3 Project, and (c) include the name, phone number and email address of an appropriate point of contact regarding employment opportunities.

Examples of Qualitative Efforts

- Engage in outreach efforts to generate job applicants who are Targeted Section 3 workers
- Provide training or apprenticeship opportunities
- Provide technical assistance to help Section 3 workers compete for jobs (e.g., resume assistance, coaching)
- Assist or connect Section 3 workers with drafting resumes, preparing for interviews, and finding job opportunities
- Hold one or more job fairs
- Provide or refer Section 3 workers to services supporting work readiness and retention (e.g., work readiness activities, interview clothing, test fees, transportation, childcare)
- Provide assistance to apply for or attend community college, a four-year educational institution, or vocational/technical training
- Help Section 3 workers to obtain financial literacy training and/or coaching
- Engage in outreach efforts to identify and secure bids from Section 3 business concerns
- Provide technical assistance to help Section 3 business concerns understand and bid on contracts
- Divide contracts into smaller jobs to facilitate participation by Section 3 business concerns
- Provide bonding assistance, guaranties, or other efforts to support viable bids from Section 3 business concerns
- Promote use of business registries designed to create opportunities for disadvantaged and small businesses
- Outreach, engagement, or referrals with the state one-stop system as defined in Section 121(e)(2) of the Workforce Innovation and Opportunity Act

I declare that all statements contained in this report and any accompanying documents are true and correct, and made with full knowledge that all statements given are subject to investigation and that any false or dishonest answer to any question may be grounds for denial or revocation of funding or other penalties as prescribed under 18 U.S. Code § 1001.

Typed/Printed Name and Title of Company Representative

Signature of Company Representative **Date**

(Reporting and Compliance Form)

Section 3 Labor Hour Tracker Methodology

(Sample)

Lafourche Parish Government
New Clinic for Lady of The Sea General Hospital

LABOR HOURS TRACKER

Contractor:

Subcontractor:

Employee Name	Status				Hours Worked per Pay Period				
	Existing	New	Sec 3 Worker	Sec 3 Targeted Worker	PR #1	PR #2	PR #3	PR #4	PR #5

SECTION 01029

SECTION 3 UTILIZATION FINAL REPORT

Lafourche Parish Government
New Clinic for Lady of The Sea General Hospital

(To Be Completed By the Prime Contractor and Include Data for All Sub-Contractors and Submitted to Owner and Owner's Grant Manager)

☐ Within Ten (10) Days of Bid ☐ After Substantial Completion

A. Section 3 Employee Labor Information

1. Total number of Labor Hours on the project: _____

2. Total number of Section 3 Labor Hours on the project: _____

Percent of Total Labor Hours: _____

3. Total number of Targeted Section 3 Labor Hour on the project: _____

Percent of Total Labor Hours: _____

4. Section 3 Employees Utilized on the Project by Prime Contractor *(attach additional sheet(s) if necessary)*:

Number	Wage Rate	Position	Description
_____	_____	_____	_____
_____	_____	_____	_____

5. Section 3 Employees Utilized on the Project by Subcontractors *(attach additional sheet(s) if necessary)*:

Number	Wage Rate	Position	Description
_____	_____	_____	_____
_____	_____	_____	_____

6. Total Number of Section 3 Employees Utilized on Project: _____

7. Names of all subcontractors *(attach additional sheet(s) if necessary)*:

_____ _____

_____ _____

B. Certification of Prime Contractor

General Contractor: _____

Address: _____

Phone: _____

As an officer and representative of the Company, I hereby certify that the above information is true and accurate and is reported fully for this construction project. It is understood final payment from the Owner for this project cannot be made until this report is submitted to the owner or authorized designee.

_____

Name & Title of Company Representative (Print or Type)

_____ _____

Signature Date

(Reporting and Compliance Form)

DIRECTIONS FOR COMPLETION OF SECTION 3 UTILIZATION REPORT

1. Determine the level of Section 3 participation in the construction project.
   a) All employees of the Prime Contractor and all subcontractors must fill out an Employee Information Form, to be retained by the Prime Contractor with copies submitted to the Owner's Compliance Officer. All new hires during the construction project must also complete the Employee Information Form.
   b) Distribute copies of the Employee Information Form to **all** subcontractors you engage for the project, for completion by all employees to be submitted to the prime for retention, with copies submitted to the Owner's Compliance Officer.
   c) Determine Section 3 eligibility for all employees in order to track labor hours performed (tracking spreadsheet provided separately)
2. Complete **(A) Section 3 Employee Information** area of the report.
   a) Enter the total number of labor hours on the project on Line 2.
   b) Enter the number of labor hours for Section 3 Workers, on Line 3; calculate the percentage (Line 2 divided by Line 3)
   c) Enter the number of labor hours for Targeted Section 3 Workers on Line 4; calculate the percentage (Line 2 divided by Line 4)
   d) Enter number of Section 3 Employees utilized by Prime Contractor on Line 5
   e) Enter number of Section 3 Employees utilized by subcontractors on Line 6
   f) Enter total number Section 3 Employees utilized on the project on Line 7 (Line 5 + Line 6)
   g) List all subcontractors on Line 8 (insert additional pages as needed)
3. Complete **(B) Certification by Prime Contractor** section of the report
   a) List name, address, and telephone of your company (prime contractor)
   b) Print or type the name and title of authorized company representative
   c) Have authorized company representative sign and date the Report

Important Reminder

Final payment of retainage funds will not be made until Section 3 Utilization Report is submitted to the Owner or Owner's Compliance Officer.

SECTION 01030

ATTESTATIONS AFFIDAVIT

Lafourche Parish Government
New Clinic for Lady of The Sea General Hospital

Before me, the undersigned notary public, duly commissioned and qualitied in and for the parish and state aforesaid, personally came and appeared Affiant, who after being duly sworn, attested as follows:

LA R.S. 38:2227 PAST CRIMINAL CONVICTIONS OF BIDDERS

A. No sole proprietor or individual partner, incorporator, director, manager, officer, organizer, or member who has a minimum of a ten percent (10%) ownership in the bidding entity named below has been convicted of, or has entered a plea of guilty or nolo contendere to any of the following state crimes or equivalent federal crimes:

(a) Public bribery (R.S. 14:118)
(b) Corrupt influencing (R.S. 14:120)
(c) Extortion (R.S. 14:66)
(d) Money laundering (R.S. 14:230)

B. Within the past five years from the project bid date, no sole proprietor or individual partner, incorporator, director, manager, officer, organizer, or member who has a minimum of a ten percent (10%) ownership in the bidding entity named below has been convicted of, or has entered a plea of guilty or nolo contendere to any of the following state crimes or equivalent federal crimes, during the solicitation or execution of a contract or bid awarded pursuant to the provisions of Chapter 10 of Title 38 of the Louisiana Revised Statutes:

(a) Theft (R.S. 14:67)
(b) Identity Theft (R.S. 14:67.16)
(c) Theft of a business record (R.S.14:67.20)
(d) False accounting (R.S. 14:70)
(e) Issuing worthless checks (R.S. 14:71)
(f) Bank fraud (R.S. 14:71.1)
(g) Forgery (R.S. 14:72)
(h) Contractors; misapplication of payments (R.S. 14:202)
(i) Malfeasance in office (R.S. 14:134)

LA R.S. 38:2212.10 VERIFICATION OF EMPLOYEES

A. Appearer is registered and participates in a status verification system to verify that all employees in the state of Louisiana are legal citizens of the United States or are legal aliens.

B. If awarded the contract, Appearer shall continue, during the term of the contract, to utilize a status verification system to verify the legal status of all new employees in the state of Louisiana.

C. If awarded the contract, Appearer shall require all subcontractors to submit to it a sworn affidavit verifying compliance with Paragraphs (A) and (B) of this Subsection.

LA R.S. 23:1726(B) CERTIFICATION REGARDING UNPAID WORKERS COMPENSATION INSURANCE

A. R.S. 23:1726 prohibits any entity against whom an assessment under Part X of Chapter 11 of Title 23 of the Louisiana Revised Statutes of 1950 (Alternative Collection Procedures & Assessments) is in effect, and whose right to appeal that assessment is exhausted, from submitting a bid or proposal for or obtaining any contract pursuant to Chapter 10 of Title 38 of the Louisiana Revised Statutes of 1950 and Chapters 16 and 17 of Title 39 of the Louisiana Revised Statutes of 1950.

B. By signing this bid /proposal, Affiant certifies that no such assessment is in effect against the bidding/proposing entity.

_____ _____
NAME OF BIDDER NAME OF AUTHORIZED SIGNATORY OF BIDDER

_____ _____
DATE TITLE OF AUTHORIZED SIGNATORY OF BIDDER

_____
SIGNATURE OF AUTHORIZED
SIGNATORY OF BIDDER

WITNESSES:

_____

_____

Sworn to and subscribed before me this _____ day of _____, 202___

_____
Notary Public

SECTION 01 11 00 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 SCOPE

A. Generally, the work under this Contract consists of furnishing and installing all labor, materials, equipment, services, temporary facilities, coordination, and incidental work required for complete construction of the project within the limits indicated by the Contract Documents.
Project: **LADY OF THE SEA MEDICAL CLINIC**
Owner: Lafourche Parish Government
Facility/User: Lady of the Sea General Hospital
Architect's Project No.: GHC 2403 / MCA 202416.00
Location: Larose, Louisiana (South Lafourche)

B. The Contract Documents are prepared by Gossen-Holloway-Cortez / Moliere Chappuis Architects, A Joint Venture, with engineering consultants identified in the Contract Documents. Work includes, but is not limited to, the following disciplines:
1. Architectural documents
2. Civil documents
3. Structural documents
4. Mechanical documents
5. Plumbing documents
6. Electrical documents
7. Fire Protection / Sprinkler documents

C. Provide and install specialty items, equipment, furnishings, and related work specifically indicated in the architectural, structural, civil, mechanical, plumbing, electrical, fire protection, and other Contract Documents. Work includes required utility connections, rough-ins, anchors, blocking, supports, backing, substructure, housekeeping pads, sleeves, openings, and other coordination necessary for a complete installation, including items designated CFCI, OFCI, or NIC as applicable.

D. The General Contractor, also referred to as the Contractor in the Drawings and Specifications, shall be responsible for a complete and finished final product. Provide all labor, materials, tools, equipment, and services necessary for or incidental to the complete performance of the Work and coordinate the Work of all trades. Items shown or indicated in any portion of the Contract Documents shall be provided as part of the Work whether or not repeated elsewhere or included on shop drawings. Shop drawings are not Contract Documents and do not relieve the Contractor or Subcontractors from providing the Work required by the Contract Documents.

E. Provide positive drainage and appropriate slopes at roofs, gutters, paved areas, walks, exterior slabs, grades adjacent to buildings, swales, foundation drainage, interior slabs with floor drains, and other areas intended to drain. Completed construction shall not permit unintended ponding of water.

F. Take particular care to provide all required flashing, weather-resistive transitions, sealants, and waterproofing at roofs, exterior walls, doors, windows, storefronts, curtain walls, penetrations, and other locations indicated. Photograph concealed flashing and waterproofing conditions before they are covered when requested by the Architect or required elsewhere in the Contract Documents.

G. Employ a full-time qualified superintendent experienced in the type of construction required for this Project. The superintendent shall coordinate all phases of the Work and shall remain assigned to the Project through completion unless otherwise approved by the Owner and Architect.

H. The construction shown and described in the Contract Documents includes the following. This is a partial summary only; refer to the Drawings and other Specification Sections for the complete scope:

1. Construction of a new one-story medical clinic of approximately 25,727 gross square feet. The building is classified as Business occupancy and Type II-B construction and is designed as a sprinklered building.
2. Major functional areas include public lobby, check-in/check-out and waiting areas; pharmacy and pharmacy pick-up/consultation; specialty clinic; physical therapy; dental treatment and support spaces; rural health / primary care exam and treatment areas; Kid Med; behavioral health; imaging and X-ray; laboratory and medication areas; nurse stations; business and administrative areas; restrooms; staff support; storage; clean and soiled support spaces; and mechanical, electrical, data, medical gas, and dental equipment spaces.
3. Exterior construction includes running-bond face brick veneer, preformed metal siding, aluminum storefront and curtain wall systems, architectural soffits, sheet-metal flashing and trim, and related exterior enclosure components as indicated.
4. Roof construction consists primarily of standing-seam architectural metal roofing with associated underlayment, insulation, metal roof deck, flashings, gutters, downspouts, valleys, hips, ridges, and roof penetrations as indicated.
5. Structural construction includes structural steel framing, cold-formed metal framing, metal roof deck, concrete foundations and slabs, and associated structural work as indicated in the Structural and Architectural Contract Documents.
6. Interior construction includes cold-formed metal stud partitions, gypsum board assemblies, glazed openings, doors and frames, casework and millwork, interior finishes, accessories, and other work indicated.
7. Ceilings include suspended lay-in acoustical ceiling systems, gypsum board ceilings and soffits, and areas open to structure as indicated.
8. Mechanical, plumbing, and specialty utility work includes complete HVAC and chilled-water systems, plumbing systems, medical and dental support utilities where indicated, controls, equipment, and associated coordination.
9. Electrical work includes lighting, power, data pathways and systems shown, electrical site work, equipment connections, and related work. Fire protection work includes a complete automatic sprinkler system and associated components shown in the Contract Documents.
10. Civil work includes site grading, drainage, utility improvements, and related site construction shown in the Civil Contract Documents, together with required coordination of site electrical and building utility connections.
11. Selective demolition, removals, patching, and restoration required for the Work shall be performed where indicated. Materials, fixtures, casework, equipment, and other items removed from the Project site shall remain the property of the Owner unless the Contract Documents or Owner direct otherwise.

I. Coordinate temporary barriers, barricades, signage, access controls, protection, and other temporary construction required to maintain safe conditions at and around the Project site. Comply with Owner requirements for site access and personnel identification established at the preconstruction conference or elsewhere in the Contract Documents.

J. Coordinate inspections and testing with the Owner, Architect, consultants, authorities having jurisdiction, and any independent testing agencies retained for the Project. Provide required advance notice before concrete placement, concealed work, inspections, and other activities requiring observation or testing in accordance with the Contract Documents.

1.2 DIVISION OF RESPONSIBILITY

A. These Specifications are organized generally in accordance with CSI MasterFormat to identify the Work and responsibilities of the Contractor, Subcontractors, and Material Suppliers. The Contractor is responsible for determining that all phases of the Work are included in the Contract Sum and for assigning responsibility among qualified

subcontractors and suppliers so that all Work required by the Contract Documents is complete.

B. Where materials, equipment, systems, testing, or services are furnished by the Owner or under separate contracts, the Contractor shall determine and perform its responsibilities for coordination, rough-in, support, access, utilities, protection, scheduling, and completion of the Work. Owner or separate-contractor work may occur concurrently with the Work of this Contract.
   1. OWNER-FURNISHED / OWNER-INSTALLED ITEMS
      a. Movable medical, dental, pharmacy, imaging, office, furniture, equipment, and other items specifically designated as NIC or Owner-furnished/Owner-installed in the Contract Documents shall be furnished and installed by the Owner or the Owner's separate vendors. The Contractor shall coordinate access, rough-ins, supports, utilities, clearances, and required building interfaces.
      b. The Owner may retain independent construction materials testing and inspection agencies. The Contractor shall coordinate with these agencies, provide access, notification, samples, and assistance required by the Contract Documents, and shall not impede required testing or inspection.
   2. OWNER-FURNISHED / CONTRACTOR-INSTALLED ITEMS
      a. Review the Contract Documents for locations of Owner-furnished, Contractor-installed products. Provide all rough-in, backing, support systems, anchorage, connections, plumbing, mechanical, electrical, and other interfaces required to receive and install Owner-furnished products.
         1. Owner will arrange for delivery of Owner-furnished items in coordination with the Contractor's construction schedule.
         2. Contractor shall include required delivery, installation, connection, testing, and coordination dates for Owner-furnished products in the construction schedule.
         3. Contractor shall review available shop drawings and product data for Owner-furnished items and promptly identify discrepancies, dimensional conflicts, missing rough-ins, or anticipated installation problems.
         4. Contractor shall protect Owner-furnished products after receipt or installation when they are in the Contractor's care, custody, or control.
         5. Damage to Owner-furnished products caused by the Contractor or its subcontractors shall be repaired or replaced at the Contractor's expense.

C. Cooperate fully with the Owner and the Owner's separate contractors and vendors so that work performed under separate contracts may proceed without interfering with or delaying the Work under this Contract. Include coordination with Owner-furnished equipment and specialty systems in the Contractor's coordination drawings and schedules when required.

D. OWNER-FURNISHED PRODUCTS REQUIRING CONTRACTOR ROUGH-IN: Review the Contract Documents and Owner equipment information for all products requiring rough-in. Provide the complete rough-in and support infrastructure required to receive the Owner's products whether final installation is by the Contractor, Owner, or separate vendor, except where specifically indicated otherwise.

1.3 WARRANTY PERIODS

A. Unless specified otherwise for individual portions of the Work, workmanship, materials, and equipment included in the Work shall be warranted for one (1) year from the date of Substantial Completion. This one-year warranty does not limit or replace longer warranties required elsewhere in the Contract Documents.

B. During the warranty period, if any portion of the Work is found to be defective in material or workmanship, the Owner may require correction by repair or replacement as appropriate. The warranty period for corrected Work shall be extended as required by the Contract Documents.

C. Unless specified otherwise in individual Specification Sections, warranties and guarantees shall commence on the date of Substantial Completion.

1.4 PERMITS AND CODES

A. The General Contractor shall secure and pay for the building permit and shall be responsible for permits, licenses, fees, inspections, and approvals assigned to the Contractor by the Contract Documents or required by authorities having jurisdiction.

B. Perform the Work in accordance with applicable Federal, State of Louisiana, Lafourche Parish, and local laws, codes, ordinances, regulations, and requirements of authorities having jurisdiction. The codes identified on the Drawings are part of the design basis; the Contractor remains responsible for compliance with requirements applicable to its means, methods, safety, and execution of the Work.

C. Comply with applicable Occupational Safety and Health Administration (OSHA) requirements and all other laws and regulations governing construction safety. Means, methods, sequences, procedures, and safety precautions remain the responsibility of the Contractor.

D. Familiarization with special site restrictions, access limitations, utility constraints, and regulatory requirements is the responsibility of the Contractor prior to bidding and throughout construction.

1.5 ORDERING AND DELIVERY OF PRODUCTS

A. Order products, equipment, and materials sufficiently early to meet the approved construction schedule. Failure to place timely orders, including for long-lead items, is not a basis for accepting substitutions that do not comply with the Contract Documents or for extending the Contract Time unless otherwise allowed by the Contract Documents.

1.6 STATE AND LOCAL SALES AND USE TAX

A. The Owner is Lafourche Parish Government, a political subdivision of the State of Louisiana. Purchases of qualifying materials and equipment permanently incorporated into the Project may be eligible for State and local sales and use tax exemption when purchased in accordance with applicable Louisiana law and Owner procedures.

B. The Contractor and applicable subcontractors and suppliers shall execute and maintain required exemption certificates, agency designations, invoices, purchase records, and other documentation required by the Owner and taxing authorities. Coordinate the current tax-exemption procedure with the Owner before making purchases for which exemption is claimed.

C. The Contractor and its subcontractors and suppliers remain responsible for taxes on nonexempt items and for compliance with current tax laws, regulations, and administrative requirements. Nothing in this Section guarantees exemption for purchases that do not qualify under applicable law.

1.7 CDBG-DR AND FEDERAL GRANT REQUIREMENTS

A. The Project is funded in whole or in part through the Community Development Block Grant - Disaster Recovery (CDBG-DR) program administered through Lafourche Parish Government. Contractor and all tiers of subcontractors shall comply with the CDBG-DR

supplementary conditions, Federal requirements, and grant requirements incorporated into the Contract Documents.

B. Requirements include, where applicable, current Federal labor standards and wage determinations, Davis-Bacon and Related Acts requirements, equal employment opportunity and civil rights requirements, Section 3 requirements, debarment and suspension requirements, recordkeeping and access-to-records requirements, recovered-material and domestic-preference requirements, and other CDBG-DR provisions contained in Division 00 and other Contract Documents.

C. The Contractor shall incorporate applicable Federal and grant requirements into subcontracts and purchase orders, maintain required payrolls, certifications, records, and reports, and cooperate with compliance reviews and inspections by the Owner and administering agencies.

1.8 COORDINATION OF WORK

A. Consult with the Owner and Architect regarding construction sequencing and scheduling. Prepare and maintain a construction schedule that coordinates the Work with Owner operations, adjacent occupied areas, site access, utility availability, deliveries, shutdowns, and work by separate contractors and vendors.

B. Coordinate all work with the Owner, including staging, entry, use of existing facilities, temporary utilities, permanent utility interruptions, scheduling, noise, dust, smoking and eating restrictions, deliveries, parking, and protection of adjacent property and operations.

C. Erect dust barriers, barricades, temporary partitions, signage, reflectors, lighting, and other temporary construction as required to protect the public, Owner personnel, adjacent operations, and the Work. Clearly identify areas closed to the public and maintain required means of egress and fire protection features for any occupied areas throughout construction.

D. The Contractor is responsible for protecting existing property, utilities, structures, equipment, and improvements that are to remain. Damage caused by construction operations shall be repaired or replaced at the Contractor's expense to the satisfaction of the Owner and Architect.

E. Clean the construction site at the end of each working day and remove trash and debris regularly. Do not allow adjacent areas to become dusty, dirty, damaged, or cluttered as a result of construction operations.

F. Where existing conditions or dimensions differ from those indicated, or where conflicts between Drawings, Specifications, existing conditions, equipment, or utilities are discovered, notify the Architect before proceeding with affected Work. Do not scale drawings in lieu of written dimensions.

G. Coordinate mechanical, electrical, plumbing, fire protection, equipment, and architectural work to achieve the results indicated. Fill, patch, firestop, seal, and restore openings resulting from the Work and maintain the integrity of required fire, smoke, air, water, and weather barriers.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 11 00

SECTION 01 26 00 – CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for modifications to the Contract, including the following:
   1. Minor changes in the Work.
   2. Architect's Supplemental Instructions.
   3. Proposal Requests.
   4. Contractor-initiated proposals.
   5. Change Orders.
   6. Construction Change Directives.

B. Related Requirements:
   1. Section 01 20 00 "Price and Payment Procedures" for administrative requirements governing Applications for Payment.
   2. Section 01 25 00 "Substitution Procedures" for procedures governing substitutions.
   3. Section 01 31 00 "Project Management and Coordination" for procedures related to Requests for Information.
   4. Section 01 32 00 "Construction Progress Documentation" for requirements related to revisions to the Construction Schedule.
   5. Section 01 77 00 "Closeout Procedures" for requirements related to final Contract adjustments and closeout documentation.

1.2 DEFINITIONS

A. **Change Order:** A written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon a change in the Work, the amount of the adjustment to the Contract Sum, if any, and the extent of adjustment to the Contract Time, if any.

B. **Construction Change Directive:** A written order prepared by the Architect and signed by the Owner and Architect directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time.

C. **Architect's Supplemental Instruction:** A written instruction issued by the Architect directing a minor change in the Work that does not involve an adjustment to the Contract Sum or Contract Time.

D. **Proposal Request:** A written request issued by the Architect describing a proposed change in the Work and requesting the Contractor to submit the effect of the proposed change on the Contract Sum and Contract Time.

E. **Contractor's Proposal Request:** A written proposal submitted by the Contractor requesting a change in the Contract Sum, Contract Time, or Contract requirements.

1.3 MINOR CHANGES IN THE WORK

A. Architect may issue written instructions authorizing minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment to the Contract Sum or Contract Time.

B. Minor changes may be issued by Architect's Supplemental Instruction or other written directive permitted by the Contract Documents.

C. Promptly execute minor changes in the Work upon receipt of Architect's written instruction.

D. If Contractor believes that a minor change will affect the Contract Sum or Contract Time, notify Architect in writing before proceeding with the affected Work. Failure to provide written notification before proceeding may constitute acceptance that the change has no effect on Contract Sum or Contract Time, subject to requirements of the Conditions of the Contract.

1.4 PROPOSAL REQUESTS

A. **Owner-Initiated Proposal Requests:** Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or Contract Time.
   1. Proposal Requests are issued for information and pricing purposes and are not authorization to proceed with the proposed change.
   2. Do not proceed with Work described in a Proposal Request until authorized by an executed Change Order, Construction Change Directive, or other written authorization permitted by the Contract Documents.

B. Within the time indicated in the Proposal Request, or within ten (10) calendar days if no time is indicated, submit a complete proposal identifying the effect of the proposed change on the Contract Sum and Contract Time.

C. Include the following information with each proposal:
   1. Detailed description of the proposed change.
   2. Reason for the proposed adjustment.
   3. Itemized quantities and costs of labor, materials, and equipment.
   4. Labor rates, labor classifications, and estimated labor hours.
   5. Material quantities, unit costs, taxes, delivery charges, and other applicable costs.
   6. Equipment type, duration of use, and rental or ownership costs.
   7. Itemized subcontractor quotations.
   8. Itemized costs for applicable bonds and insurance.
   9. Contractor's and subcontractors' overhead and profit, separately identified and limited as required by the Contract Documents.
   10. Credits for deleted or reduced Work, including applicable overhead and profit.
   11. Description of any effect on the Construction Schedule and Contract Time.
   12. Number of calendar days requested for an extension of Contract Time, with supporting schedule documentation demonstrating the effect of the proposed change on the critical path.
   13. Other supporting documentation requested by Architect or Owner.

D. Proposals lacking sufficient cost or schedule documentation may be returned without review.

1.5 CONTRACTOR-INITIATED PROPOSALS

A. When Contractor proposes a change to the Contract Documents or believes that circumstances warrant an adjustment to the Contract Sum or Contract Time, submit a written proposal to Architect.

B. Do not consider an RFI, submittal, meeting discussion, field conversation, email inquiry, shop drawing comment, or similar communication to constitute notice of a claim or request for adjustment unless specifically identified and submitted as required by the Contract Documents.

C. Contractor-initiated proposals shall include:
   1. Description of the condition or circumstance giving rise to the proposal.
   2. Specific Contract Document requirements affected.

3. Proposed modification.
4. Detailed cost breakdown.
5. Requested adjustment to Contract Time, if any.
6. Supporting schedule analysis where additional Contract Time is requested.
7. Supporting drawings, photographs, product information, subcontractor quotations, or other documentation necessary to evaluate the proposal.

D. Contractor shall not proceed with proposed changes until written authorization is received, except where immediate action is required to protect persons or property or as otherwise permitted by the Contract Documents.

1.6 CHANGE ORDER PROCEDURES

A. When Owner and Contractor agree on adjustments to the Contract Sum and Contract Time resulting from a proposed change, Architect will prepare a Change Order.

B. Change Order will describe:
1. Change in the Work.
2. Adjustment to the Contract Sum.
3. Adjustment to the Contract Time.
4. Supporting documentation or references, as appropriate.

C. Change Orders are not effective until executed as required by the Contract Documents.

D. Contractor's execution of a Change Order constitutes full and final agreement regarding the cost and time effects of the Work described in the Change Order unless specific reservations are expressly stated in the executed Change Order.

E. Include approved Change Order amounts in the next Application for Payment following execution of the Change Order.

1.7 CONSTRUCTION CHANGE DIRECTIVES

A. Architect may issue a Construction Change Directive when Owner directs a change in the Work before Owner and Contractor have agreed on the adjustment to the Contract Sum or Contract Time.

B. Upon receipt of a Construction Change Directive, promptly proceed with the directed Work unless otherwise stated in the directive.

C. Maintain detailed records of costs attributable to Work performed under a Construction Change Directive.

D. Maintain separate daily records including:
1. Labor classifications and hours.
2. Material quantities and costs.
3. Equipment used and hours of operation.
4. Subcontractor costs.
5. Other costs directly attributable to the change.
6. Photographs or other documentation where appropriate.

E. Submit documentation at intervals requested by Architect and upon completion of the directed Work.

F. Adjustments to Contract Sum and Contract Time resulting from a Construction Change Directive will be determined in accordance with the Conditions of the Contract.

1.8 TIME AND MATERIAL WORK

A. When authorized in writing to perform changed Work on a time-and-material basis, maintain complete and accurate records of actual costs.

B. Submit daily time-and-material tickets for verification by Owner's or Architect's representative.

C. Each ticket shall include:
1. Date.
2. Description and location of Work performed.
3. Names and labor classifications of workers.
4. Labor hours worked.
5. Equipment used and hours of operation.
6. Materials incorporated into the Work.
7. Supporting invoices, delivery tickets, and receipts where applicable.

D. Signature or acknowledgment of a daily ticket by Architect, Owner, or their representative verifies only that the listed labor, materials, and equipment were reported as present or used. Such acknowledgment does not constitute approval of entitlement, cost, markup, Contract Sum adjustment, or Contract Time adjustment.

E. Failure to maintain or submit adequate supporting records may result in rejection of costs that cannot be substantiated.

1.9 OVERHEAD AND PROFIT

A. Include overhead and profit in proposals only as permitted by the Conditions of the Contract.

B. Apply permitted markups only to actual allowable costs associated with the change.

C. Clearly identify Contractor and subcontractor overhead and profit separately in each proposal.

D. For changes resulting in a credit to Owner, include appropriate reductions for overhead and profit in accordance with the Contract Documents.

1.10 CONTRACT TIME ADJUSTMENTS

A. Requests for adjustment to Contract Time shall clearly identify the number of calendar days requested and demonstrate the effect of the change on the current approved Construction Schedule.

B. An increase in cost does not automatically establish entitlement to additional Contract Time.

C. Provide schedule analysis demonstrating that the proposed change affects activities on the critical path or otherwise affects the required Contract completion date.

D. Failure to identify a requested Contract Time adjustment in the proposal may be interpreted as Contractor's representation that the proposed change can be completed without adjustment to Contract Time, subject to the Conditions of the Contract.

1.11 ALLOWANCES AND UNIT PRICES

A. Where a Contract modification involves Work covered by an allowance or unit price, determine adjustments in accordance with the applicable requirements of the Contract Documents.

B. Submit documentation of actual quantities and costs as required to establish the adjustment.

C. Do not include costs already compensated through an allowance, unit price, or other Contract provision as additional costs in a proposed Contract modification.

1.12 DOCUMENTATION

A. Maintain a log of Proposal Requests, Contractor proposals, Change Orders, Construction Change Directives, and other Contract modifications.

B. Identify each modification by sequential number and date.

C. Maintain copies of executed Contract modifications at the Project site and incorporate modifications into Contractor's record documents.

D. Revise the Schedule of Values, Construction Schedule, submittal schedule, and other Project documentation as required to reflect approved modifications.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXECUTION OF CHANGED WORK

A. Perform changed Work in accordance with requirements of the Contract Documents unless specifically modified by the written Contract modification.

B. Use products, materials, workmanship, and installation methods consistent with requirements for similar Work unless the modification specifically indicates otherwise.

C. Coordinate changed Work with adjacent and related Work.

D. Where changed Work affects Work previously completed, remove and replace or modify existing Work as necessary to provide a complete and properly coordinated installation.

E. Update record documents to accurately reflect changes made during construction.

3.2 UNAUTHORIZED WORK

A. Work performed without required written authorization is performed at Contractor's risk.

B. Owner is not obligated to compensate Contractor for unauthorized changes in the Work.

C. Architect's review of submittals, shop drawings, RFIs, field conditions, or Work in progress does not authorize changes to the Contract Sum or Contract Time.

D. Verbal directions, discussions, meeting comments, or field observations do not constitute authorization for additional compensation or Contract Time unless subsequently documented through procedures required by the Contract Documents.

3.3 CLOSEOUT OF CONTRACT MODIFICATIONS

A. Before Final Completion, verify that:
   1. All approved Change Orders have been incorporated into the Contract Sum.
   2. All approved Contract Time adjustments have been incorporated into the Contract completion date.
   3. Pending Proposal Requests and Construction Change Directives have been resolved or otherwise addressed to Owner's satisfaction.
   4. Record Documents reflect all modifications to the Work.

END OF SECTION 01 26 00

SECTION 01 33 23 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 - GENERAL

1.1 SCOPE

A. The General Contractor shall be responsible for preparing, coordinating, reviewing, and submitting shop drawings, product data, samples, delegated-design submittals, calculations, certifications, coordination drawings, mockups, and other submittals required by the Contract Documents. Submittals shall comply with Article 3.12 of the General Conditions and the individual Specification Sections. Submit electronically through the project management/submittal system designated by the Owner and Architect.

B. **Any submittal not reviewed, stamped or electronically approved, dated, and identified as reviewed by the General Contractor prior to submittal to the Architect will be returned without review.** The Contractor's review shall verify field dimensions, quantities, materials, model numbers, coordination with adjacent work, required interfaces, installation requirements, and compliance with the Contract Documents before the submittal is transmitted to the Architect.

C. Samples submitted shall remain on file with the Architect or Owner when required and may not be returned. Furnish duplicate samples when required by an individual Specification Section or when one sample must remain at the Project site.

D. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, Owner-furnished equipment, and related activities that require sequential or concurrent coordination. Submit related information together when review of one item depends on another.

1. **The Architect reserves the right to withhold action on any submittal requiring coordination with other submittals or Owner-furnished equipment information until the related information is received from the Contractor.**

E. **NOTE: Any deviation from the Contract Documents shall be clearly identified on the submittal, highlighted in yellow, and specifically labeled "DEVIATION FROM CONTRACT DOCUMENTS."** Include a written explanation of the deviation and identify any effect on cost, schedule, dimensions, performance, warranties, utilities, or adjacent work. Architect's review of a submittal does not constitute acceptance of an unlisted or unidentified deviation.

F. **Within thirty (30) calendar days after Official Notice to Proceed for the Construction Phase, the Contractor shall submit a complete submittal register and submittal schedule for the Project.** The schedule shall identify each required submittal, responsible trade, planned submission date, required review period, anticipated resubmittal time, fabrication/delivery duration, and installation date. Coordinate the submittal schedule with the Contractor's construction schedule and update it as the Work progresses.

G. Prioritize submittals for long-lead and coordination-critical work, including structural and delegated-design systems; building-envelope systems; standing-seam metal roofing and sheet metal; storefront, curtain wall and glazing; door hardware and access-control interfaces; major mechanical, plumbing, electrical and fire-protection equipment; controls; and medical, dental, pharmacy, imaging, and other Owner-furnished equipment interfaces and rough-ins.

H. **Late, incomplete, or uncoordinated submittals shall not be a basis for extending the Contract Time, approving a nonconforming substitution, or delaying work of other trades.** Any liquidated damages or other contractual consequences for late submittals shall be as stated in the General Conditions, Supplementary Conditions, or other Contract Documents. Rejected submittals shall be corrected and resubmitted within

fourteen (14) calendar days, or sooner when required by the approved construction schedule.

1.2 SUBMITTAL PROCESSING TIME

A. The Architect will endeavor to review and return each complete submittal as quickly as possible. Processing time begins when the Architect receives a complete, Contractor-reviewed submittal and all related information required for review, as follows:

1. Allow the Architect fourteen (14) working days for review of each submittal.

2. Allow an additional five (5) working days for structural, mechanical, plumbing, electrical, fire-protection, civil, or other consultant-reviewed submittals.

3. If a submittal requires coordination with other submittals, Owner-furnished equipment, delegated-design information, or additional information, additional processing time will be required. The amount of time will depend upon the coordination and information required.

4. Resubmittals are subject to the same review periods unless the Architect agrees otherwise. Requests for expedited review do not obligate the Architect or consultants to reduce the specified review time and do not shift responsibility for the Contractor's schedule.

5. The General Contractor shall be solely responsible for timely delivery of submittals, samples, color selections, and delegated-design information. **Submit each item far enough in advance of the scheduled installation date, and not less than forty-five (45) calendar days before installation unless a longer lead time is required, to allow for review, correction, resubmittal, ordering, fabrication, and delivery. Incomplete submittals are considered "NO SUBMITTAL."**

6. Do not fabricate, order custom materials, or install work for which review of a submittal is required until the applicable submittal has been returned with an action permitting the Work to proceed, except where specifically authorized in writing by the Architect.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Furnish the Architect one (1) electronic PDF for each submittal package. **SUBMITTALS ARE TO BE REVIEWED, APPROVED, DATED, AND IDENTIFIED BY THE CONTRACTOR BEFORE SUBMITTING TO THE ARCHITECT.** Each PDF shall identify the Project, Specification Section, submittal number, description, manufacturer, date, revision number, and Contractor's review. Mark selections clearly and remove or strike out options that do not apply. Combine related sheets into a single organized PDF unless the submittal system requires otherwise.

B. The General Contractor shall maintain a current submittal log showing required submittals, dates submitted, review status, resubmittal status, and final disposition. Maintain access to the log and the current reviewed submittals at the Project site throughout construction.

C. Submit physical samples, finish samples, color selections, and mockups when required by the individual Specification Sections or requested for selection or verification. Where color, texture, or finish varies, submit the full available range unless a narrower range is specifically required.

D. Delegated-design calculations and drawings shall be prepared, signed, and sealed by a professional engineer licensed in the State of Louisiana when required by the Contract

Documents. Coordinate delegated-design work with the structural, architectural, mechanical, plumbing, electrical, and other affected work before submittal.

E. Where required by the CDBG-DR, Federal, or other grant provisions incorporated into the Contract Documents, include product certifications, origin/manufacturing documentation, recovered-material information, domestic-preference documentation, and other compliance information applicable to the submitted product or system.

2.2 SUBMITTALS

A. The General Contractor shall furnish submittals required by the individual Specification Sections. The following project-specific list identifies major coordinated submittals and is not intended to be all-inclusive. **Any changes from the Contract Documents shall be identified as required by Paragraph 1.1.E above.**

1. Structural and delegated-design work: structural steel, cold-formed metal framing, metal deck, anchors and fasteners, equipment supports, miscellaneous metals, and delegated-design calculations where required.

2. Building-envelope work: masonry materials and samples; air-barrier materials and details; preformed metal wall and soffit panels; standing-seam metal roofing; sheet-metal flashings, gutters and downspouts; waterproofing; joint sealants; storefront, curtain wall, glazing, and related structural calculations and test data.

3. Openings and interior work: doors, frames, door hardware and access-control interfaces; casework, millwork and countertops; ceilings; flooring; tile; painting and coatings; specialties; signage; toilet accessories; and other finish samples and color selections required by the Contract Documents.

4. Medical and specialty coordination: radiation shielding and related calculations or reports where required; medical, dental, pharmacy, imaging, laboratory, and clinical equipment interfaces; blocking, anchorage, backing, utility rough-ins, penetrations, clearances, and other work required to receive Owner-furnished or specialty equipment.

5. Mechanical, plumbing, electrical, and fire-protection work: major HVAC and chilled-water equipment; controls; plumbing fixtures and equipment; medical or dental utility systems where indicated; electrical service and distribution equipment; emergency power equipment; lighting; low-voltage, data, security and fire-alarm systems; and automatic sprinkler systems.

6. Civil and site work: paving, curbs, walks, accessible-site components, drainage structures and piping, utilities, site electrical work, site accessories, and other site products requiring review under the Civil and related Contract Documents.

B. For Owner-furnished or Owner-vendor equipment, obtain available vendor shop drawings and product data early enough to coordinate dimensions, access, backing, supports, utilities, service clearances, controls, electrical requirements, plumbing requirements, penetrations, and installation sequencing. Promptly identify conflicts or missing information to the Architect before fabrication or installation of affected work.

2.3 SUBSTITUTIONS

A. Do not use a shop drawing, product-data submittal, or sample as a request for substitution. Proposed substitutions shall be submitted and reviewed only in accordance with Section 01 33 24 - Substitutions, applicable Division 00 requirements, and the General and Supplementary Conditions.

B. Where “or equal,” “approved equal,” or similar wording is used in the Contract Documents, do not assume that a product is accepted merely because it is submitted. Follow the applicable equal-product or substitution procedure and provide complete

comparison information. An unapproved substitution or unidentified deviation may be returned without review.

2.4 PURPOSE

A. The purpose of shop drawings and product data is to provide detailed information specifically prepared for the Project and coordinated with actual field and fabrication conditions. **Variations from the Contract Documents shall be specifically identified and labeled "DEVIATION FROM CONTRACT DOCUMENTS."** Failure to identify a variation does not transfer responsibility for the variation to the Architect or Owner.

B. Architect's review is only for general conformance with the design concept of the Project and general compliance with the information given in the Contract Documents. **The Contractor is solely responsible** for dimensions and quantities; field verification; fabrication processes; means, methods, techniques, sequences and procedures of construction; coordination of the Work of all trades; and performing the Work in a safe and satisfactory manner.

C. Corrections or comments made during review do not relieve the Contractor from compliance with the Drawings and Specifications. Review of a specific item does not constitute review of an assembly of which the item is a component, nor does it constitute approval of an unidentified deviation from the Contract Documents.

2.5 ASBESTOS CONTAINING BUILDING MATERIALS (ACBM)

A. Do not furnish or install asbestos-containing building materials as part of the Work. If the Contractor discovers that a proposed or furnished product contains asbestos or cannot be verified as asbestos-free, notify the Architect immediately and do not install the product until a compliant material has been accepted in accordance with the Contract Documents.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 33 23

SECTION 01 33 24 - SUBSTITUTIONS

PART 1 - GENERAL

1.1 PRE-BID PRIOR APPROVALS

A. Requests for approval of products other than those specified that are submitted before bid opening shall comply with Article 3, Paragraph 3.3, "Substitutions (Prior Approval Required)," of the Instructions to Bidders.

B. The Bid shall be based only upon products specified in the Bidding Documents or products approved by Addendum before bid opening.

C. Approval of a product before bidding does not relieve the Bidder or Contractor from responsibility for compliance with all requirements of the Contract Documents.

1.2 SUBSTITUTIONS AFTER CONTRACT EXECUTION

A. After execution of the Contract, substitutions will be considered only in accordance with Section 3.4.2 and Article 7 of AIA Document A201-2017 and only when one or more of the following conditions exist:

1. The specified product has been discontinued or is unavailable for reasons beyond the Contractor's control, despite timely procurement efforts.
2. A change in applicable laws, codes, or regulations prevents use of the specified product.
3. Unforeseen conditions make use of the specified product impractical or unsuitable.
4. The Architect determines that the specified product is inappropriate for the intended application.
5. The proposed substitution provides a substantial documented benefit to the Owner without reducing quality, performance, service life, appearance, or warranty.

B. Substitutions proposed solely for the convenience of the Contractor, Subcontractor, supplier, or manufacturer; to reduce the Contractor's cost; because the Contractor failed to submit a pre-bid prior approval request; or because the Contractor failed to order the specified product in a timely manner will not be considered.

C. The Contractor shall not purchase, fabricate, or install a proposed substitute unless it has been accepted in writing in accordance with Paragraph 1.6.

1.3 SUBSTITUTION REQUESTS

A. Submit each request in writing to the Architect promptly after the need for the substitution is discovered and sufficiently in advance of the date a decision is required to avoid delay to the Work.

B. Include the following information with each request:

1. Identification of the specified product and applicable Specification Section.
2. Manufacturer, model or series number, and complete description of the proposed substitute.
3. A side-by-side comparison of the proposed substitute with the specified product, addressing each requirement of the Contract Documents.
4. Product data, drawings, samples, test reports, certifications, and applicable reference standards required for a complete evaluation.
5. The reason for the request and supporting documentation, including evidence of discontinuance or unavailability when applicable.
6. Identification of changes required to drawings, details, dimensions, utilities, finishes, adjacent construction, and the work of other trades.
7. Availability information and the effect, if any, on the construction schedule and Contract Time.
8. Complete cost information, including all related costs and any proposed credit to the Owner.
9. Warranty information for the proposed substitute.

C. Incomplete requests or requests that do not clearly demonstrate compliance with the Contract Documents will be returned without review.

D. Submit a separate request for each proposed substitution. The Architect may require additional information, samples, testing, or demonstrations before completing the evaluation.

1.4 CONTRACTOR'S REPRESENTATIONS

A. By submitting a substitution request, the Contractor represents and certifies that:
   1. The Contractor has investigated the proposed substitute and determined that it is equal or superior to the specified product in all material respects.
   2. The proposed substitute complies with applicable laws, codes, regulations, and the requirements of authorities having jurisdiction.
   3. The Contractor will provide warranties equal to or greater than those required for the specified product.
   4. The submitted cost information is complete and includes all costs associated with incorporating the substitution.
   5. The Contractor will coordinate the substitution and perform all resulting changes required for complete installation without reducing the quality or performance of the Work.
   6. The proposed product is available in the required quantities and within the required construction schedule.
   7. The Contractor waives claims for additional cost or time arising from the substitution except to the extent expressly included in an executed written modification to the Contract.

1.5 TESTING AND ADDITIONAL REVIEW COSTS

A. When the quality or performance of a proposed substitute cannot be determined from the submitted information, the Architect may require testing by an independent testing agency acceptable to the Architect.

B. The Contractor shall pay the costs of required testing and additional services of the Architect and consultants attributable to the review or incorporation of the proposed substitution, whether the substitution is accepted or rejected, except when the substitution is requested by the Owner or results from an error or omission in the Contract Documents.

1.6 ACCEPTANCE OR REJECTION

A. The Architect will evaluate the technical acceptability of the proposed substitution. The Owner reserves the right to accept or reject the substitution.

B. A substitution is not accepted unless incorporated into the Contract by Change Order, Construction Change Directive, or other written modification authorized by the Contract Documents.

C. Rejection of a substitution request does not relieve the Contractor from furnishing the specified product and does not constitute grounds for an increase in the Contract Sum or Contract Time.

D. Acceptance of a substitution does not relieve the Contractor from responsibility for compliance with the Contract Documents or for the suitability, coordination, and performance of the substituted product.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 33 24

SECTION 01 40 00 – QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Quality requirements include the following:

1. Contractor's quality-control responsibilities.
2. Regulatory requirements.
3. Qualifications of manufacturers, fabricators, installers, and testing agencies.
4. Mockups.
5. Testing and inspection services.
6. Special inspections.
7. Manufacturer's field services.
8. Testing and inspection reports.
9. Repair and protection of Work.
10. Correction of nonconforming Work.
11. Retesting and reinspection.

C. Testing and inspection services are required to verify compliance with requirements specified or indicated in the Contract Documents. These services do not relieve Contractor of responsibility for compliance with the Contract Documents.

1.2 DEFINITIONS

A. **Quality Assurance:** Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and to ensure that proposed construction complies with requirements.

B. **Quality Control:** Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements.

C. **Mockup:** Full-size physical assembly constructed to verify selections made under submittals, demonstrate aesthetic effects and qualities of materials and execution, review coordination, test performance, and establish standards by which the Work will be judged.

D. **Testing Agency:** Entity engaged to perform specific tests, inspections, or both.

E. **Special Inspector:** Qualified individual or agency engaged to perform special inspections required by the applicable building code and Contract Documents.

1.3 GENERAL QUALITY REQUIREMENTS

A. Contractor is responsible for the quality of the Work and shall provide Work that complies with the Contract Documents.

B. Where Contract Documents require materials, products, assemblies, or workmanship to comply with referenced standards, provide Work complying with the latest applicable requirements of those standards unless a specific edition is indicated.

C. Where no specific quality standard is identified, provide materials and workmanship suitable for intended use and consistent with recognized industry standards for first-class commercial construction.

D. Contractor shall coordinate quality-control activities of Subcontractors, suppliers, manufacturers, testing agencies, and other entities performing Work.

E. Contractor shall maintain a quality-control program sufficient to verify that Work complies with the Contract Documents before requesting Architect's review or Owner's acceptance.

F. Architect's observations, reviews, approvals, certifications, or presence at the Project site do not relieve Contractor of responsibility for:

1. Quality of the Work.
2. Compliance with Contract Documents.
3. Dimensions and field conditions.
4. Means, methods, techniques, sequences, and procedures.
5. Coordination of portions of the Work.
6. Correction of defective or nonconforming Work.

1.4 REGULATORY REQUIREMENTS

A. Perform Work in accordance with applicable federal, state, and local laws, codes, ordinances, regulations, and requirements of authorities having jurisdiction.

B. Where requirements of authorities having jurisdiction exceed requirements of the Contract Documents, comply with the more stringent requirement unless directed otherwise in writing by Architect.

C. Obtain inspections and approvals required by authorities having jurisdiction that are the responsibility of Contractor under the Contract Documents.

D. Coordinate required governmental inspections with the Work and provide sufficient advance notice to avoid delays.

1.5 CONFLICTING REQUIREMENTS

A. If compliance with two or more standards establishes different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement unless the Contract Documents indicate otherwise.

B. Refer uncertainties and conflicts to Architect for interpretation before proceeding with affected Work.

C. Contractor's failure to identify an apparent conflict before proceeding does not relieve Contractor of responsibility for providing Work complying with Architect's interpretation of the Contract Documents.

1.6 CONTRACTOR QUALITY-CONTROL PLAN

A. Before beginning construction, establish procedures for monitoring and controlling quality of the Work.

B. Quality-control procedures shall include, as applicable:

1. Review of Contract Documents with affected trades.
2. Verification of field conditions before fabrication and installation.
3. Coordination among trades.
4. Review of approved submittals before installation.
5. Verification that required samples and mockups have been approved.
6. Coordination of testing and inspections.
7. Identification and correction of deficient Work.
8. Documentation of corrective actions.
9. Verification that deficiencies are corrected before Work is concealed.
10. Maintenance of testing and inspection records.

C. Where required by Architect, submit written quality-control procedures for specific portions of the Work.

1.7 QUALIFICATIONS

A. **Manufacturer Qualifications:** Manufacturer regularly engaged in manufacture of products of types and capacities required and whose products have been in satisfactory use in similar service for the period specified in the individual Specification Section.

B. **Installer Qualifications:** Firm or individual experienced in installing, applying, or erecting materials and systems similar in material, design, and extent to those required for this Project.

C. Where a Specification Section requires a manufacturer's authorized, approved, certified, or licensed installer, provide documentation confirming current qualification before beginning affected Work.

D. **Fabricator Qualifications:** Firm experienced in producing products similar to those indicated and with a record of successful in-service performance.

E. **Testing Agency Qualifications:** Independent agency with experience and capability to conduct testing and inspections indicated and qualified in accordance with applicable ASTM, ICC, or other recognized industry standards.

F. Testing laboratories shall be accredited where accreditation is required by applicable codes or individual Specification Sections.

G. **Professional Engineer Qualifications:** Professional engineer legally qualified to practice in the State of Louisiana and experienced in providing engineering services of the type indicated.

1.8 DELEGATED DESIGN

A. Where delegated design is required by individual Specification Sections, provide design services by a qualified professional engineer legally authorized to practice in the State of Louisiana.

B. Delegated-design submittals shall include:
1. Design calculations.
2. Drawings and details.
3. Design criteria.
4. Loads and performance requirements.
5. Applicable code requirements.
6. Professional engineer's signed and sealed certification where required.

C. Contractor and delegated-design professional remain responsible for dimensions, coordination, fabrication, installation, and compliance with specified performance criteria.

D. Architect's review of delegated-design submittals is limited to general conformance with design intent and information contained in the Contract Documents.

1.9 MOCKUPS

A. Construct mockups where required by individual Specification Sections or directed by Architect.

B. Mockups are intended to:
1. Verify selections made under sample submittals.
2. Demonstrate aesthetic effects and workmanship.
3. Demonstrate coordination of materials and assemblies.
4. Establish standards of quality for completed Work.
5. Test performance where required.

C. Notify Architect sufficiently in advance of mockup construction to permit observation.

D. Do not proceed with related Work until mockup has been reviewed and accepted for establishing the required quality standard.

E. Accepted mockups establish minimum standards for appearance and workmanship.

F. Maintain accepted mockups during construction in an undisturbed condition as a standard for judging completed Work.

G. Unless indicated otherwise, accepted mockups incorporated into the Work may remain as part of completed construction if they remain undamaged and comply with Contract Documents.

H. Remove mockups that are not incorporated into the Work when directed.

1.10 TESTING AND INSPECTION SERVICES

A. Testing and inspections may be performed by:
1. Owner's independent testing agency.
2. Contractor's testing agency.
3. Manufacturer's representatives.
4. Authorities having jurisdiction.
5. Special inspectors.
6. Other qualified entities required by the Contract Documents.

B. Where the Contract Documents indicate that testing or inspection is to be performed by Owner's testing agency, Owner will engage the agency unless indicated otherwise.

C. Contractor shall cooperate with testing agencies and provide access to the Work.

D. Contractor shall provide, without additional cost to Owner:
1. Incidental labor and facilities necessary to facilitate tests and inspections.
2. Safe access to Work requiring testing or inspection.
3. Representative samples of materials to be tested when required.
4. Storage and curing of test samples when required.
5. Preliminary design mixes and product information.
6. Advance notice of Work requiring testing or inspection.
7. Coordination of scheduling with testing personnel.
8. Temporary facilities, scaffolding, lifts, power, water, and other services necessary to conduct tests and inspections where required.
9. Protection and repair of Work affected by testing.

E. Testing and inspection by Owner do not relieve Contractor of responsibility for providing compliant Work.

F. Testing and inspection do not constitute acceptance of defective Work or modification of Contract requirements.

1.11 OWNER'S TESTING AGENCY

A. Where Owner engages an independent testing agency, agency will perform testing and inspection services identified in the Contract Documents as Owner's responsibility.

B. Owner's testing agency will report results to Owner, Architect, Contractor, and other parties as required.

C. Contractor shall notify testing agency and Architect sufficiently in advance of operations requiring testing or inspection.

D. Unless a longer period is required by an individual Specification Section, provide not less than 48 hours' notice for scheduled testing or inspection.

E. If testing agency is unable to perform required services because Contractor failed to provide adequate notice, Contractor shall be responsible for resulting additional costs.

1.12 CONTRACTOR'S TESTING AND INSPECTION

A. Where individual Specification Sections require Contractor to engage testing or inspection services, engage a qualified independent testing agency.

B. Submit testing agency qualifications to Architect when requested.

C. Costs of Contractor-required testing and inspections are included in the Contract Sum.

D. Tests performed by Contractor's agency do not replace tests required to be performed by Owner's agency or authorities having jurisdiction.

1.13 SPECIAL INSPECTIONS

A. Special inspections required by the adopted building code shall be performed in accordance with the approved Statement of Special Inspections and requirements of authorities having jurisdiction.

B. Owner will engage the Special Inspector or special inspection agency when required by the Contract Documents or applicable code.

C. Contractor shall:

1. Notify Special Inspector when Work requiring special inspection is ready.
2. Provide access to Work.
3. Furnish information and documents required by Special Inspector.
4. Coordinate inspections to prevent concealment of Work before required inspections are completed.
5. Correct deficiencies identified by Special Inspector.
6. Notify Special Inspector when corrective Work is complete and ready for reinspection.

D. Do not cover or conceal Work requiring special inspection until required inspection has been completed.

E. Special inspection does not relieve Contractor of responsibility for complying with the Contract Documents.

1.14 MANUFACTURER'S FIELD SERVICES

A. Where required by individual Specification Sections, engage manufacturer's qualified representative to perform field observations, inspections, testing, startup assistance, or training.

B. Manufacturer's representative shall report observations and recommendations in writing.

C. Submit manufacturer's field reports to Architect promptly after each site visit.

D. Correct deficiencies identified by manufacturer's representative before requesting final acceptance of affected Work.

E. Manufacturer's field observation does not relieve Contractor of responsibility for proper installation.

1.15 TESTING AND INSPECTION REPORTS

A. Testing agencies shall prepare reports documenting tests and inspections performed.

B. Reports shall include, as applicable:

1. Date issued.
2. Project identification.
3. Name of testing or inspection agency.
4. Location and date of test or inspection.
5. Description of material or Work tested.
6. Applicable Specification Section.
7. Applicable test standard.

8. Test or inspection results.
9. Whether results comply with specified requirements.
10. Identification of deficiencies or nonconforming conditions.
11. Name and signature of individual performing test or inspection.

C. Distribute reports to Architect, Owner, Contractor, and other parties required by the Contract Documents.

D. Contractor shall maintain copies of current testing and inspection reports at the Project site.

1.16 NONCONFORMING WORK

A. Work that does not comply with the Contract Documents is considered nonconforming.

B. Promptly correct nonconforming Work discovered by Contractor, Architect, Owner, testing agency, Special Inspector, manufacturer, or authority having jurisdiction.

C. Do not conceal known nonconforming Work.

D. Contractor shall bear costs associated with correction of nonconforming Work, including:
1. Removal and replacement.
2. Additional testing.
3. Reinspection.
4. Professional services required to evaluate deficient Work.
5. Restoration of adjacent Work affected by corrective operations.
6. Other costs resulting from Contractor's failure to comply with Contract Documents.

E. Acceptance of nonconforming Work, if considered by Owner, shall be only by written modification to the Contract Documents.

1.17 RETESTING AND REINSPECTION

A. Where tests or inspections indicate that Work does not comply with Contract Documents, Contractor shall correct deficiencies and arrange for retesting or reinspection.

B. Contractor shall pay costs of retesting and reinspection resulting from failed or nonconforming Work, including costs incurred by Owner, Architect, consultants, testing agencies, and Special Inspectors where permitted by the Contract Documents.

C. Repeated failures may require additional testing or inspection beyond originally specified requirements when reasonably necessary to establish compliance.

D. Additional testing resulting from Contractor's failure to follow specified procedures or maintain required quality is at Contractor's expense.

1.18 DOCUMENTATION

A. Maintain quality-control records throughout construction.

B. Records shall include, as applicable:
1. Testing and inspection reports.
2. Special inspection reports.
3. Manufacturer field reports.
4. Certificates.
5. Mockup approvals.
6. Corrective-action documentation.
7. Reinspection and retesting reports.
8. Other quality documentation required by the Contract Documents.

C. Submit quality-control documentation as part of Project closeout where required.

PART 2 - PRODUCTS

2.1 GENERAL

A. Material and product quality requirements are specified in individual Specification Sections.

B. Where products are specified by reference standard, provide products complying with applicable requirements of the referenced standard.

C. Where products are required to bear labels, certifications, listings, or approvals of recognized testing organizations, provide products bearing current applicable identification.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify conditions before beginning each portion of the Work.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

C. Beginning installation constitutes Contractor's acceptance of substrates and conditions affecting performance of the Work, except concealed conditions not reasonably discoverable before installation.

3.2 PREPARATION

A. Prepare substrates and existing conditions in accordance with requirements of individual Specification Sections and manufacturers' written instructions.

B. Verify dimensions, elevations, locations, and other field conditions before fabrication or installation.

3.3 INSTALLATION

A. Install materials and equipment in accordance with:
1. Contract Documents.
2. Approved submittals.
3. Manufacturer's written instructions.
4. Applicable codes and standards.
5. Accepted mockups.
6. Recognized industry standards.

B. Where manufacturer requirements conflict with Contract Documents, notify Architect before proceeding.

C. Maintain workmanship at or above standards established by accepted mockups and approved installations.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections required by individual Specification Sections.

B. Notify Architect and testing agencies when Work is ready for required observation, testing, or inspection.

C. Do not cover Work until required testing and inspection have been completed.

D. Correct deficiencies identified by testing or inspection before proceeding with Work that would conceal affected construction.

3.5 REPAIR AND PROTECTION

A. Repair and protect construction disturbed by testing and inspection.

B. Restore affected Work to conditions complying with Contract Documents.

C. Protect completed Work from damage during subsequent construction.

D. Failure of testing or inspection services to detect defective Work does not relieve Contractor of responsibility to correct Work that does not comply with Contract Documents.

END OF SECTION 01 40 00

SECTION 01 50 00 – TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SCOPE

A. The General Contractor shall provide the following temporary facilities on the immediate work site and maintain the same for the duration of the work:
   1. Temporary field offices
   2. Temporary utilities
   3. Sanitary conditions
   4. Storage shed and/or yard
   5. Protection of the site
   6. Temporary Roads and Paved Areas
   7. Temporary Site Fencing

B. Related work: See General Conditions, Supplementary Conditions, Division 00 requirements, and other sections of the Contract Documents for additional requirements concerning temporary facilities, safety barricades, site access, utilities, protection, trash removal, and construction coordination.

C. Locate field office, storage facilities, sanitary facilities, temporary access, and other temporary support facilities in locations coordinated with the Owner and Architect. Maintain required support facilities until they are no longer needed for the Work. Do not use completed permanent medical-clinic spaces or facilities for construction operations without the Owner's written approval.

D. The General Contractor shall be responsible for the orderly arrangement, use, maintenance, and removal of temporary facilities for the Contractor and all subcontractors and shall maintain the site as an orderly, secure, and safe construction area.

1.2 MATERIALS

A. **Temporary Field Office:** The General Contractor shall furnish and set up a suitable temporary air-conditioned office for the job superintendent, Contractor personnel, project meetings, and use by the Architect during site visits. The office shall be weathertight, lockable, air conditioned, and of sufficient size to accommodate meetings of a minimum of 12 people and to maintain current Contract Documents, permits, approved submittals, RFIs, project correspondence, record documents, testing information, and required jobsite postings. Provide electrical power, reliable internet/data access, and printing capability for a minimum 8-1/2 x 11 sheet. Maintain applicable CDBG-DR, Federal labor, equal-employment, safety, permit, and other required notices at the site. Provide the Architect with the superintendent's current cell phone number. Keep the field office clean and orderly throughout the Project. Do not use the field office for storage of building materials or construction tools except in a separate secured storage area.

B. **Temporary Utilities:**

   1. Electrical Power Service: The General Contractor shall provide temporary electrical power as required for construction operations. Do not assume that existing Owner service or the permanent Project electrical service is available for temporary construction use. Any temporary connection to existing or permanent service shall be coordinated with the Owner and serving utility and shall be installed, protected, metered when required, and removed at the Contractor's expense. Repair damage to existing or permanent electrical systems caused by temporary construction operations at the Contractor's expense.

   2. Water Service: The General Contractor shall provide temporary water service as required for construction operations. Do not assume that existing Owner service

or the permanent Project water service is available for temporary construction use. Any temporary connection to existing or permanent service shall be coordinated with the Owner and serving utility and shall be installed, protected, metered when required, and removed at the Contractor's expense. Repair damage to existing or permanent water systems caused by temporary construction operations at the Contractor's expense.

C. **Sanitary Conditions:** The General Contractor shall provide and maintain temporary sanitary facilities for the duration of the Work. Provide self-contained toilet units and hand-washing facilities in quantities required by applicable regulations, located to provide privacy and maintained in clean and sanitary condition. Contractor personnel, subcontractors, installers, and vendors shall not use completed permanent toilets, lavatories, sinks, drinking fountains, or other Owner facilities unless specifically authorized in writing by the Owner.

D. **Storage Shed or Yard:** The General Contractor shall provide and maintain secure storage trailers, sheds, or storage yard areas as required for construction tools, materials, and equipment. Protect stored items from weather, damage, theft, and vandalism and comply with applicable safety requirements. Coordinate storage and staging locations with the Owner and Architect so they do not interfere with site access, drainage, permanent utility work, emergency access, or work by the Owner's separate contractors and vendors.

E. **Protection of Site:** The General Contractor shall be solely responsible during the Work for security and safety of the construction site, temporary facilities, stored materials and equipment, existing utilities and improvements to remain, adjacent property, and persons in or near the Work area. Provide barricades, warning signs, reflectors, temporary lighting, and other protection required to clearly identify construction areas and areas closed to the public. Coordinate temporary construction and protection with the Owner and Architect so adjacent operations and required access remain safe. Refer to the General Conditions and Supplementary Conditions for additional requirements.

F. **Temporary Roads and Paved Areas:** If required for construction, construct and maintain temporary roads, construction entrances, parking, and access areas adequate to support anticipated loads and traffic. Coordinate temporary access with the Owner, Architect, Civil Drawings, existing drainage, permanent site construction, and public roadways. Provide temporary culverts or drainage measures required by temporary access work and maintain positive drainage throughout construction. **(Remove temporary roads and access improvements when no longer required and restore affected areas to the condition required by the Contract Documents or, where outside permanent improvements, to preconstruction condition or better.)**

G. **Temporary Site Fencing:** The General Contractor shall be responsible for site security and public safety for the duration of the Project. Provide and maintain temporary chain-link fencing around active construction, staging, and storage areas, with controlled access through lockable gates. Coordinate fence limits and gate locations with the Owner and Architect and modify the enclosure as required by the progress of the Work.

1. Provide barriers, fencing, and gates of a design and arrangement that discourage unauthorized entry into the construction area while maintaining required access for construction personnel, emergency services, utilities, inspectors, the Owner, and authorized visitors.

Maintain fencing, gates, barricades, warning signage, reflectors, and temporary lighting in good condition throughout construction. Secure gates when the site is unattended. Keep construction access and staging from blocking required Owner access, emergency routes, or adjacent operations. Refer to the General Conditions, Supplementary Conditions, and Contract Drawings for additional requirements.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 Maintain temporary facilities throughout the duration of the Work. Keep facilities clean, neat, orderly, secure, and in compliance with applicable safety, environmental, and regulatory requirements.

3.2 Remove temporary facilities, temporary utility connections, fencing, storage, and access improvements promptly when no longer required and before final acceptance unless otherwise approved by the Owner. Repair damage and leave the completed Project clean and ready for use.

3.3 During execution of the Work, comply with applicable codes and regulations, especially safety requirements. Disturb existing property, adjacent facilities, utilities, drainage, and areas outside the permanent Work only to the extent necessary to complete the Project. **(Restore disturbed areas to the condition required by the Contract Documents or, where outside the permanent Work, to preconstruction condition or better, subject to acceptance by the Owner.)**

END OF SECTION 01 50 00

SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Divisions of the Specification sections, apply to this section of the specifications. In general, the provisions of all the Contract Documents are part of this section.

1.2 General Requirements

A. This section includes administrative and procedural requirements for the contract closeout including, but not limited to, the following:
   1. Project Review Procedures
   2. Record Documentation
   3. Operations and Maintenance Manuals, Bonds and Guarantees
   4. Fire Marshal Information
   5. Demonstration and Training of Owner's Personnel
   6. Final Project Cleaning

B. Divisions 11, 21, 22, 23, 26, 27, and 28 and other technical Specification Sections have related information concerning Operation and Maintenance Data, Guarantees / Warranties, Demonstration and Training, testing, certifications, and specific closeout and special cleaning requirements.

C. The Contractor shall start accumulating required Substantial Completion manuals, guarantees / warranties, testing and certification records, CDBG-DR / Federal compliance documentation, materials, equipment information, and other closeout items as early as during the shop drawings, product data, and samples review process.

1.3 Project Review Procedures

A. Substantial Completion Review
   1. Preliminary Requirements: **Before the Contractor requests a project observation for determining date of Substantial Completion**, the following list of items shall be completed:
      a. **Prepare a list of uncompleted items and items to be corrected by the Contractor or his Subcontractors and reasons why the work is not completed or corrected. The list shall include the following:**
         1. Prepare list of areas in sequential order, starting with the site and exterior of the building and proceeding through the single-story interior by functional area, followed by building systems and equipment.
         2. Prepare list of items for each space by major elements such as floors, walls, ceiling, millwork, equipment, and building systems.
         3. The following information shall be listed at the top of the first page:
            a. The Architect's project name and number, the date, the name of the Architect, the name of the Contractor along with a page number for each sheet.
      b. The Contractor shall discuss with the Owner and Architect anticipated insurance change over dates and requirements.
      c. Submit guarantees / warranties, maintenance service agreements, final certifications, testing records, and similar documents required for Substantial Completion.
      d. Obtain and submit releases and approvals permitting the Owner unrestricted use of the Project and access to services and utilities.

Include Certificate of Occupancy, State Fire Marshal approval, utility releases, and other approvals required by authorities having jurisdiction.

e. Prepare and submit record documentation.
f. Deliver any tools, spare parts, extra materials, and similar items to the Owner at the location designated. Label all of these items with manufacturer's name and model numbers.
g. Complete change-over of permanent locks and access-control functions and deliver keys, cores, credentials, programming information, and related access items to the Owner as applicable.
h. Complete startup, functional testing, commissioning activities, and required demonstrations of building systems and equipment as required by the Contract Documents.
i. Submit testing, adjusting and balancing records; startup reports; system certifications; and other required test reports.
j. Remove all temporary facilities on the project site, along with mock-ups, construction tools and similar temporary elements of the project.
k. Advise Owner the anticipated date of change-over of all utilities.
l. Submit change-over information related to the Owner's occupancy, use, operation, maintenance, and coordination with Owner-furnished medical, dental, pharmacy, imaging, information-technology, security, and other equipment or vendors.
m. Complete all final cleaning requirements for the project.
n. Touch-up and repair / restore damaged finishes to eliminate any visual defects.

2. **Project Review and Final Completion:** Submit a written request for a project review for Substantial Completion. Upon receipt of the written request, the Architect will either proceed with the project review or notify the Contractor of unfulfilled requirements. The Architect and Consultants shall not make trial project reviews to determine whether the Project is ready. If Substantial Completion is not achieved within the Contract Time, any liquidated damages or other contractual consequences shall be as stated in the Contract Documents. The Architect will prepare a Certificate of Substantial Completion after a successful review or will identify items that shall be completed or corrected before the Certificate is issued.
   a. Additional Project Review: Request additional project review when the items listed in previous project review, as incomplete or incorrect, have been completed or corrected.
   b. **Multiple Project Reviews:** Should multiple project reviews be required because the Contractor has not corrected previously identified punch-list items or has requested review before the Work is ready, costs of additional services or reviews may be charged to the Contractor to the extent permitted by the Contract Documents.
   c. The Contractor shall pay for and cause the Certificate of Substantial Completion to be recorded in the Clerk of Court's office for Lafourche Parish, Louisiana, within the time required by the Contract Documents and applicable law, and shall provide the recording information to the Owner and Architect. Issuance or recording of the Certificate does not constitute Final Acceptance. If the Contractor fails to record the Certificate when required, the Owner may do so at the Contractor's expense to the extent permitted by the Contract Documents.
   d. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will review the Contractor's final Application for Payment and make the certification or recommendation required by the applicable General and Supplementary Conditions. Final payment remains subject to completion of all closeout requirements and other conditions precedent stated in the Contract Documents.
   e. Coordinate the Owner's move-in and installation, startup, and final connection of Owner-furnished medical, dental, pharmacy, imaging, furniture, information-technology, security, and other equipment. Provide

access and sequencing required for these activities without interfering with completion of the Work. Occupancy or early access shall occur only as authorized by the Owner and permitted by the Contract Documents.

f. The Contractor shall submit a certified copy of the Architect's Substantial Completion review list of items to be completed or corrected (punch list) endorsed and dated by the Architect. The certified copy of the punch list shall state that each item has been completed or resolved for acceptance of the work.

g. Insurance coverage complying with the insurance requirements for the project shall be carried until final completion.

h. The Contractor shall provide instruction for Owner-designated personnel, including Lady of the Sea General Hospital operations and facilities personnel, in the operation, adjustment, and maintenance of products, equipment, and systems. Schedule instruction in coordination with the Owner and Architect so required personnel can attend.

i. The Contractor shall submit the following documents:
   1. Clear Lien Free Certificate from Clerk of Court
   2. Contractor's Affidavit for Payment of Debts and Claims
   3. Contractor's Affidavit of Release of Liens
   4. Consent of Surety to Final Payment
   5. Consent of Surety to Reduction or Partial Release of Retainage

j. Before final payment, submit all CDBG-DR and Federal closeout documentation required by Division 00 and the Contract Documents, including final payroll and labor-compliance records, certifications, reports, and other grant closeout documentation required by Lafourche Parish Government and its Grants & Economic Development Department.

1.4 Record Documentation

A. Record Documents: Contractor shall maintain, during the entire Project, current Record Documents and shall make Record Drawings available at each monthly meeting for review with the Architect and Owner's representative:

1. Record Drawings: Maintain a complete working set of Contract Drawings, approved shop drawings, Addenda, Architect's Supplemental Instructions, Construction Change Directives, Change Order drawings, and other issued drawing revisions for record mark-up purposes throughout the Contract Time.
2. Mark Record Drawings during the course of the Work to show changes and actual installation conditions sufficient to form a complete record for the Owner's future use. Give particular attention to concealed construction; underground site utilities; mechanical, plumbing, fire-protection, electrical and controls work; medical and dental utility systems; sleeves and penetrations; and work that may require servicing or replacement during the life of the Project. Annotate changes in red or another clearly contrasting color.
3. Require entities making record changes to identify and date each mark-up. Maintain one coordinated record set under the control of the General Contractor.
4. Accurately record information in an understandable and legible drawing technique. Record changed data immediately after data is received.
5. Record Construction Change Directive Numbers, Change Order Numbers, and similar identifications in appropriate areas on the Record Drawings.
6. Do not indicate in any area of the drawing or correspondence concerning the project the words "as-built drawings". All Record Documentation shall be referenced with the indication "Record Drawings and Record Specifications."
7. **Record Documents shall be available for review with the Architect and Consultants at each monthly meeting until completion of the Project. All changes, including Addenda, Supplemental Instructions, Construction Change Directives, Change Orders, RFIs that modify the Work, and field changes, shall be indicated on Record Documentation.**

8. **At the end of the Project, submit Record Drawings to the Architect as an organized color PDF set together with the original marked-up hard-copy record set. Electronic files shall be legible at full drawing size and organized in the same order as the Contract Drawings.**

B. Record Specifications: Contractor shall maintain, during the entire Project, current Record Specifications and shall make them available at each monthly meeting for review with the Architect and Owner's representative:
1. Maintain one (1) complete copy of the Project Specifications, including Addenda, Supplemental Instructions, approved substitutions, and Contract Modifications. Mark the Specifications to indicate actual products and installations where the Work differs from the original Contract Documents. Annotate record changes in red or another clearly contrasting color.
2. Give particular attention to products which will be concealed and installations that cannot be readily identified and recorded at a later date.
3. Mark Record Specification changes to include the proprietary name and model number of products, materials, and equipment including substitutions selected.
4. **Record Specifications shall be available for review with the Architect and Consultants at each monthly meeting until completion of the Project. All changes shall be indicated on the Record Documentation.**
5. **At the end of the Project, submit Record Specifications to the Architect as an organized color PDF set together with the original marked-up hard-copy record set.**

C. **Prior to final payment**, the Contractor shall turn over to the Architect one complete 24 x 36 inch marked-up paper set of Record Drawings, one complete marked-up paper set of Record Specifications, and organized electronic PDF copies of both. Record Documentation shall clearly reflect changes made during construction and shall be neat, legible, coordinated, and suitable for the Architect's preparation of final Record Documents. The Contractor shall bear costs associated with preparation and delivery of its Record Documentation.

D. Incorporate or clearly append all Addenda, Supplemental Instructions, Construction Change Directives, Change Order drawings, and other Contract Modifications into the Record Documentation set.

E. **Prior to final payment**, submit the complete Record Documentation package electronically through the project management system or other method directed by the Owner and Architect. Provide a USB drive or additional electronic copy when requested by the Owner for project closeout and grant records.

1.5 Operations and Maintenance Manuals, Bonds and Guarantees

A. Three (3) physical copies (binders) and one (1) complete searchable digital PDF copy of Operations and Maintenance Manuals, Bonds and Guarantees shall be submitted to the Architect prior to final acceptance of the Project. Unless a different commencement date is stated in an individual Specification Section or in the Certificate of Substantial Completion, warranties and guarantees shall begin on the date of Substantial Completion. Final payment may be withheld until required manuals, warranties, bonds, and corrected warranty dates have been received and accepted.

B. Refer to plans and specifications (specific sections) for information as to requirements for manuals, bonds and guarantees, including but not necessarily limited to the following:
1. Mechanical equipment, chilled-water systems, controls, and sequences of operation
2. Plumbing systems, water-heating equipment, pumps, and medical / dental utility systems where applicable
3. Electrical systems, lighting controls, emergency power systems, and related equipment
4. Fire-protection, fire-alarm, and other life-safety systems

5. Door hardware, access-control interfaces, and other security-related building systems furnished under this Contract
6. Architectural specialties, finishes, casework, and equipment requiring maintenance information
7. Roofing, sheet-metal, glazing, waterproofing, and other building-envelope warranties and maintenance requirements
8. Emergency instructions and procedures
9. Operating procedures, including startup, shutdown, seasonal operation, and normal operating sequences
10. Piping, wiring, controls, and system diagrams required for operation and maintenance
11. Manufacturer's information, including recommended spare parts and consumables
12. Name, address, telephone number, and email address of installer, supplier, and service organization
13. Maintenance procedures, preventive-maintenance schedules, and maintenance record forms
14. Copies of maintenance service agreements and required service contracts
15. Copies of warranties, guarantees, bonds, certifications, and final test reports

C. Organize Operations and Maintenance Manuals, Bonds and Guarantees into suitable sets of manageable size. Bind and index physical data, including a table of contents, in heavy-duty three-ring binders sized for the contents with pockets for folded oversized sheets. Identify each binder on the front and spine with the title "Operations and Maintenance Manuals, Bonds and Guarantees" and the Project name. **Provide three (3) complete binder sets and one complete searchable, bookmarked digital PDF set prior to final acceptance. Organize the digital set by Specification Section and system so individual documents can be readily located.**

1.6 Final Reviewed Shop Drawings

A. **Contractor shall assemble all final reviewed shop drawings, product data, delegated-design calculations, certifications, and final resubmittals into one organized electronic PDF closeout set. Include only the final reviewed version of each submittal, clearly identified by Specification Section and submittal number. Submit the electronic set through the project management system or other method directed by the Owner and Architect as part of the closeout documents.**

1.7 Fire Marshal and Authority Having Jurisdiction Information

A. All fire- and life-safety documentation required by the Drawings, Specifications, State Fire Marshal, building official, and other authorities having jurisdiction shall be submitted with shop drawings and other submittals and shall be available for required inspections, including the following:
1. Coordinate required State Fire Marshal and other authority inspections at appropriate stages of construction. Do not conceal fire- or life-safety Work requiring inspection until the required inspection has been completed or authorization to conceal has been received.
2. Correct fire- and life-safety construction that does not comply with the Contract Documents or requirements of authorities having jurisdiction.
3. Provide required fire- and life-safety product data, listed-system information, certifications, test reports, firestopping documentation, sprinkler information, fire-alarm documentation, and other records required for inspection and occupancy.
4. Notify the Architect in writing at least three (3) weeks before the Contractor's requested Substantial Completion review so required State Fire Marshal and occupancy inspections can be coordinated. Required approvals for occupancy shall be obtained before Substantial Completion unless the Architect and Owner determine otherwise in accordance with the Contract Documents.
5. All fire- and life-safety systems and devices shall be complete, tested, and operational before the final authority inspection, including sprinkler, fire alarm,

emergency lighting, exit signage, and access-controlled egress functions where applicable. Incomplete or non-operational life-safety systems are not punch-list items for Substantial Completion. Require appropriate subcontractors and system vendors to be present for inspections and testing when needed.

6. Maintain current stamped Contract Documents, approved fire- and life-safety shop drawings, testing documentation, and required certifications at the Project site for authority inspections.

1.8 Demonstration and Training of Owner's Personnel

A. Instruct / train Owner-designated personnel, including Lady of the Sea General Hospital operations and facilities personnel, in operation and maintenance of systems and equipment (mechanical, plumbing, electrical, fire-protection, controls, and other systems) as required by individual Specification Sections and as follows:

1. Provide instructors experienced in operation, maintenance, troubleshooting, and service procedures for the systems being presented.
2. Coordinate instruction with the Owner for dates and times convenient to required personnel. For equipment requiring seasonal operation, include instruction addressing seasonal startup, shutdown, and changeover procedures.
3. Training shall be scheduled with the Owner, through the Architect, with at least 14 days advance notice.
4. The Contractor shall coordinate the instructors for training, including notification of dates, times, length of instruction, and instructional content.
5. Conduct training in a manner that can be video recorded by the Owner for future reference. Provide a minimum of two (2) training opportunities for major building systems when required to accommodate Owner personnel and operating schedules; additional training shall be provided where required by individual Specification Sections.
6. Coordinate training so mechanical, plumbing, electrical, fire-protection, controls, and other major system sessions are scheduled to permit required Owner personnel to attend without conflicting sessions.
7. **Complete training required for safe occupancy and operation before Substantial Completion is requested. Complete all remaining required training before Final Completion.**

B. Program Procedure: Develop an instruction program that includes individual training sessions for each system and equipment that may not be part of a system, as required by specific specification sections. For each training session, develop a learning objective and training outline. Include instruction for the following:

1. System design and operation philosophy
2. Review of documentation
3. Operations
4. Adjustments
5. Troubleshooting
6. Maintenance
7. Repair

1.9 Additional attic stock

A. Individual Specification Sections require extra materials and attic stock for the Owner's future use. Deliver required stock from the same lot, production run, dye lot, or finish batch as installed material where matching is important. Package, label, inventory, and deliver attic stock to the Owner-designated storage location before Substantial Completion unless otherwise directed.

1.10 Final Project Cleaning

A. Conduct final cleaning and waste removal operations to comply with local laws, ordinances, federal and local environmental and anti-pollution regulations.

B. Employ experienced workers or professional cleaners for final cleaning. Clean all surfaces to a condition appropriate for a new medical clinic ready for Owner move-in and operation. Comply with manufacturers' written instructions for cleaning products, finishes, equipment, casework, glazing, flooring, and specialty materials.

C. Complete the following cleaning operations before Substantial Completion Review is requested:

1. Clean and repair the project site in areas disturbed by construction activities, including landscape development areas, of trash, waste materials, litter, and other foreign materials not to remain as part of the project.
2. Clean concrete or asphalt paved areas. Remove any spills, stains and other foreign deposits from these hard surfaces.
3. Prepare the grounds that are not planted or covered with a hard surface to a smooth, even-textured surface conducive to plant growth.
4. Remove all tools, construction equipment, machinery and surplus materials from the project site and repair any areas, such as ruts, swales, indentions, etc., of the site that have been damaged by these devices.
5. Remove debris and surface dust / dirt from limited access spaces such as roof areas, plenums, shafts, trenches, equipment vaults, manholes, attics and similar spaces.
6. Sweep concrete floors, broom clean, in unoccupied spaces.
7. Vacuum carpet and clean resilient flooring, tile, base, and other finished floor surfaces in accordance with manufacturers' written recommendations. Remove visible soil, construction residue, adhesive, stains, scuffs, and other foreign material without damaging finishes.
8. Clean all mirrors and glass in doors and windows. Remove excess glazing compound and other noticeable materials not part of the glazing system. Replace any chipped or broken glass or other damaged transparent materials. Polish all mirrors and glass without scratching surfaces.
9. Remove labels that are not permanent along with any glue that remains after label removal.
10. Repair, restore and touch-up damaged materials / surfaces. Replace any material / surface that cannot be satisfactorily repaired, restored or touched-up.
11. **Do not paint over any UL and similar fire labeling, including mechanical and electrical name plates.**
12. Clean surfaces of mechanical, plumbing, electrical, fire-protection, controls, and other building equipment. Remove excess lubrication, paint, mortar, dust, labels not required to remain, and other foreign substances. Leave equipment rooms clean and ready for operation and maintenance.
13. Clean plumbing fixtures, clinical sinks, casework, countertops, built-in accessories, and similar surfaces to a clean and sanitary condition, free of construction residue, stains, dust, and debris.
14. Replace all disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers and grilles.
15. Clean ducts, blowers and coils at all units that were operated without filters during construction.
16. Clean light fixtures, lenses, lamps, globes, and reflectors to permit full-efficiency operation. Replace burned-out or defective lamps, drivers, controls, and similar components that are part of the Work.

D. The General Contractor shall, upon job completion, remove all temporary facilities, excess materials, equipment, trash, debris, waste, and construction residue from the Project and Project site. Roof areas, paved areas, landscaped areas, and the building interior shall be clean and ready for Owner use. Turn the medical clinic over in a generally "spotless" condition with glass, hardware, doors, walls, floors, ceilings, casework, fixtures, and equipment surfaces free from grease, dirt, dust, adhesive, and scuff marks.

E. During final cleaning, volatile waste must be properly disposed of and shall not be dumped on the ground, burnt or allowed into storm or sanitary sewer systems or

waterways. Burying or burning of waste is prohibited. Remove waste materials from project site and dispose of lawfully.

F. At completion of the Project, maintain a cleaning crew of sufficient size to complete final cleaning promptly so this phase of the Work does not delay Substantial Completion, Owner move-in, occupancy, or Final Completion.

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION (not used)

END OF SECTION 01 77 00

SECTION 02 06 30.13 - BORING OR TEST PIT LOG SCHEDULE

PART 1 - GENERAL

1.1 Included in this section is a report of geotechnical investigation for the proposed Lady of the Sea Medical Clinic for Lafourche Parish Government / Lady of the Sea General Hospital, Larose, Louisiana. This investigation was performed by a Louisiana licensed geotechnical engineer under the Project's Geotechnical Engineering Services and was prepared for use in design of the building foundation and site work. This geotechnical investigation has been provided for informational purposes only.

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION (not used)

SECTION 024100 - SITE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Demolition of structures, paving, and utilities.
2. Filling voids created as a result of removals or demolition.

B. Related Requirements:
1. Louisiana Department of Transportation and Development (DOTD) Standards and Specifications (LSSRB), latest edition.
2. Section 311000 - Site Clearing: Clearing of trees and other plant vegetation
3. Section 312000 - Earthwork: Placement of fill material
4. Section 313500 - Erosion and Sedimentation Control (Including SWPPP): Erosion protection during demolition operations.

1.2 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

1.3 REGULATORY REQUIREMENTS

A. Conform to applicable State and local codes for demolition of structures, safety of adjacent structures, dust control, runoff control, and pollution prevention.

B. Obtain required permits and licenses from appropriate authorities. Pay associated fees including disposal charges.

C. Notify affected utility companies before starting work and comply with their requirements.

D. Do not close or obstruct public or private roadways, sidewalks, or fire hydrants without appropriate permits or written authorization.

E. If hazardous, contaminated materials or other environmental related conditions are discovered, stop work immediately and notify the Owner’s Construction Representative (OCR) for action to be taken. Do not resume work until specifically authorized by the OCR.

1.4 SUBMITTALS

A. Project Record Documents: Accurately record actual locations of capped utilities and subsurface obstructions that will remain after demolition. Submit record as part of closeout submittals.

1.5 PROJECT CONDITIONS

A. Structures to be demolished will be discontinued in use and vacated prior to start of work.

B. Owner assumes no responsibility for condition of structures to be demolished.

C. Conditions existing at time of inspection for bidding purposes will be maintained by Owner as reasonably practical. Variations within structures may occur by Owner's removal and salvage operations prior to start of demolition work.

D. Unless otherwise indicated in Contract Documents or specified by the Owner, items of salvageable value to Contractor shall be removed from site and structures. Storage or sale of removed items on site will not be permitted and shall not interfere with other work specified.

E. Explosives shall not be brought to site or used without written consent of authorities having jurisdiction. Such written consent will not relieve Contractor of total responsibility for injury to persons or for damage to property due to blasting operations. Performance of required blasting shall comply with governing regulations.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

A. Fill material shall be aggregate fill materials as specified in Section 02300.

PART 3 - EXECUTION

3.1 PREPARATION

A. Provide, erect, and maintain erosion control devices, temporary barriers, and security devices at locations indicated on Construction Drawings.

B. Protect existing landscaping materials, appurtenances, and structures, which are not to be demolished. Repair damage to existing items to remain caused by demolition operations.

C. Prevent movement or settlement of adjacent structures. Provide bracing and shoring as necessary.

D. Mark location of utilities. Protect and maintain in safe and operable condition utilities that are to remain. Prevent interruption of existing utility service to occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities as acceptable to governing authorities and Owner.

E. Notify adjacent property owners of work that may affect their property, potential noise, utility outages, or other disruptions. Obtain written permission from adjacent property owners when demolition equipment will traverse, infringe upon, or limit access to their property. Coordinate notice with Owner.

3.2 GENERAL DEMOLITION REQUIREMENTS

A. Conduct demolition to minimize interference with adjacent structures or pavements to remain.

B. Cease operations immediately if adjacent structures appear to be in danger. Notify authority having jurisdiction. Do not resume operations until directed by authority.

C. Conduct operations with minimum of interference to public or private access. Maintain ingress and egress at all times.

D. Sprinkle work with water to minimize dust. Provide hoses and water connections for this purpose.

E. Comply with governing regulations pertaining to environmental protection.

F. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing prior to start of work.

3.3 DEMOLITION

A. Demolish site improvements designated to be removed as shown on the drawings. Site improvements shall include but not be limited to structures, retaining walls, foundations, pavements, curbs and gutters, drainage structures, utilities, signage or landscaping.

B. Disconnect and cap or remove utilities to be abandoned as shown on the drawings.

C. Fill or remove underground tanks, piping, and appurtenances as shown.

D. Demolish buildings completely and remove from site using methods as required to complete work within limitations of governing regulations. Small structures may be removed intact when acceptable to Owner and authorities having jurisdiction.

E. Locate demolition equipment and remove materials to prevent excessive loading to supporting walls, floors, or framing.

F. Demolish concrete and masonry in small sections. Break up concrete slabs-on-grade that are 2-feet or more below proposed subgrade to permit moisture drainage. Remove slabs-on-grade and below grade construction within 2-feet of proposed subgrade. Use proper dust control methods to maintain dust emissions below the permissible level.

3.4 FILLING BASEMENTS AND VOIDS

A. Completely fill below grade areas and voids resulting from demolition or removal of structures, underground fuel storage tanks, wells, cisterns, etc., using aggregate fill materials consisting of stone, gravel, or sand free from debris, trash, frozen materials, roots, and other organic matter.

B. Areas to be filled shall be free of standing water, frost, frozen or unsuitable material, trash, and debris prior to fill placement.

C. Place fill materials in accordance with Section 02300 unless subsequent excavation for new work is required.

D. Grade surface to match adjacent grades and to provide flow of surface drainage after fill placement and compaction.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove from site debris, rubbish, and other materials resulting from demolition operations. Leave areas of work in clean condition.

B. No burning of any material, debris, or trash on-site or off-site will be allowed except when allowed by appropriate governing authority and Owner. If allowed as stated above, burning shall be performed in manner prescribed by governing authority. Attend burning materials until fires have burned out and have been completely extinguished.

C. Transport materials removed from demolished structures with appropriate vehicles and dispose off-site to areas that are approved for disposal by governing authorities and appropriate property owners.

END OF SECTION

SECTION 03 11 00 - CONCRETE FORMWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all materials, labor, equipment and incidental services for the installation of all forms for structural concrete.

B. All formwork shall conform to all requirements of ACI 301, Standard Specifications for Concrete Construction and ACI 318, Building Code Requirements for Structural Concrete, published by the American Concrete Institute, except as modified by the requirements of these Contract Documents.

C. The design and engineering of formwork, as well as its construction shall be the responsibility of the Contractor.

D. Contractor shall adjust formwork construction as required to accommodate all inserts, openings, chases, thimbles, etc. necessary to complete work of other trades described in architectural, mechanical and electrical contract documents.

E. Forms shall have sufficient strength to withstand all forces resulting from placement and vibration of the concrete and shall have sufficient rigidity to maintain specified tolerances.

PART 2 - PRODUCTS

2.1 Earth cuts may be used as forms for footings and grade beams if the surfaces can be held true to line and grade without wetting. Earth cut forming may not be used on concrete surfaces to be exposed. If a previously acceptable earth cut form is ruined by rain, sloughing or other such phenomenon, the Contractor shall remove reinforcing steel, re-excavate and provide form materials as required to meet specified tolerances.

2.2 All lumber and plywood shall be sound and undamaged and shall conform to requirements of ACI Special Publication No. 4, Formwork for Concrete.

2.3 For exposed concrete surfaces, use form liners or special coatings to prevent wood grain marks on the concrete surface.

PART 3 - EXECUTION

3.1 Construct all formwork so as to insure that the concrete surfaces will not exceed the following tolerances:

A. Footing Dimensions:
1. plan . . . . . plus 6 inch; minus 0 inch
2. depth . . . . . plus 4 inch; minus 0 inch

B. Slab variation from the designated planes.....¼ inch per 10 feet but not more than ½ inch.

C. Variation from designated elevation (top and bottom of slabs and beams).....½ inch.

D. Variation of the building line from established position.....1 inch.

E. Variation in cross-sectional dimensions of beams and columns and in thickness of slabs and walls.....plus ½ inch; minus ¼ inch.

3.2 Where those tolerances do not apply, all tolerances shall comply with ACI 117 "Specification for Tolerances for Concrete Construction and Materials."

3.3 Forms shall not allow leakage of cement paste.

3.4 Provide temporary openings at the base of column forms and wall forms and at other points where necessary to facilitate cleaning and to allow drainage before concrete is placed.

3.5 Form coatings to prevent bond with concrete shall be applied before reinforcing is placed. Coating material shall not be allowed to stand in puddles within the forms; nor be allowed to contact concrete against which fresh concrete is to be placed.

3.6 ACCESSORIES AND INSERTS

A. Form accessories to be wholly or partially embedded in the concrete, such as ties and hangers, shall be a commercially manufactured type and shall break off not less than one inch within the concrete surface.

B. All inserts necessary for connecting work shall be securely fastened in proper position before concrete placement begins.

3.7 FORM REMOVAL

A. All structural members shall be adequately shored until control cylinder tests indicate the concrete has reached its specified 28 day compressive strength.

B. Side forms for grade beams may be removed 24 hours after concrete is placed.

C. When side forms are removed within 48 hours of pour, these formed surfaces shall be cured by damp mats or curing compounds as herein specified.

D. Immediately after stripping forms remove all projections and patch surface defects with a mortar paste of same proportions as concrete. Defects which expose reinforcing steel or which extend over an area greater than 200 square inches shall not be repaired until inspected by Architect.

END OF SECTION 03 11 00

SECTION 03 20 00 - CONCRETE REINFORCING STEEL

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all materials, labor, equipment, incidental services and accessories to place all reinforcing steel included in the Contract.

B. All reinforcing steel work shall conform to all requirements of ACI 301, Specifications for Concrete Construction and ACI 318, Building Code Requirements for Structural Concrete, published by the American Concrete Institute, except as modified by the requirements of these Contract Documents.

C. Comply with requirements of the following codes and standards, except as herein modified (latest editions):
   1. American Concrete Institute, ACI 318 "Building Code Requirements for Structural Concrete".
   2. American Welding Society, AWS D12.1, "Reinforcing Steel Welding Code."
   3. Concrete Reinforcing Steel Institute, "Placing Reinforcing Bars."
   4. Concrete Reinforcing Steel Institute, "Manual of Standard Practice."

D. Shop drawings shall be prepared by the Contractor to guide workmen in fabrication and placement of reinforcing and to provide additional assurance that there are no substantive discrepancies in the broader description of the project contained in the Contract Documents.

E. Submit to the Architect for review, three prints of all Shop Drawings showing the fabrication and placing of reinforcing steel and accessories. Before submittal to the Architect, all Shop Drawings shall be checked by the Contractor and shall be signed to certify that this has been done. The Architect will review these Drawings and return one copy to the Contractor with marks thereon indicating any exceptions taken to the content of these Drawings. Review of Shop Drawings shall be only for general conformance with design concept of the Project and for general compliance with information given in the Contract Documents. Review of the Shop Drawings shall not be construed as approval of quantities and dimensions, of fabricating process, of construction techniques or of approval of any variance from the intent of the Contract Documents.

F. Reinforcement shall be stored on the site to prevent damage. Provide adequate blocking to prevent bars from contacting the ground. Any mud on bars shall be removed and bar brushed clean before placing bar in form.

PART 2 - PRODUCTS

2.1 Reinforcing bars including those in footings shall conform to American Society for Testing Materials (ASTM) Specification A615 Grade 60 or ASTM A706 Grade 60.

2.2 Reinforcing bars which are welded to inserts, such as angles and plates, shall conform to ASTM A706. Welding of reinforcing steel shall conform to AWS D1.4 Structural Welding Code - Steel Reinforcing Bars by the American Welding Society.

PART 3 - EXECUTION

3.1 DETAILING AND PLACING REINFORCEMENT

A. Provide additional supplemental reinforcing steel in the structure if required to accommodate the Contractor's means, methods and sequence of construction.

B. Details of reinforcement, steel supports and accessories shall be in accordance with the "Manual of Standard Practice" by the Concrete Reinforcing Steel Institute.

C. Reinforcing in footings and in grade beams shall be supported on precast concrete blocks (2500 psi concrete) and secured with a tie wire. These blocks shall be cast on Site by the Contractor or purchased from a reputable supplier. Thickness of the blocks shall be determined by the clear concrete cover shown on the Drawings. Plan size of the blocks shall be 2 inches by 2 inches minimum.

D. Reinforcing in slabs on grade shall be supported on precast concrete blocks as described above or on slab bolsters with sand plates or chairs with sand plates.

E. All supporting legs of chairs and accessories with contact work for exposed concrete surfaces shall be the "no-rust" type, constructed of plastic, plastic coated steel or stainless steel. Chairs of this type shall also be used as required to maintain horizontal clearance between reinforcing and sides of beam forms.

F. Place reinforcing steel to a tolerance of ±¼ inch in slabs and ±½ inch in beams and columns and tie securely in place to prevent movement during pouring of concrete.

G. Bar supports shall be spaced a maximum of 2 feet apart on #3 bars, 3 feet apart on #4 bars, 4 feet apart on #5 bars and 5 feet apart on #6 bars and larger. Welded wire fabric shall be manufactured and delivered in flat sheets and shall be supported at a maximum of 2 feet in either grid

direction. Increase support for reinforcement as necessary to prevent its moving out of specified tolerances due to laborers walking over it during concrete placement.

H. Do not weld or tack crossing bars for assembly of reinforcement.

I. All welding of reinforcement anchors to inserts shall conform to the standards and recommendations of the American Welding Society.

J. Reinforcing rods may be shifted a maximum of 6 inches from original position to accommodate slab openings. Otherwise, rods shall be cut at openings and replacement rods shall be added on each side of the opening. These replacement rods shall extend a minimum of 48 inches on each side of the opening.

K. Contractor shall provide carrying bars, dowels, hangers, tie wires and other commonly used devices as required to hold reinforcement in designated position until all concrete is poured and set.

3.2 MINIMUM REINFORCEMENT

A. Provide 24" by 24", 90 degree corner bars at all corners and intersections of footings, foundation walls and grade beams with bars the same size and number as horizontal reinforcing, unless otherwise noted on the drawings.

B. If slab openings exceed 12 inches on any side and no specific detail is shown on the Drawings add 2 #4 rods at 45 degrees at each corner of the opening. These rods shall be at least twice as long as the longest side of the opening.

END OF SECTION 03 20 00

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all materials, labor, equipment and incidental services required to complete all concrete work in the Contract.

B. All concrete work shall conform to all requirements of ACI 301, Specifications for Concrete Construction and ACI 318, Building Code Requirements for Structural Concrete, published by the American Concrete Institute, except as modified by the requirements of these Contract Documents.

C. All references herein to standards of the American Concrete Institute (ACI) and the American Society for Testing Materials (ASTM) apply to the latest revisions thereof.

D. Cooperate with the Testing Laboratory in its performance of services pertaining to concrete work as specified elsewhere in these Specifications.

1.2 CAST-IN-PLACE CONCRETE SPECIAL INSPECTIONS

A. In accordance with the 2021 International Building Code (IBC), Chapter 17, the Owner shall employ an approved agency (OAA) to verify that cast-in-place concrete complies with the contract documents and with the applicable provisions of the IBC.

B. The OAA shall perform periodic inspections and verifications to comply with IBC Table 1705.3, and as necessary to determine that all work related to concrete mixing, handling and placement conforms to the construction documents. These inspections and verifications shall include anchors post-installed in hardened concrete members.

C. The Contractor shall cooperate fully with the OAA and shall provide the OAA with convenient and safe access to construction activities as necessary for the OAA to conduct its duties.

D. The Contractor has full responsibility to provide competent supervision and adequate quality control to assure that all concrete installed in the project meets the requirements of these specifications. The activities of the OAA do not, in any way, relieve the Contractor of this responsibility.

E. In addition to, or as supplement to, the inspections and verifications listed in IBC table 1705.3, the OAA shall perform the following services:

1. Each person inspecting the Work shall be certified by the American Concrete Institute as a Concrete Field Testing Technician - Grade I.
2. Inspect the loading ticket for each concrete truck at the job site. Each ticket shall include all of the information required by these Specifications. Reject any truck which is not properly ticketed.
3. For each different mix placed, cast compression test cylinders according to the following schedule. Cast cylinders in groups of four (4). Cast each group from a different truck load (or batch) and use concrete from middle portion of the truck load. Field mark each cylinder for identification.

LOCATION OF CONCRETE	# OF FOUR CYLINDER GROUPS REQUIRED
Footings	One per fifty cubic yards placed
Slabs, grade beams	One per fifty cubic yards placed

4. If the total placement in one (1) day is less than the amounts listed above, one group of four (4) cylinders shall be taken from the day's placement.
5. The samples of concrete used to prepare test cylinders shall also be tested for slump, air content and concrete temperature.
6. For each group of cylinders, test one (1) at seven (7) days and two (2) at twenty-eight (28) days. Hold one cylinder for additional testing if necessary. Submit prompt written reports of these tests to the Architect, Structural Engineer, Contractor, Ready-mix Supplier and to other parties designated by the Architect.
7. Cast and cure all cylinders in accordance with ASTM Specification C31. Test cylinders in accordance with ASTM Specification C39. All slump tests shall conform to ASTM Specification C143.
8. Reports on test cylinders shall contain the standard data plus the following specific information on each cylinder:
    a. The identifying mark placed on the cylinder in the field.
    b. The actual measured slump of each specimen.
    c. Amount of concrete in truck.
    d. Amount of water withheld from truck for later addition on site.
    e. Amount of water added on site.
    f. The date and time of day the cylinder was molded.
    g. The date on which the cylinder was received by the Laboratory and placed in the required controlled environment.
    h. The date the cylinder was tested.
    i. The total cubic yards of the pour from which the cylinders were taken.
9. All cylinders shall be stored at the site and shipped to the Laboratory in rigid containers. Straw or similar shock absorbing material shall be stuffed between and around each cylinder during shipment.

F. If the Contractor fails to notify the OAA of a scheduled pour and as a result no cylinders are taken, the Contractor shall bear the cost of verifying that

the in place concrete meets the strength requirements of the specifications. Cores shall be extracted and tested from the cast-in-place concrete in accordance with ASTM C42. Location of cores shall be determined by the Architect.

G. If any work is found not to comply with these specifications, the OAA shall immediately notify the Contractor that the work is rejected. If the Contractor persists in placing rejected material into the work, the OAA shall obtain a set of cylinders from the rejected batch, and shall notify the Architect.

H. When quality control tests performed by the OAA show that work fails to meet the specified requirements, the Contractor shall correct and/or remove and replace all defective work and shall coordinate retesting with the OAA. All costs associated with reinspection and retesting of defective work shall be the sole responsibility of the Contractor.

PART 2 - PRODUCTS

2.1 Portland Cement shall conform to ASTM Specification C150 Type I.

2.2 Slag cement conforming to ASTM C989, Grade 100 or 120, may be used in quantities not exceeding 25% by weight of cementitious material.

2.3 Fly ash shall not be used.

2.4 Aggregates shall conform to ASTM Specification C33. The maximum size of aggregate shall be no larger than one-fifth (1/5) of the narrowest dimension between sides of forms within which the concrete is to be cast nor larger than three-fourths (3/4) of the minimum clear spacing between reinforcing bars, or between reinforcing bars and forms.

2.5 Mixing water for concrete shall conform to ASTM C94.

2.6 A water reducing admixture shall be used. Admixture shall conform to ASTM C494 Type A or Type D. Admixture shall be proportioned and mixed in accordance with manufacturer's recommendations.

2.7 An air-entraining admixture is not required but is acceptable if it conforms to ASTM C260 and is compatible with the required water reducing admixture. Submit such admixtures for approval by the Architect prior to use.

2.8 If admixtures contain chloride ions, the percent by weight of cement shall be furnished in writing to the Architect.

2.9 In no case shall the sum of chloride ions from all sources exceed 0.15 percent by weight of cement in conventionally reinforced concrete and 0.06 percent in pre-stressed concrete.

2.10 All admixtures shall be used in accordance with the manufacturer's instructions.

PART 3 - EXECUTION

3.1 QUALITY OF CONCRETE

A. Ready-mixed concrete shall be proportioned mixed and transported in accordance with ASTM C94 "Specification for Ready-Mix Concrete".

B. All proposed concrete mixes shall include documentation conforming to Specifications for Structural Concrete (ACI 301-16) Section 4.2.3 – Proportioning.

C. If field test data is not available, Contractor shall hire a testing agency to design each concrete mix in accordance with ACI 301 by the trial batch method. Submit the design mix curves for each concrete strength to the Architect at least seven (7) days before concrete is poured.

D. Concrete mixes shall conform to the following table:

Construction	Type of Concrete	28 Day Compressive Strength	Minimum Sacks[1] of Cement Per Cubic Yard	Slumps[2]
Pile Caps	Normal Weight	3000 psi	5	4
All Other Concrete	Normal Weight	3500 psi	5¼	4

[1] In no case shall the cement content be less than the above minimum. If a higher cement content is required to meet the specified strength it shall be supplied at no extra cost to the Owner.

[2] Slumps of pumped concrete placed without a pump aid admixture shall not exceed 6 inches at the pump hopper and shall not exceed the specified values at the discharge nozzle. In no case shall the concrete water-cement ratio be increased.

E. Each truck sent from the Ready-mix Plant to the Job site shall have a delivery ticket containing at least the following information:
1. Name of Ready-mix Plant and serial number of ticket.
2. Date and truck number.
3. Name of Job and Contractor.
4. Number of sacks of cement per cubic yard.
5. Amount of concrete.
6. Amount of water withheld for later addition on site.
7. Time of day truck was loaded.

F. Any truck without a proper ticket shall be rejected.

3.2 PLACING CONCRETE

A. Contractor shall notify Architect and Engineer of each concrete placement at least 48 hours prior to placement. See Supplementary Conditions Section 13.5.5.1 for additional requirements regarding advanced notice of concrete placement.

B. Concrete shall be placed and consolidated in accordance with ACI 301.

C. If concrete arrives at the Project with its slump below that suitable for placing, water may be added only if neither the maximum permissible water-cement ratio nor the maximum slump is exceeded. Use additional mixing as required to fully incorporate the added water.

D. No concrete shall be placed until all of the following are accomplished:
1. All reinforcement and other embedded items are securely fastened in proper position and all formwork for the placement is completed.
2. All debris is removed from the places to be occupied by the concrete.
3. All water (in amounts large enough to appreciably alter the water-cement ratio) has been removed from the places to be occupied by the concrete.
4. All reinforcement is thoroughly cleaned of detrimental coating or debris.
5. All forms are thoroughly wetted (except in freezing weather) or oiled.

E. Equipment and procedures for chuting, pumping and pneumatically conveying concrete from mixer to forms shall insure a continuous flow of concrete at the delivery end without segregation of the concrete materials.

F. Deposit concrete as nearly as practical to its final position to avoid segregation due to rehandling or flowing.

G. Place concrete in a continuous operation until placement of the panel or section is completed. When construction joints are necessary, make them in accordance with JOINTS AND EMBEDDED ITEMS.

H. Consolidate all concrete during placement and work concrete thoroughly around reinforcement and embedded fixtures and into the corners of the forms.

I. If placing concrete in atmospheric temperatures below 40 degrees F., provide adequate equipment to maintain concrete temperatures at 50

degrees F. or higher during placing. (See CURING AND PROTECTION for cold weather methods).

J. Pump hoses used for placing concrete shall not be in contact with the reinforcing steel. All such hoses shall be supported on special brackets, troughs or such devices to prevent contact between hoses and reinforcing steel throughout the concrete work.

K. No piling shall be driven within 100 feet of freshly poured concrete less than seven days old, unless cylinder tests demonstrate such concrete to have attained 75% of the specified strength.

L. Finished concrete surfaces shall not exceed the tolerances specified in the CONCRETE FORMWORK specification section.

3.3 SLAB ON GRADE VAPOR BARRIER

A. All building slabs on earth fill shall be poured on a vapor retarder conforming to ASTM E1745, Class A.

3.4 JOINTS AND EMBEDDED ITEMS

A. Joint fillers shall extend full depth of joint and shall be of the thickness shown on the Drawings.

B. Use asphalt impregnated fiberboard conforming to ASTM D-1751 for expansion joint fillers.

C. Construction joints not shown on the Drawings shall be properly keyed and shall be located at sections of minimum shear. Prior approval of the Architect is required for such joints.

D. Joints shall not extend under columns. Joints on column lines shall be routed around column base or pedestal.

E. Edges of concrete at joints shall be straight and sound. Remove unsound or unbonded material and repair all chips, spalls, cracks or other damaged edges.

F. Concrete surfaces at all construction joints shall be thoroughly cleaned and all laitance removed. Hardened concrete surfaces shall be wetted and slushed with a coat of cement grout immediately before placing fresh concrete.

G. All sleeves, inserts, anchors and other embedded items required for other work shall be placed prior to concreting.

H. For slabs on grade, all conduit 1 inch in diameter and larger shall be placed in the earth fill below the slab. Conduits smaller than 1 inch may be placed on top of the waterproof membrane and below the slab reinforcing. Conduits shall be routed to avoid unnecessary crossings and to avoid accumulation of conduit runs at critical areas such as directly above piling, footings, column bases and construction joints. If any such accumulation of conduits is anticipated, the Contractor shall notify the Architect for inspection and approval prior to scheduling concrete pours.

I. Position all embedded items accurately and support them against displacement during concrete operations.

J. Exposed control joints shall be sealed with a gray colored paving sealant which has been approved by the Architect.

3.5 CURING AND PROTECTION

A. Cure concrete for at least 7 days after placement by keeping it in a moist condition by one of the following methods:
   1. Ponding or continuous sprinkling.
   2. Absorptive mat or fabric kept continuously wet.
   3. Application of sheet materials conforming to ASTM C171.
   4. Curing compounds conforming to ASTM C309 "Specifications for Liquid Membrane-Forming Compounds for Curing Concrete". Apply such compounds in two (2) coats at right angles to each other. Apply at a rate of at least 200 square feet per gallon.

B. Do not use curing compound on areas of concrete which must be bonded to subsequent concrete pours.

C. The method of slab curing chosen by the Contractor shall be compatible with the subsequent floor finish and/or floor covering. Submit written verification to the Architect that the curing method chosen will not adversely affect finished floor materials and adhesives.

D. During the curing period, protect the concrete from load stresses and damaging mechanical disturbances such as heavy shock and excessive vibration. Also protect all finished concrete surfaces from damage.

E. If concrete is placed in atmospheric temperatures below 40 degrees F., the temperature of the concrete shall be maintained at 50 degrees F. or greater during placing and during the entire 7 day curing period.

F. During curing, the temperature of the concrete shall not be allowed to change more than plus (+) or minus (-) five degrees Fahrenheit in any one (1) hour period nor more than plus (+) or minus (-) fifty degrees Fahrenheit in any twenty-four (24) hour period.

3.6 FINISHING OF CONCRETE SURFACES

A. Slab Surfaces:
   1. Contractor shall provide construction joints and divide slab into pour sizes which will assure proper finishing consistent with weather conditions, available labor and resources, and will minimize shrinkage cracking and early thermal cracking of slabs.
   2. No finishing operation shall be performed while there is excess moisture or bleeding water on the slab surface. Do not use finishing tools on slab surface until bleeding has stopped and water sheen has disappeared.
   3. Do not begin power floating if footprints in the slab surface are deeper than 1/8 inch and/or if the float blades throw mortar.
   4. Force the coarse aggregate below the surface (if necessary), then consecutively screed, float and power trowel according to the following schedule:

LOCATION	FINAL SURFACE FINISH
Depressed slabs to receive setting beds for tile or special surfaces	Screed to a true plane
Slabs to receive resilient flooring or carpet	Power trowel to a smooth, dense surface free of burnishes
Exterior walks and drives	Screed off, then brush with a stiff broom to a uniform non-slip surface
Exposed floor slabs	Power trowel to a smooth, dense surface free of burnishes and seal with two (2) coats of an approved liquid hardening and dust-proofing compound

B. Formed Surfaces:
   1. Exposed sides of grade beams shall have a smooth and blemish free appearance.
   2. Formed surfaces not exposed to public view shall have a rough form finish. For this finish no selected form facing materials are required; tie holes and defects shall be patched with cement paste and fins exceeding one-fourth inch (1/4") in height shall be chipped off.
   3. Concrete surfaces exposed to public view shall have a grout cleaned finish. On these surfaces the form facing materials shall produce a smooth, hard uniform texture on the concrete; fins shall

be completely removed and tie holes and defects patched. These surfaces shall be brushed or sprayed with a grout of one (1) part Portland Cement, one and one-half (1-1/2) parts fine sand and sufficient water to produce the consistency of thick paint. Concrete surfaces shall be wetted to prevent absorption of water from the grout. Immediately after applying the grout, scrub the surface with a stone to coat the surface, eliminate air bubbles and fill all holes. Remove excess grout before it dries. After surface whitens from drying, rub with clean burlap. Keep surface damp for thirty-six (36) hours after final rubbing.

4. In lieu of the grout finish above, concrete surfaces exposed to public view may have a smooth rubbed finish (Contractor's option). These surfaces shall be wetted and rubbed with a carborundum brick or other abrasive no later than the day following form removal. No cement grout shall be used other than the cement paste drawn from the concrete itself by the rubbing process.

3.7 REPAIR OF DEFECTIVE SURFACES

A. Defective formed surfaces shall be repaired in conformance with ACI 301.

B. All slab surfaces which have been improperly finished or damaged and exhibit blisters, excessive shrinkage cracks and/or early temperature cracks, flaking, spalling, and delaminations shall be repaired according to the following outline:

1. Fill all cracks wider than one thirty second (1/32) of an inch and coat all crazed surfaces with a commercially proven crack healer/ penetrating sealer. Apply in strict conformance to recommendations of the manufacturer.
2. Remove spalls and popouts and grind and/or shot blast all unbonded, unsound and loose surface material to expose a sound, roughened concrete surface approximately 1/8" deep. Remove <u>all</u> debris and blow clean with compressed air. Delaminations below the surface shall be identified by dragging a steel chain over the surface and detecting the hollow sounds which occur over delaminated areas. All prepared surfaces shall be rectangular in plan with sharp vertical edges at least 1/8" deep. Feathered edges are not acceptable.
3. Verify with the manufacturer's technical representatives that all bonding agents and repair materials which are proposed for use are designed for the specific repair applications and are compatible with the planned use of the building by the Owner.
4. Fill and uniformly finish all prepared areas with a commercially proven screed mortar or repair mortar, depending on depth of repair. Apply these products in strict conformity to recommendations of the manufacturer.

5. If cracks wider than one sixteenth (1/16) of an inch occur in unreinforced, jointed slabs (such as exterior paving), the cracked slabs shall be removed and replaced in sections no smaller than one half (½) of the original panel size.
6. If slab edges at joints are offset vertically by more than one quarter (¼) of an inch, grind down the high edges so that the slab is flush across the joint to within one sixteenth (1/16) of an inch.

END OF SECTION 03 30 00

SECTION 04 05 13 – MASONRY MORTARING

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of mortar for exterior face brick veneer as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.

B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. List of Materials:

1. Masonry Cement - (ASTM Designation C91, Type N).

2. Sand - Shall conform to current ASTM Specifications for aggregate for Masonry Mortar ASTM Designation C144. Use natural sand, free of contaminants.

3. Water - Shall be clean and free of deleterious amounts of solids, alkalis, salts, or organic materials.

4. Admixtures - All mortar used for laying exterior face brick veneer shall be mixed and used in strict accordance with manufacturer's written instructions. Color shall be standard gray.
   No air-entraining admixtures or cementitious materials containing air-entraining admixtures shall be used in the mortar.
   No antifreeze compounds or other substances shall be used in the mortar to lower the freezing point.
   Calcium chloride or admixtures containing calcium chloride shall not be used in mortar in which reinforcement, metal ties or anchors are embedded.

5. Brands - Brands of cementitious materials and the source of supply of sand shall remain the same throughout the entire job and shall not be changed without written permission of the Architect.

6. Not Used.

7. Coloring of mortar:

   a. All exterior mortar associated with veneer brick shall be standard gray.

   b. A sample of the standard gray mortar shall be submitted to the Architect and mixed in strict accordance with manufacturer’s printed instructions. The mortar sample shall be used in conjunction with the sample masonry test panel indicated in Section 04 20 00 - Unit Masonry / Brick Veneer. The final mortar shall be uniform in color and shall not change in color throughout the wall. Maintain consistent cementitious materials, sand source, mix proportions, batching, water content, and joint tooling throughout the Work to maintain color consistency.

B. Prepared Masonry Cement - “Type - N Mix" manufactured by Cemex USA, Holcim USA, Argos USA or prior approved equal.

C. Storage - Cementitious materials and aggregates shall be stored in such a manner as to prevent deterioration, or intrusion of foreign matter.

PART 3 - EXECUTION

3.1 WORKMANSHIP

A. Preparation

1. Proportions: One volume masonry cement and between 2-1/4 and 3 volume of damp, loose mortar sand (or as recommended by manufacturer and ASTM C270). Water shall be used in quantity necessary to give proper workability.

2. Mixing Mortars: All cementitious materials and aggregate shall be mixed for at least 3 minutes and nor more than 5 minutes in a mechanical batch mixer, with the maximum amount of water to produce a workable consistency. Mixing shall comply with ASTM C270

3. Time Limits: Mortar shall be used and placed in final position within 2 hours after mixing when the air temperature is 80 degrees F. Mortar not used within these time limits shall be discarded.

4. Retempering: Mortars that have stiffened within the time intervals stated above because of evaporation of moisture, may be retempered to restore workability by adding water. (This procedure can be done only once.)

B. Unit masonry shall be kept clean of all excess mortar, dirt, grease, etc. Acids may be used only by qualified cleaning service people skilled in this work. Any damaged unit masonry shall be replaced by the Contractors expense and shall be made to match surrounding work.

C. Exterior masonry shall be kept clean of all excess mortar, dirt, grease, etc. All cleaning of brick shall be performed by a qualified cleaning service skilled in this work.

END OF SECTION 04 05 13

SECTION 04 21 13 - BRICK MASONRY

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, with Brick Masonry as shown on drawings and as specified in accordance with provisions of the contract documents and completely coordinated with that of all other trades.

B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, and complete installation of brick masonry shall be furnished and installed as part of this work.

C. For additional information refer to section:
04 05 13 - Masonry Mortaring
07 11 00 - Dampcoursing

D. All brick masonry shall comply with ASTM standard specifications for brick and applicable testing methods, specifically ASTM C216, Grade SW, Type FBS, and shall be installed by qualified masons.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Facebrick - Facebrick shown on drawings shall be nominal 8" long brick that lay up 3 courses in 8" with a nominal 4" bed depth. Brick shall be for use in exposed external and masonry walls and portions where a high degree of mechanical perfection, and minimum permissible variation in size are required. The Architect will review bricks submitted for conformance with the field brick specified herein and the accent brick selected by the Owner. The Architect shall have final opinion on match before any brick is installed. There will be two (2) colors of facebrick provided by Cherokee Brick, which shall be selected for use on this project. (The two colors of brick shall be the field brick and the accent brick as shown in the drawings and specified herein.)

1. Manufacturer:

Cherokee Brick
Field Brick Color #1= Bengal Blend Straight Edge Mod
Accent Brick Color #2= M/S Vel Dark Gray 530

B. The Contractor shall set up test masonry walls for sampling coordination of brick and mortar color. The test masonry wall shall be of a size and shape to allow a full repeat of range, color variation, texture and color as required to render a complete wall system that reflects the masonry to be installed on the building and to render an approval by the Owner/Architect (minimum size 8'H x 8'W). Test walls may be required for several samples. Refer to Section 01 33 23 - Shop Drawings, Product Data and Samples for additional information. The mortar to be used shall be as specified in Section 04 05 13 - Masonry Mortaring. The mortar color shall be standard gray. The wall shall not be destroyed or moved until the project is complete.

C. Wall Reinforcement

1. Brick masonry shall be attached thru rigid wall insulation and into stud back-up wall with anchor system as supplied in accordance with the recommendations of the manufacturer and indicated in Contract Documents. (One tie, minimum, for every 1.77 sq. ft. and no more than 16" o.c. horizontally and vertically. Ties shall also be staggered.) Approximate spacing is at every 6th course vertically and

every 16" o.c. horizontally. NOTE: All masonry anchors in cavity wall shall be hot dipped galvanized and installed in accordance with TMS 402/602.

a. Acceptable Manufacturers:

Heckmann Building Products: Pos-I-Tie; or

Hohmann & Barnard: 359-FH Veneer Anchor with VBT Series Triangular Ties); or

Prior Approved Equal.

(Note: corrugated ties shall not be accepted.)

D. Weep Hole Cover - New construction weep hole cover shall be:

1. 3-3/4” deep x 2-1/2" high x 3/8" wide, Model No. WHC-40 Series (Gray), as manufactured by Tamlyn; or

2. 3-3/8" deep x 2-1/2" high x 3/8" wide, Model No. QV - Quadro-Vent, as manufactured by Hohmann & Barnard, Inc.

or prior approved equal

E. Certification - Manufacturer shall furnish Architect with certification of products used as to their meeting all specified quality, grade, etc.

F. Storage of Materials - All mortar materials shall be stored under cover in a dry place. During freezing weather, all masonry units shall be protected with tarpaulins or other suitable material.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Wetting Brick - All brick having absorption rates (determined in accordance with ASTM Specification C67) in excess of 0.025 oz. per square inch per minute shall be wetted so that the rate of absorption when laid does not exceed this amount.

B. Protection of Work - During erection, all walls shall be kept dry by covering at the end of each day or shutdown period with strong, waterproof membrane. Partially completed walls not being worked on shall be similarly protected at all times. All covering shall overhang at least 2' on each side of the wall and shall be securely anchored.

C. Freezing Weather - Comply with TMS 602 cold weather masonry construction requirements. Do not lay masonry on frozen surfaces or when temperature is below 40°F without required protection.

D. Joining of Work - Where fresh masonry joins masonry that is partially set or totally set, the exposed surface of the set masonry shall be cleaned and lightly wetted so as to obtain the best possible bond with new work. All loose brick and mortar shall be removed. If it becomes necessary for construction purposes to "stop off" a horizontal run of masonry, this shall be done only by racking back in each course. Toothing will not be permitted.

E. Tooling Joints - When brick mortar joints, which are exposed and have become "thumbprint" hard, they shall be tooled with a round or other approved jointer. The jointer shall be slightly larger than the width of the mortar joint so that a complete contact is made along the edges of the units, compressing and sealing the surface of the joint. All joints shall be 3/8" tooled concave joints.

F. Do not use chipped or broken units. If such units are in the finished wall, they shall be rejected by the Architect and their removal and replacement made by the contractor at the contractor's cost.

G. Use brick from standard lots, with all face brick coming from the same lot as much as possible. Brick laid up with obvious banding, mismatching of color, tone and/or consistency of mix, shall be rejected by the Architect and their removal and replacement made by the contractor at the Contractor's cost.

H. Temporary Shoring for Arches and Lintels - Mason shall be responsible for assembly, installation, maintenance and removal of all formwork and shoring necessary for complete installation of Masonry Lintels and Arches. The mason shall provide safe, stable, secure and complete forms capable of supporting all material dead loads and construction live loads. Forms shall be removed and shall leave no visible signs on surrounding masonry. Forms shall be constructed in a manner which is dimensionally accurate to maintain level and plumb lines, and consistent arch radius. Shoring shall remain in place until the masonry has developed sufficient strength to carry its weight. (Re: Brick Institute of America - Technical Notes on Brick Construction - Entry 31, 31A and 31B)

3.2 WORKMANSHIP

A. All masonry shall be laid plumb, level, and true to line. Maintain uniform joint thickness and lay in a running bond pattern. Brick shall be laid with completely filled mortar joints. The ends of brick shall be buttered with sufficient mortar to fill the end joints. Closures shall be rocked into place with the head joints thrown against the two adjacent brick in place. **Full Head & Bed Joints are mandatory. If any work does not have Full Head & Bed Joints the work shall be rejected by the Architect.**

B. Where cutting of brick is necessary, a masonry power saw shall be used.

C. When flashing is to be laid on or against masonry, the surface of the masonry shall be smooth and free from projections which might puncture the flashing material. Weep holes spaced 24" o.c. shall be provided in the head joints in the first course immediately above all flashing or as indicated on drawings. Weep holes shall be kept free of mortar droppings.

D. Cavity shall be kept free and clean of mortar and mortar droppings.

E. Expansion Joints

1. Shall be located at offsets and at junctions of walls in “L”, “T”, or “U” shapes along with a maximum of 30'-0" on straight walls. Expansion joint shall be 3/8" wide and shall consist of one-part polysulfide or polyurethane sealant over backer rod.

F. Backer-rod shall be closed cell polyethylene foam, with the diameter at least 25 percent greater than the joint width.

3.3 CLEANING

A. All holes in exposed masonry shall be pointed, and defective joints shall be cut out and repointed with mortar.

B. Exposed masonry shall be protected against staining by wall coverings, and excess mortar shall be wiped off the surface as the work progresses.

C. All exposed masonry shall be thoroughly cleaned. This final cleaning of brick shall be done in coordination with the General Contractor and the subcontractor applying sealer to the brick. The time of final cleaning and sealing shall be decided with the General Contractor making the final decision on the time. It is realized that cleaning will be required within seven (7) to ten (10) days after laying of masonry to allow ease of mortar

removal, masonry dust, etc. This is the usual maintenance cleaning of the masonry and shall not be confused with the final cleaning before sealing of masonry which shall be coordinated and scheduled with the General Contractor. Before applying any cleaning agent to the entire wall, it shall be applied to a sample wall area of approximately 20 sq. ft., in a location approved by the Architect. No further cleaning work may proceed until the sample area has been approved by the Architect, after which time the same cleaning materials and method shall be used on the remaining wall area. If stiff brushes and water do not suffice, the surface shall be thoroughly wetted with clear water and then scrubbed with solutions approved by the Architect. Muriatic acid-based masonry cleaners shall not be used. All sash, metal lintels and other corrodible parts shall be thoroughly protected during cleaning.

D. Any burning or discoloration of masonry, mortar or adjacent materials, due to unapproved cleaning methods shall be reason for rejection of the work by the Architect with the respective work removed and replaced by the Contractor at his cost.

END OF SECTION 04 21 13

SECTION 04 22 23.29 - SPLIT-FACE CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor shall furnish labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete of Split-face Concrete Unit Masonry as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.

B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, and complete installation shall be furnished and installed as part of this work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Obtain Veneer Masonry Units from a single source to ensure color, finish and texture continuity. Manufacturer shall have no less than 5 years production experience. All masonry units shall be manufactured by one of the following:

1. E Dillon and Company
   2522 Swords Creek Road
   Swords Creek, VA 24649
   (P)800-234-8970 Or

2. Block USA, Gulf Coast Division
   10043 South Park Drive
   Gulfport, MS. 39503
   (P) (228) 897-1828
   Split-Faced Color: Wellhouse Rope Or

3. Headwaters Construction Materials
   Eagle - Cordell Concrete Products (Oldcastle)
   10538 Beaumont Hwy.
   Houston, TX 77078
   (P) (713) 691-5526
   Split-Faced Color: Antique Brass Or

4. DecraStone
   120 Industrial Road North
   Tupelo, MS 38801
   (P) (662) 842-7811
   Split-Faced Color: Driftwood Or

5. Acceptability for use on the project shall be based upon the color of the split-faced block and smooth faced (velour) block. The approval of a manufacturer is contingent upon the Architect approving the color. The Architect shall have final opinion on the acceptability of block color in coordination with all other veneer masonry.

B. Masonry units shall comply with ASTM C-90.

1. Minimum Net Area Average Compressive Strength: Average of three units 1900 PSI, individual unit 1700 PSI. (See concrete masonry Note 2 on Drawing Sheet SDC-1.0.)

2. Maximum Absorption: The absorption rate shall not exceed 13 lbs/CF.

3. Weight Classification: Normal Weight (not less than 125 lbs/CF).

4. Dry-Block certification.- admixtures shall comply with NCMA TEK Notes or manufacturer's requirements for integral water repellents

C. The Contractor shall set up test masonry walls of split face block in conjunction with brick masonry for sampling of both block types and mortar color. The test masonry wall shall be of a size (minimum size 8'H x 8'W) and shape to allow a full repeat of range, color variation and texture as required to render an approval by the Owner/Architect. Test walls may be required for several samples and/or several manufacturers. Refer to Section 01 33 23 - Shop Drawings, Product Data and Samples for additional information. The mortar color shall be as specified in Section 04 05 13 - Masonry Mortaring. This wall shall not be destroyed or moved until the project is complete.

1. One (1) color of Split-Faced Block shall be selected for use on this project.

2. The Architect / Owner shall determine acceptable colors. Acceptance / Rejection of Color shall be critical for all Split-Faced Block and shall determine Prior Approval or Rejection of material for use on the project.

D. The standard size unit to be used on the job is 8" x 8" x 16" solid units. L-Shaped Corner blocks shall be used at all corners.

E. Mortar - Refer to Section 04 05 13 - Masonry Mortaring. All mortar in exterior walls shall contain recommended amount of DRY-BLOCK mortar admixture for water repellancy. Color shall be as specified in Section 04 05 13 - Masonry Mortaring.

1. There will be a maximum of one (1) colors of mortar selected for use on this project.

F. At single wythe split-faced concrete unit masonry walls use ty-wall #9 gauge hot dipped galvanized "Z-type" assembly sized to wall thicknesses as indicated on drawings, or prior approved equal and shall comply with ASTM A951.

G. Certification - Manufacturer shall furnish Architect with certification of products used as to their meeting all specified quality, grade, etc.

H. Storage of Materials - All mortar materials shall be stored under cover in a dry place. During freezing weather, all masonry units shall be protected with tarpaulins or other suitable material.

PART 3 - EXECUTION

3.1 WORKMANSHIP

A. All concrete masonry units shall be laid in running bond, and horizontal and vertical joints shall be concave or otherwise noted.

B. Protect masonry by brushing clean during layout and against spattering or defacing during other operations. Cover top of walls at end of work each workday.

C. Unit masonry laid true to dimensions, plumb and level.

D. SPLIT-FACED MASONRY UNITS - Exposed areas must be free of chips or cracks after erection. It is of paramount importance that concrete masonry units be uniform in size so that an acceptable exposed wall can be built. Do not use split-faced masonry units showing sufficient variations in dimensions which in the Architect's opinion, produce a wall with too wide a range of joint width. Use masonry saw for any cuts.

E. LINTELS - Provided as detailed. Minimum bearing eight inches (8"). Modulate blocks with adjacent split-faced masonry units for a uniform pattern.

F. DAMPCOURSING - See Section 0715 - Dampcoursing.

G. FREEZING WEATHER - No masonry shall be laid when the temperature of the outside air is below 40°F, unless means approved by the Architect are provided to heat and maintain the temperature of the masonry materials and protect the completed work from freezing. Protection shall consist of heating and maintaining the temperature of the masonry materials at least 40°F, and maintaining an air temperature above 40°F. Comply with requirements of ACI 530 / TMS 602.

H. NOTE: Great time and effort were used to course out with block work horizontally and vertically especially at all openings. These efforts are to be carried out according to plans during construction.

I. NOTE: All split-faced masonry units shall be laid in stack bond pattern. The mortar joints shall have a concave tool joint to seal the joint.

J. Expansion Joints

1. Shall be located at offsets and at junctions of walls in “L”, “T”, or “U” shapes along with a maximum of 30'-0" on straight walls. Expansion joint shall be 3/8" wide and shall consist of one-part polysulfide or polyurethane sealant over backer rod. Joints shall comply with TMS 402/602 Building Code Requirements for Masonry Structures for spacing and detailing.

K. NOTE: All masonry shall be laid with **FULL HEAD AND BED JOINTS.**

3.2 CLEANING

A. All exposed split-face masonry shall be thoroughly cleaned. It is realized that cleaning will be required within seven (7) to ten (10) days after laying of split-face masonry to allow ease of mortar removal, masonry dust, etc. Before applying any cleaning agent to the entire wall, it shall be applied to a sample wall area of approximately 20 sq. ft., in a location approved by the Architect. No further cleaning work may proceed until the sample area has been approved by the Architect, after which time the same cleaning materials and method shall be used on the remaining wall area. If stiff brushes and water do not suffice, the surface shall be thoroughly wetted with clear water and then scrubbed with solutions approved by the Architect. Muriatic acid-based masonry cleaners shall not be used. All sash, metal lintels and other corrodible parts shall be thoroughly protected during cleaning.

END OF SECTION 04 22 23.29

SECTION 04 72 00 - CAST STONE MASONRY (BUILDERS CAST STONE)

PART 1 - GENERAL

1.1 The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete of builder's cast stone as shown on drawings and specified in accordance with provisions of the contract documents and completely coordinated with that of all other trades.

1.2 Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.

1.3 Section Includes - Architectural Cast Stone

A. Scope - All labor, materials and equipment to provide the Cast Stone shown on architectural drawings and as described in this specification.
   1. Manufacturer shall furnish Cast Stone covered by this specification.
   2. Installing contractor shall unload, store, furnish all anchors, set, patch, clean and seal the Cast Stone as required.

1.4 Related Sections
A. Section 01 33 23 - Samples, Shop Drawings and Submittals
B. Section 04 05 13 - Masonry Mortaring
C. Section 07 92 00 - Joint Sealants

1.5 References
A. ACI 318 - Building Code Requirements for Reinforces Concrete
B. ASTM A1064 - Standard Specification for Steel Wire and Welded Wire Reinforcement for Concrete
C. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel bars for Reinforced Concrete
D. ASTM C 33 - Standard Specification for Concrete Aggregates
E. ASTM C 150 - Standard Specification for Portland Cement
F. ASTM C 173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volume Method
G. ASTM C 231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
H. ASTM C 260 - Standard Specification for Air-Entrained Admixtures for Concrete
I. ASTM C 270 - Standard Specification for Mortar for Unit Masonry
J. ASTM C 426 - Standard Test Method for Linear Shrinkage of Concrete Masonry Units
K. ASTM C 494/C 494M - Standard Specifications for Chemical Admixtures for Concrete
L. ASTM C 618 - Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
M. ASTM C 666 - Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
N. ASTM C 979 - Standard Specification for Coloring Pigments for integrally Pigmented Concrete
O. ASTM C 989 - Standard Specification for Ground Granulated Blast-Furnace slag for Use in Concrete
P. ASTM C 1194 - Standard Test Method for Compressive Strength of Architectural Cast Stone
Q. ASTM C 1195 - Standard Test Method for Absorption or Architectural Cast Stone
R. ASTM C 1364 - Standard Specification for Architectural Cast Stone
S. ASTM C 2244 - Standard Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates
T. Cast Stone Institute ® Technical Manual (Current Edition)

1.6 Definitions

A. Cast Stone - shall be a refined architectural concrete building unit manufactured to simulate natural cut stone, used in unit masonry applications as described below:

1. Dry Cast Concrete Products - manufactured from zero slump concrete.
   a. Vibrant Dry Tamp (VDT) casting method: Vibratory ramming of earth moist, zero-slump concrete against a rigid mold until it is densely compacted.
   b. Machine casting method: manufactured from earth moist, zero-slump concrete compacted by machinery using vibration and pressure against a mold until it becomes densely consolidated.

2. Wet Cast Concrete Products - manufactured from measurable slump concrete.
   a. Wet casting method: manufactured from measurable slump concrete and vibrated into a mold until it becomes densely consolidated.

1.7 Submittal Procedures

A. Comply with Section 01 33 23 - Samples, Shop Drawings and Submittals.

B. Samples: Submit pieces of the Cast Stone that are representative of the general range of finish and color proposed to be furnished for the project.

C. Test Results: Submit manufacturer’s test results of Cast Stone previously made by the manufacturer.

D. Shop Drawings: Submit manufacturer’s shop drawings including profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors annotation of stone types and their location.

1.8 Quality Assurance

A. Manufacturer Qualifications:

1. Manufacturer shall have sufficient plant facilities to produce the shapes quantities and size of cast stone required in accordance with the project schedule.

2. Manufacturer shall submit a written list of projects similar in scope and at least three (3) years of age, along with Owner, Architect and Contractor references.

B. Standards: Comply with the requirements of the Cast Stone Institute Technical Manual and the project Specifications. Where a conflict may occur, the Contract Documents shall prevail.

PART 2 - PRODUCTS

2.1 Architectural Cast Stone

A. Comply with ASTM C 1364

B. Physical properties: Provide the following:

1. Compressive Strength - ASTM C 1194: 6,500 psi (45 Mpa) minimum for products at 28 days.

2. Absorption - ASTM C 1195: 6% maximum by the cold water method, or 10% maximum by the boiling method for products at 28 days.

3. Air Content - ASTM C173 or C 231, for wet cast product shall be 4-8% for units exposed to freeze-thaw environments. Air entrainment is not required for VDT products.

4. Freeze-thaw - ASTM C 1364: The CPWL shall be less than 5% after 300 cycles of freezing and thawing.

5. Linear Shrinkage - ASTM C 426: Shrinkage shall not exceed 0.065%.

C. Job Site Testing - One (1) samples from production units may be selected at random from the field for each 500 cubic feet (14 m 3) delivered to the job site.

1. Three (3) field cut cube specimens from each of these samples shall have an average minimum compressive strength of not less than 85% with no single specimen testing less than 75% of design strength as allowed by ACI 318.

2. Three (3) field cut cube specimens from each of these samples shall have an average maximum cold-water absorption of 6%.

3. Field specimens shall be tested in accordance with ASTM C 1194 and C 1195.

D. Provide all cast stone indicated in the drawings. Manufacturers shall be members of the Cast Stone Institute® or approved equal.

1. EXTERIOR CANOPY COLUMN SURROUND CAP

2.2 Raw Materials

A. Portland Cement - Type I or Type III, white and/or grey, ASTM C 150.

B. Coarse Aggregates - Granite, quarts or limestone, ASTM C 33, except for gradations, and are optional for the VDT casting method.

C. Fine Aggregates - Manufactured or natural sands, ASTM C33, except for gradation.

D. Colors - Inorganic iron oxide pigments, ASTM C 979 except that carbon black pigments shall not be used.

E. Admixtures - Comply with the following:

1. ASTM C 260 for air-entraining admixtures.

2. ASTM C 494/C 495M Types A-G for water reducing, retarding, accelerating and high range admixtures.

3. Other admixtures: integral water repellents and other chemicals, for which no ASTM Standard exists, shall be previously established as suitable for use in concrete by proven field performance or through laboratory testing.

4. ASTM C 618 mineral admixtures of dark and variable colors shall not be used in surfaces intended to be exposed to view.

5. ASTM C 989 granulated blast furnace slag may be used to improve physical properties. Tests are required to verify these features.

F. Water - Potable

G. Reinforcing Bars:

1. ASTM A 615/A 615M. Grade 40 or 60 steel galvanized or epoxy coated when cover is less than 1.5 in. (37mm).

2. Welded Wire Fabric: ASTM A1064 where applicable for wet cast units.

H. All anchors, dowels and other anchoring devices and shims shall be standard building stone anchors commercially available in a non-corrosive material such as zinc plated, galvanized steel, brass, or stainless steel Type 302 or 304.

2.3 Color and Finish

A. Architect shall select color and finish from Builder's Cast Stone samples submitted through the shop drawings / samples process.

B. All surfaces intended to be exposed to view shall have a fine grained texture similar to natural stone, with no air voids in excess of 1/32 in. (0.8 mm) and the density of such voids shall be less than 3 occurrences per any 1 in. (25mm2) and not obvious under direct daylight illumination at a 5 ft (1.5m) distance.

C. Units shall exhibit a texture approximately equal to the approved sample when viewed under direct daylight illumination at a 10 ft (3m) distance.

1. ASTM D 2244 permissible variation in color between units of comparable age subjected to similar weathering exposure.
   a. Total color difference - not greater than 6 units
   b. Total hue difference - not greater than 2 units.

D. Remove cement film, if required, from exposed surfaces prior to packaging for shipment.

2.4 Reinforcing

A. Reinforce the units as required by the drawings and for safe handling and structural stress.

B. Minimum reinforcing shall be 0.25 percent of the cross section area.

C. Reinforcement shall be non-corrosive where faces exposed to weather are covered with less than 1.5 in. (38mm) of concrete material. All reinforcement shall have minimum coverage of twice the diameter of the bars.

D. Panels, soffits and similar stones greater than 24 in. (600mm) in one direction shall be reinforced in that direction. Units less than 24 in. (600mm) in both length and width dimension shall be non-reinforced unless otherwise specified.

E. Welded wire fabric reinforcing shall not be used in dry cast products.

2.5 Curing

A. Cure units in a warm curing chamber approximately 100°F (37.8°C) at 95 percent relative humidity for approximately 12 hours, or cure in a 95 percent moist environment at a minimum 70°F (21.1°C) for 16 hours after casting. Additional yard curing at 95 percent relative humidity shall be 350 degree days (i.e. 7 days @ 50°F (10°C) or 5 days @ 70°F (21°C)) prior to shipping. Form cured units shall be protected from moisture evaporation with curing blankets or curing compounds after casting.

2.6 Manufacturing Tolerances

A. Cross section dimensions shall not deviate by more than ±1/8 in. (3mm) from approved dimensions.

B. Length of units shall not deviate by more than length/360 or ±1/8 in. (3mm), whichever is greater, not to exceed ±1/4 in. (6mm).

1. Maximum length of any unit shall not exceed 15 times the average thickness of such unit unless otherwise agreed by the manufacturer.

C. Warp, bow or twist of units shall not exceed length/360 or ±1/8 in. (3mm), whichever is greater.

D. Location of dowel holes, anchor slots, flashing grooves, false joints and similar features - on formed sides of unit 1/8 in. (3mm), on unformed sides of unit, 3/8 in (9mm) maximum deviation.

2.7 Production Quality Control

A. Testing

1. Test compressive strength and absorption from specimens selected at random from plant production.

2. Samples shall be taken and tested from every 500 (14 m3) cubic feet of product produced.

3. Perform tests in accordance ASTM C 1194 and C 1195.

4. New and existing mix designs shall be tested for strength and absorption compliance prior to producing units.

2.8 Delivery, Storage and Handling

A. Mark production units with the identification marks as shown on the shop drawings.

B. Package units and protect them from staining or damage during shipping and storage.

C. Provide an itemized list of product to support the bill of lading.

2.9 MANUFACTURERS

A. Texas Building Products, Inc., 320 E. Broadway, Fort Worth, Texas 76104 (Phone: 817-332-2373)

B. or prior approved equals

PART 3 - EXECUTION

3.1 Examination

A. Installing Contractor shall check Cast Stone materials for sit and finish prior to installation. Do not set unacceptable units.

3.2 Setting Tolerances

A. Comply with Cast Stone Institute ® Technical Manual.

B. Set stones 1/8 in. (3mm) or less, within the plane of adjacent units,

C. Joints, plus - 1/16 in. (1.5mm), minus - 1/8. (3mm).

3.3 Jointing

A. Joint Size:

1. At stone/brick joints 3/8 in. (9.5mm).

2. At stone/stone joints in vertical position 1/4 in. (6mm) (3/8 in. (9.5 mm) optional).
3. Stone/stone joints exposed on top 3/8 in. (9.5mm).

B. Joint Materials:

1. Mortar, Type N, ASTM C 270.

2. Use a full bed of mortar at all bed joints.

3. Flush vertical joints full with mortar.

4. Leave all joints with exposed tops or under relieving angles open for sealant.

5. Leave head joints in copings and projecting components open for sealant.

C. Locations of Joints:

1. As shown on shop drawings.

2. At control and expansion joints unless otherwise shown.

3.4 Setting

A. Drench units with clean water prior to setting.

B. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.

C. Set units in full bed of mortar, unless otherwise detailed.

D. Rake mortar joints 3/4 in. (18mm) for pointing.

E. Remove excess mortar from unit faces immediately after setting

F. Tuck point unit joints to a slight concave profile.

3.5 Joint Protection

A. Comply with requirements of Section 07 92 00 - Joint Sealants..

B. Prime ends of units, insert properly sized backing rod and install required sealant.

3.6 Repair and Cleaning

A. Repair chips with touch up materials furnished by manufacturer.

B. Saturate units to be cleaned prior to applying an approved masonry cleaner.

C. Consult with manufacturer for appropriate cleaners.

3.7 Inspection and Acceptance

A. Inspect finished installation according to Bulletin #36.

B. Do not field apply water repellant until repair, cleaning, inspection and acceptance is completed.

END OF SECTION 04 72 00

SECTION 05 12 00 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all materials, labor, equipment and incidental services necessary for the fabrication, painting and erection of all structural steel, incidental steel framing, and steel joists included in the Contract.

B. Unless otherwise stipulated, all references herein to standards of the American Institute of Steel Construction (AISC) and the American Society for Testing Materials (ASTM) and the American Welding Society (AWS) apply to the latest revision thereof.

C. Fabricate and erect all structural steel in conformance with 2016 Specification for Structural Steel Buildings by the American Institute of Steel Construction (AISC 360-16), except that references to the AISC Code of Standard Practice shall apply only to dimensional tolerances and quality of work for fabrication and erection. Other provisions of the AISC Code of Standard Practice may be voluntarily adopted by the Contractor as a basis for fabrication and erection subcontracts, but these other provisions are not part of this project specification.

D. Shop drawings shall be prepared by the Contractor to guide workmen in fabrication and erection and to provide additional assurance that there are no substantive discrepancies in the broader description of the project contained in the Contract Documents.

E. Submit to the Architect for review, three copies of all Shop and Erection drawings. Before submittal to the Architect, all shop drawings shall be checked by the Contractor and shall be signed to verify that this has been done. The Architect will review these Drawings and return one copy to the Contractor with marks thereon indicating any exceptions taken to the content of these Drawings. Review of Shop Drawings shall be only for general conformance with design concept of the Project and for general compliance with information given in the Contract Documents. Review of the Shop Drawings shall not be construed as approval of quantities and dimensions, fabricating processes, erection sequences, construction techniques or of approval of any variance from the intent of the Contract Documents.

F. Shop drawings are the instrument of the Contractor. Structural Contract Drawings are not intended to be used or adapted as shop drawings. The Contractor shall not use or adapt structural Contract Drawings as part of the shop drawing submittal without first carefully checking all Contract Documents for discrepancies and resolving all such discrepancies. By the use or adaptation of Structural Contract Drawings as part of the shop drawing

submittal the Contractor shall be deemed to warrant that any discrepancies undetected in the shop drawing phase which may be detected as construction progresses will not be used as a basis for extra cost claims under this Contract.

G. Contractor shall provide all structural steel suppliers with a complete set of Contract Drawings and Specifications. Shop drawings shall be comprehensive documents which include and coordinate structural steel and miscellaneous steel items described or indicated on any drawing or in any specification included in the Contract Documents. Steel items shown or indicated on the Contract Drawings or described in the Contract Specifications shall be provided by the Contractor whether or not the items have been included on the shop drawings.

H. Splices and connections not shown on the Drawings shall be designed by the Contractor to develop the full strength of the largest connecting member. Such connections shall be submitted for review separately from the shop drawings. Fully descriptive sketches and a written request for review shall be submitted by the Contractor.

1.2 STRUCTURAL STEEL SPECIAL INSPECTIONS AND TESTS

A. Structural steel special inspections and tests shall be done in conformance with the 2021 International Building Code (IBC) Chapter 17. As required by IBC 1705.2.1, special inspections and nondestructive testing of structural steel elements shall be in accordance with the requirements of AISC 360-16, Specification for Structural Steel Buildings1705.2.3.

B. As required by AISC 360-16, Section N1:
   1. Quality Control (QC) for Structural Steel Fabrication shall be provided by the steel fabricator.
   2. Quality Control (QC) for Structural Steel Erection shall be provided by the steel erector.
   3. Quality Assurance (QA) shall be provided by an inspection and testing agency hired by the Owner.
   4. Non-destructive Testing (NDT) of welded joints shall be performed by the Owner's inspection and testing agency which is responsible for Quality Assurance (QA).

C. All QC and QA shall conform to AISC 360-16, Section N5 and specific inspection tasks shall be as outlined in the tables which are included in Section N5.

D. AISC Certification:
   1. If the steel fabricator and/or erector is AISC certified, QA inspections (except NDT) may be waived per AISC 360-16, Section N6.

C. The Contractor shall cooperate fully with the Owner's approved agency (OAA), shall provide written certification(s) from suppliers and subcontractors if requested by the OAA and shall provide the OAA with convenient and safe access to construction activities as necessary for the OAA to conduct its duties.

D. The Contractor has full responsibility to provide competent supervision and adequate quality control to assure that all structural steel and joists installed in the project meets the requirements of these specifications. The activities of the OAA do not, in any way, relieve the Contractor of this responsibility.

E. When quality control tests performed by the OAA show that the work fails to meet the specified requirements, the Contractor shall correct and/or remove and replace all defective work and shall coordinate retesting with the testing laboratory. All costs associated with reinspection and retesting of defective work shall be the sole responsibility of the Contractor.

PART 2 - PRODUCTS

2.1 All materials shall be new and undamaged.

2.2 Structural steel W, C and MC shapes shall conform to ASTM A992.

2.3 Structural steel M, S, HP and L shapes shall conform to ASTM A572 Grade 50.

2.4 Steel plates shall conform to ASTM A572 Grade 50.

2.5 Pipe shall conform to ASTM A53 Grade B.

2.6 Square, rectangular and round HSS shapes shall conform to ASTM A500 Grade C

2.7 Headed stud shear connectors shall be cold finished carbon steel conforming to ASTM A-108 Grade 1015 or 1020 with dimensions complying with AISC Specifications.

2.8 Anchor rods and anchor bolts shall conform to ASTM F1554 Grade 36 unless specifically noted otherwise on the Drawings.

2.9 Bolts shall be heavy hexagon structural bolts conforming to ASTM A-325 Type 1 for interior locations and Type 3 for exterior locations.

2.10 Steel joists shall be as designated on the Drawings and shall conform to the latest "Standard Specifications and Load Tables for Steel Joists and Joist Girders", as adopted by the Steel Joist Institute.

2.11 Non-shrink grout beneath column base plates shall be non-ferrous and shall conform to ASTM C1107.

PART 3 - EXECUTION

3.1 WELDING

A. Materials and processes used, and details of all joints shall comply with the American Welding Society Code for Arc and Gas Welding in Building Construction.

B. Use AWS A5.1 or A5.5 E70XX electrodes for manual arc welding and AWS A5.17 F7X-EXXX electrodes for submerged arc welding.

C. All welders shall be qualified according to AWS Standards for the type of welding that they perform on this Project. Welders shall carry their certification papers and show them to the Owner's representatives upon request.

3.2 HIGH STRENGTH BOLTING

A. High strength bolted joints, where called for on Drawings, shall be assembled in accordance with "Specification for Structural Joints using High-Strength Bolts" as prepared by RCSC Committee A.1-Specifications and approved by the Research Council on Structural Connections.

3.3 ERECTION

A. The steel framing system described in these drawings and specifications is designed for strength and serviceability as a completed and functioning structure under loads prescribed by the governing codes. The strength and stability of the incomplete steel framing system will vary throughout construction and will depend on the means, methods, and sequence of construction selected by the Contractor.

B. The lateral load resisting system for the building is not complete until all framing is aligned, fully connected and secured in final position, all floor slabs are poured and cured for seven days, and all roof decks are fastened in final position.

C. The Contractor has sole authority and responsibility for the means, methods, sequence and safety of construction. The Contractor shall, at all times, provide temporary shoring, bracing and tie-down anchorage consistent with the Contractor’s selected means, methods and sequence of construction and such temporary supports shall be adequate to assure stability and to prevent movement or collapse of the steel framing, or any portion thereof, during erection and throughout construction.

D. Anchor bolts and other anchorage devices are designed for loads required by governing codes after the project is complete. The Contractor is responsible for independent structural analysis to verify the safety of these bolts and devices under loads which may be imposed during erection and construction.

E. Erect all steel in accordance with standards and specifications of the AISC. Locate anchor bolts accurately and install into connecting work in advance. Install base plates true to line and level and set solid in non-shrinking grout.

F. Do not enlarge shop-made bolt holes by flame cutting in the field. If shop-fabricated components do not assemble properly in the field, do not modify them in any manner without first obtaining the approval of the Architect.

3.4 PAINTING

A. This section applies to steel which does not receive finished painting or spray-applied fireproofing. See other documents for finished painting requirements. Steel to receive spray-applied fireproofing shall be cleaned and surface prepared as required by the manufacturer of the fireproofing material.

B. Paint all structural steel in the shop after fabrication is completed. After erection, paint all field connections, all welded areas and touch up all abrasions, damaged or defective paint and rust areas and remove all dirt, mud, mortar, debris, etc., from all steel surfaces.

C. Immediately before painting, thoroughly prepare the steel surface in compliance with the Steel Structures Painting Council Specifications SP-3. Remove all oil and grease, loose mill scale, loose rust, loose paint and other detrimental foreign matter from the steel surface.

D. Apply paint with brush, roller or spray; or dip in accordance with manufacturer's specifications.

E. For shop painting of and touch up field painting of hot rolled steel shapes, a primer conforming to Steel Structures Painting Council Paint System No. 1. Dry film thickness shall be 1.7 - 2.0 mils.

F. Where called for on Drawings, galvanizing shall conform to ASTM A 123 and A 153. The Contractor shall consult with the galvanizer to assure that fabricated components will not warp during the galvanizing process. Subassemblies which are warped beyond normal tolerances will not be installed and will be replaced at Contractor's expense.

G. Welds of galvanized members shall comply with AWS D19.0. Damage to galvanized coating in weld areas shall be restored in accordance with ASTM A780, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

END OF SECTION 05 12 00

SECTION 05 30 00 - METAL DECK

PART 1 - GENERAL

1.1 SUMMARY

A. The work required under this section consists of all steel decks and related items necessary to complete the work indicated on Drawings and described in Specifications.

B. All steel deck products, procedures, and installation shall conform to all applicable standards of the Steel Deck Institute (SDI) and specifically to the following provisions:
   1. ANSI/SDI - RD-2017 Standard for Steel Roof Deck
   2. ANSI/SDI - QA/QC - 2017 Standard for Quality Control and Quality Assurance for Installation of Steel Deck.

C. The Contractor shall furnish signed certification that the metal deck as manufactured, fabricated and installed meets the requirements specified herein.

1.2 METAL DECK SPECIAL INSPECTIONS

A. In accordance with the 2021 International Building Code (IBC), Chapter 17, the Owner shall employ an approved agency (OAA) to verify that all metal deck complies with the contract documents and to perform Quality Assurance (QA) inspections per ANSI/SDI - QA/QC - 2017 Appendix 1, Tables 1.1 through 1.8 as applicable.

B. The OAA shall verify metal deck material(s) and product(s) by markings on the product(s) and/or by obtaining copies of the deck manufacturer’s certified test reports and internal quality control documentation.

C. The OAA shall conduct periodic inspections and verifications of metal deck screw anchorage as necessary to determine that this work is completed in compliance with the contract documents and with the requirements and recommendations of the manufacturer of the screw fastener(s).

D. The Contractor shall cooperate fully with the OAA, shall provide written certification(s) from suppliers and subcontractors if requested by the OAA and shall provide the OAA with convenient and safe access to construction activities as necessary for the OAA to conduct its duties.

E. The Contractor has full responsibility to provide competent supervision and adequate quality control to assure that all metal deck installed in the project meets the requirements of these specifications. The activities of the OAA do not, in any way, relieve the Contractor of this responsibility.

F. When quality control tests performed by the OAA show that the work fails to meet the specified requirements, the Contractor shall correct and/or remove and replace all defective work and shall coordinate retesting with the testing laboratory. All costs associated with reinspection and retesting of defective work shall be the sole responsibility of the Contractor.

PART 2 - PRODUCTS

2.1 Sheet steel for deck and accessories shall conform to ASTM A653 Structural Quality with a minimum yield strength of 40 ksi.

2.2 Deck corrugation depth, gage and minimum section properties shall be as noted on the drawings.

2.3 Roof decks with top flange V-grooves shall not be used.

PART 3 - EXECUTION

3.1 INSTALLATION AND ANCHORAGE

A. Place steel deck continuous over at least three (3) spans with corrugations perpendicular to supports. Sidelap adjacent sheets at least one corrugation but not less than 2 inches. End laps shall be two inches (2") minimum, shall center over a support and shall not be vertically separated by more than 1/16 of an inch. Steel deck shall be erected with a minimum bearing width of 1-1/2 inches on all supports unless specifically shown otherwise on the drawings.

B. Fasten steel roof deck to cold-formed steel trusses with No. 12 screws conforming to ASTM C1513. Contractor shall provide written documentation from the manufacturer of the screw fasteners that the screws comply with these specifications and that the screw design (such as flute length, pilot shaft and tapping threads) is intended for the application in which it is used and suitable for the material thicknesses of the supporting members.

C. Screws shall be self-drilling and self-tapping and shall be installed through the entire thickness of the base material such that the tapping threads of the screw penetrate the full thickness of the supporting material. Screws shall be installed to assure a firm, clamped interface between the underside of the steel deck and the top side of the supporting member.

D. Fasteners shall be attached to supporting members at a maximum spacing of 6 inches within 10 feet of all roof edges, ridges, and hips; and a maximum spacing of 12 inches throughout other roof areas. Side laps shall be fastened with one fastener per span.

E. Deck clamps at drains and similar devices shall be secured with bottom flanges drawn up tight prior to installing insulation.

F. Sump pans and reinforcing plates shall be provided at drains and other mechanical openings.

3.2 FINISH

A. All metal deck shall be hot-dip galvanized in conformance to ASTM A653 coating designation G90 (0.90 oz. per sq. ft.).

B. After erection, the exposed surface of all metal deck shall be cleaned of mud, dirt and stains so that these exposed surfaces are uniform in color and texture.

END OF SECTION 05 30 00

SECTION 05 40 00 - COLD FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SCOPE

A. Provide all labor, materials, tools, equipment and perform all work and incidental services necessary for the furnishing and installation, complete, of all lightgage framing included on the drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades and manufactured by the following manufacturers:

Marino\WARE
400 Metuchen Rd.
South Plainfield, NJ 07080
Phone: (908) 757-9000

ClarkDietrich Building Systems
9050 Centre Pointe Drive, Suite 400
West Chester, OH 45069
Phone: (513) 870-1100

(or prior approved equal)

B. For additional information, refer to sections:
09 26 00 - Gypsum Drywall Assemblies

C. Standards
1. ASTM A 780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
2. ASTM A 1003 - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
3. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
4. ASTM C 955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.
5. ASTM C 1513 - Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.
6. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.
7. AISI S240-20 - North American Standard for Cold-Formed Steel Structural Framing.
8. AISI S100-16 (2020) with Supplement 2-20 - North American Specification for the Design of Cold-Formed Steel Structural Members.
9. American Welding Society (AWS).
    a. AWS D1.1 "Structural Welding Code - Steel."
    b. AWS D1.3 "Structural Welding Code - Sheet Steel."

1.2 SUBMITTALS

A. Submit under provisions of Section 01 33 23 - Shop Drawings.

B. Submit manufacturer's product literature and data sheets for specified products.

C. Manufacturer’s certification of product compliance with codes and standards.

D. Shop Drawings: Submit shop drawings prepared by the successful manufacturer showing:

1. Locations of framing members, wall framing sections and opening elevations.

2. Sizes and spacing of framing members.

3. Methods of fastening framing members to each other and to supporting systems.

4. Details of vertical deflection connections to structures.
5. Locations and spacing of lateral bracing and structural bracing systems.

6. Accessory products required for complete installation.

7. Shop Drawings shall be signed and sealed by a professional engineer licensed in the State of Louisiana experienced in cold-formed steel framing.

E. Structural Calculations: Submit structural calculations prepared by the successful manufacturer to meet all codes in the State of Louisiana for approval.

1. Submittal shall be signed and sealed by a professional engineer licensed in the State of Louisiana experienced in cold-formed steel framing.

2. Description of design criteria.

3. Engineering analysis depicting stress and deflection (stiffness) requirements for each framing application.

4. Selection of framing components, accessories, fasteners, and welded connection requirements. **(All light gauge framing component sizes indicated in the drawings and specifications are considered minimum even if a smaller size or gauge would pass the current IBC.)**

5. Engineer shall have a minimum of 5 years' experience with projects of similar scope.

1.3 QUALITY ASSURANCE

A. Contractor shall provide effective, full-time quality control over all fabrication and erection complying with all codes and regulations in the State of Louisiana, specifically wind loads.

B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code-Steel" and AWS D1.3 "Structural Welding Code-Sheet Steel."

C. Qualify welding processes and welding operators in accordance with applicable requirements of AWS D1.1 "Structural Welding Code - Steel" and AWS D1.3 "Structural Welding Code - Sheet Steel."

1.4 DELIVERY, STORAGE, AND HANDLING

A. Notify manufacturer of damaged materials received prior to installing.

B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Store materials protected from exposure to rain, snow or other harmful weather conditions, at temperature and humidity conditions per the recommendations of ASTM C955.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All interior cold-formed steel wall studs and framing members indicated under Section 05 40 00 shall meet all codes and regulations and be of the type, size, spacing and gauge as shown on the plans and manufactured by Marino\WARE or, ClarkDietrich or prior approved equal.

1. All interior lightgage framing indicated under Section 05 40 00 is 20 ga. minimum 3-5/8" depth studs with a 1-5/8" minimum flange and 6" depth studs with a 1-5/8" minimum flange unless specifically indicated otherwise on drawings.
2. All studs and framing members, galvanized track, bridging, end closures, etc., and accessories shall be formed from steel that corresponds to the requirements of ASTM A1003 and ASTM A653, with minimum yield strength as required by AISI S240 and the approved structural calculations. Framing members shall be of type, size, spacing and gauge shown on drawings.

B. All exterior wall studs and framing members shall meet all codes and regulations and be of the type, size, spacing and gauge as shown on the plans and manufactured by Marino\WARE, ClarkDietrich or prior approved equal.

1. All exterior lightgage framing is 16 gauge minimum 3-5/8" depth studs with a 2" minimum flange and 6" depth studs with a 2" minimum flange unless specifically indicated otherwise on drawings.

2. All studs and framing members, galvanized track, bridging, end closures, etc., and accessories shall be formed from steel that corresponds to the requirements of ASTM A1003 and ASTM A653, with minimum yield strength as required by AISI S240 and the approved structural calculations. Framing members shall be of type, size, spacing and gauge shown on drawings.

C. All studs, joists, framing members and accessories shall be formed from steel having a G-60 galvanized coating for interior studs and a G-90 for exterior wall studs, meeting ASTM C 955 and ASTM A 653.

D. Not Used.

E. Not Used.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Inspect supporting substrates and structures for compliance of proper conditions for installation and performance of the cold-formed structural framing.

B. Prepare attachment surfaces so that they are plumb, level, and in proper alignment for accepting the clod-formed structural framing.

C. Unless otherwise indicated or specified, as a minimum, for installing all lightgage metal framing, follow the details and recommendations of the manufacturer and the Standards specified herein, complying with all details to meet minimum design loads as required by the 2021 IBC.

D. Unless otherwise indicated or specified, provide all metal studs and framing plumb, level, and spaced at 16" o.c. maximum spacing and fastened and screwed in accordance with manufacturer’s details and recommendations.

E. Unless otherwise indicated or specified, provide all metal joists level and spaced at 16" o.c. maximum spacing and fastened and screwed in accordance with manufacturer’s details and recommendations.

F. Provide continuous, metal horizontal bridging and bracing between all metal studs which are over 48" long and spaced at a maximum spacing of 48" apart for studs over 8'-0" long.

G. Provide continuous, metal horizontal bridging and bracing between all metal joists which are over 8'-0" long and spaced at maximum spacing of 8'-0" apart for joists over 16'-0" long.

H. Secure all lightgage metal framing and accessories with screws and fasteners in sizes as recommended by the lightgage metal framing manufacturer.

I. Securely brace all lightgage metal framing.

J. Securely attach all lightgage metal framing.

K. **Splices in lightgage metal materials, other than metal running tracks, metal joist end channels, furring channels, and bridging shall not be permitted.**

L. Unless otherwise indicated or specified, provide suspension wire spaced at minimum 4' centers both ways to support lightgage framing used at ceilings and soffits.

M. Unless otherwise indicated or specified, provide minimum twenty (20) gauge, minimum 3-5/8" deep studs, heavier if required, to brace the tops of all interior top tracks and tops of all metal stud walls from tops of interior walls and partitions to structural steel beams and steel purlins above at 72" centers.

N. Where tops of interior walls and partitions cannot be braced to overhead structural steel beams and steel purlins above, provide minimum 6' long horizontal 45 degree angle stud braces, placed flat, and securely fastened to top tracks of the interior walls and partitions, at all 90 degree partition corners, and all similar angled corners.

O. Provide additional interior wall bracing above latch side of interior doors to prevent wall movement when door slams shut.

P. At in-sides of metal stud chase walls, provide a pair of horizontal, continuous 3-5/8" 20 gauge channel tracks facing each other, (at heights of 48" and 96" above the finished floor), and provide 3-5/8" 20 gauge stud “X” braces securely fastened to continuous tracks at 24" maximum from ends of chase, and at 48" o.c. maximum spacing.

Q. Where opposite chase wall metal studs align with one another at 16" centers, the horizontal tracks may be omitted; hence, provide the 3-5/8" 20 gauge “X” braces securely fastened directly to both studs, (at heights of 48" and 96” above finished floor), at 24" maximum from ends of chase, and at 48" o.c. maximum spacing.

R. Where lightgage steel stud walls are secured to the bottom of structural steel beams, deep leg tracks (also known as slip tracks) shall be utilized to allow for structural deflection during the periods of high loading. Do not secure wall studs or sheathing to the deep leg track. Brace top of stud assembly with 8" wide continuous 16 ga. flat strapping secured to each stud within 6" of the top of studs or as shown on Contract Documents.

3.2 WORKMANSHIP

A. Handling and lifting of prefabricated panels shall be done in a manner as to not cause distortion in any member.

B. Tracks shall be securely anchored to the supporting structure as shown on the plans.

C. At track butt joints, abutting pieces of track shall be securely anchored to a common structural element, or they shall be butt-welded or spliced together.

D. Studs shall be plumbed, aligned, and securely attached to the flanges or webs of both upper and lower tracks.

E. Jack studs or cripples shall be installed below windowsills, above window and door heads, at free standing stair rails, and elsewhere to furnish support, and shall be securely attached to supporting members.

F. Fastening of components shall be self-drilling screws or welding. Screws shall be of sufficient size to insure the strength of the connection. All welds shall be touched up with zinc-rich paint.

END OF SECTION 05 40 00

SECTION 05 44 00 - PRE-FABRICATED COLD-FORMED STEEL TRUSSES

PART 1 - GENERAL

1.1 SUMMARY

A. All trusses shall be designed by the manufacturer in accordance with AISI S240-20 North American Standard for Cold-Formed Steel Framing.

B. Design load shall be as follows:
   1. 10 psf dead load on roof
   2. 10 psf dead load on ceiling
   3. 20 psf live load on roof
   4. Additional 400 pound concentrated load applied anywhere along the bottom chord.
   5. Wind load as required by ASCE 7-16 with the following parameters:
      (a) Basic Wind Speed (Vult).....165 mph
      (b) Exposure Category.....C
      (c) Enclosure Classification.....Enclosed
   6. All erection and handling loads
   7. All equipment operating weights.

C. Maximum total deflection shall be less than or equal 1/240 of the span.

D. Factory fabricate cold-formed steel trusses plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations and the requirements of this Section.
   1. Fabricate truss assemblies in jig templates.
   2. Cut truss members by sawing or shearing or plasma cutting (torch cutting now allowed).
   3. Fasten cold-formed steel truss members by welding or screw fastening, or other methods as standard with fabricator. Wire tying of framing members is not permitted.
      (a) Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      (b) Locate mechanical fasteners and install according to cold-formed steel truss component manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.

E. Avoid damage during handling, delivery and erection. Brace, block, or reinforce truss as necessary to avoid member and connection overstress.

1.2 SUBMITTALS

A. Manufacturer shall provide certification of truss design, materials and fabrication sealed by a professional engineer licensed to practice in the state of Louisiana. Complete Shop Drawings and details shall also be submitted to the Architect for review.

B. Shop drawings for trusses shall include an erection framing plan indicating the position and identifying mark number for each truss. This framing plan shall also indicate size and position of all lateral bracing between trusses which is required by the design of the individual truss members.

PART 2 - PRODUCTS

2.1 All steel members and framing accessories shall conform to AISI S240-20 North American Standard for Cold-Formed Steel Framing.

2.2 All steel members and framing accessories shall be galvanized and have a minimum protective coating equal to the G90 coating class.

2.3 Truss manufacturer shall provide all galvanized steel framing members and accessories as needed for full attachment of the roof deck, especially at (but not limited to) roof valleys, hips, ridges and step-down trusses.

2.4 Truss manufacturer shall provide all galvanized steel lateral bracing required by the design of the individual truss members.

PART 3 - EXECUTION

3.1 The Contractor shall have sole responsibility for the means, methods, and sequence of erection and shall provide bracing and shoring adequate to assure stability and to prevent movement or collapse during erection and throughout construction.

3.2 Members, components, and connection plates shall be straight and free of defects.

3.3 Install truss framing and accessories plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations.

A. Cutting, notching and drilling of truss members, components and connections shall be prohibited, unless approved by the truss engineer.

B. Fasten cold-formed steel roof framing by welding or screw fastening, as standard with fabricator. Wire tying of roof framing is not permitted.

1. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

2. Locate mechanical fasteners and install according to cold-formed roof framing manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.
3. Install roof framing in one-piece lengths, unless splice connections are indicated.
4. Provide temporary bracing and leave in place until trusses are permanently stabilized.

3.4 The truss manufacturer shall clearly specify on erection drawings any supplementary bracing required to provide the lateral support assumed in the design of the trusses or truss members. The Contractor shall install all such bracing.

3.5 Install all galvanized steel framing accessories as needed for full attachment of the roof deck, especially (but no limited to) roof valleys, hips, ridges, and step-down trusses.

3.6 Finished appearance and stability shall comply with all requirements of the Cold-formed Metal Framing section of these specifications.

END OF SECTION 05 44 00

SECTION 05 50 00 – METAL FABRICATIONS

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor shall furnish all labor, materials, tools, equipment and perform all work and services necessary for or incidental to the furnishing and installation, complete of Miscellaneous Metal as shown on drawings and as specified in accordance with provisions of the contract documents and completely coordinated with that of all other trades.

B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.

C. **MISCELLANEOUS STEEL SHAPES, PLATES AND ASSEMBLIES NOT SHOWN ON THE STRUCTURAL DRAWINGS AS ELEMENTS OF THE PRIMARY STRUCTURAL SYSTEM SHALL BE REQUIRED BY OTHER DRAWINGS AND SPECIFICATIONS INCLUDED IN THE CONTRACT DOCUMENTS. CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL SUCH ITEMS WHICH WILL BE CONSIDERED MISCELLANEOUS ARCHITECTURAL STEEL. MISCELLANEOUS ARCHITECTURAL STEEL DETAILS DESCRIBED IN THE CONTRACT DOCUMENTS SHALL BE CONSIDERED TYPICAL AND SHALL APPLY TO ALL IDENTICAL AND / OR SIMILAR CONDITIONS THROUGHOUT THE PROJECT. ALL MISCELLANEOUS ARCHITECTURAL STEEL TUBE SHAPES SHALL HAVE OPEN ENDS CAPPED WITH 1/4" THICK CAP PLATE UNLESS NOTED OTHERWISE. IF THE SIZE OF THE MISCELLANEOUS ARCHITECTURAL STEEL IS NOT INDICATED, THE CONTRACTOR SHALL SUBMIT TO THE ARCHITECT STEEL SIZE FOR APPROVAL. ALL CONTRACTORS AND SUBCONTRACTORS SHALL UTILIZE A COMPLETE SET OF CONTRACT DOCUMENTS FOR THE BIDDING OF THIS PROJECT. (REFER TO ARTICLE 3 OF INSTRUCTIONS TO BIDDERS.)**

D. This includes but is not limited to:
   1. Misc. Structural Steel
   2. Misc. Architectural Steel
   3. Steel Lintels
   4. Steel Bollard
   5. Misc. Steel Angles, Clips, Brackets, Countertop and Roof Edge Supports

1.2 SHOP DRAWINGS

A. Submit shop drawings for Architect's approval prior to fabrication of items specified. Shop drawings shall indicate thickness and dimensions of all parts, fastening and anchoring methods, provisions for thermal movement.

1.3 COMPLIANCE WITH STANDARD AND INDUSTRY SPECIFICATIONS

A. The current rules and practices set forth in the "Code of Standard Practice for Steel Buildings and Bridges" (AISC 303); and the "Specification for Structural Steel Buildings" (AISC 360), of the American Institute of Steel Construction shall govern the structural work, except as otherwise noted on the drawings or as otherwise specified. Welding shall be in accordance with AWS D1.1/D1.1M, "Structural Welding Code - Steel", of the American Welding Society.

B. Miscellaneous steel and ironwork shall be in accordance with "Architectural Metal Handbook" of the National Association of Architectural Metal Manufacturers.

C. It is distinctly understood that in the case of any conflict between the abovementioned documents and the drawings and specifications of the Architect, the latter shall have precedence.

D. Comply with the following standards as pertinent:
1. Steel plates, shapes, and bars: ASTM A36
2. Steel plates to be bent or cold-formed: ASTM A283, Grade C
3. Steel tubing: ASTM A500/A500M, Grade C; or ASTM A501/A501M where hot-formed tubing is required
4. Steel bars and bar-size shapes: ASTM A36/A36M
5. Cold-finished steel bars: ASTM A108
6. Cold-rolled carbon steel sheets: ASTM A1008/A1008M
7. Galvanized carbon steel sheets: ASTM A653/A653M, with G90 zinc coating
8. Stainless steel sheets: ASTM A240/A240M, Type 304, 24 gauge, with number 4 finish
9. Gray iron castings: ASTM A48, Class 10
10. Malleable iron castings: ASTM A47
11. Steel pipe: ASTM A53, Grade A, Schedule 40, Black finish unless otherwise noted.
12. Concrete inserts:
a. Threaded or wedge type galvanized ferrous castings of malleable iron complying with ASTM A47/A47M, or cast steel complying with ASTM A27/A27M.
b. Provide required bolts, shims, and washers, hot dip galvanized in accordance with ASTM A153/A153M.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Structural steel members shall be standard shapes conforming to ASTM Specification A36. Cast iron shall be soft, gray, straight, true to pattern and free from imperfections, malleable cast iron, high grade white castings, annealed. Where feasible, all members shall be welded; otherwise they shall be riveted, bolted, or screwed. Fastening shall be concealed wherever possible. All exposed welds shall be ground smooth.

2.2 FASTENERS

1. For exterior use and where built into exterior walls, provide zinc-coated fasteners. Provide fasteners of type, grade, and class required for the particular use.

2. Comply with following standards as pertinent.
a. Bolts and nuts: Provide hexagon-head regular type complying with ASTM A307, Grade A
b. Lag Bolts: Provide square-head or hex-head carbon steel lag screws complying with ASME B18.2.1.
c. Machine Screws: Provide steel machine screws complying with ASME B18.6.3; zinc-coated where used at exterior or damp locations.
d. Plain Washers: Comply with ASME B18.21.1, round, carbon steel.
e. Lock Washers: Comply with ASME B18.21.1, helical spring type carbon steel.
f. Toggle bolts: Provide type, class, and style needed for substrate and application.
g. Anchorage devices: Provide expansion or adhesive anchorage devices suitable for the substrate and application; structural anchors shall have current ICC-ES evaluation reports where applicable.

2.3 All masonry lintels shall be hot dipped galvanized, all ends shall be treated (See Paragraph 2.6 Painting and Protective Coating), all lintels painted. All masonry lintels shall be recessed a minimum of 1/4" from face of masonry. **(Backer rod shall be placed at each end of steel masonry lintels to allow for steel expansion.)**

2.4 Not Used.

2.5 PROTECTION OF ALUMINUM FROM DISSIMILAR MATERIALS (WHERE APPLICABLE)

A. General – In addition to the coating specified, aluminum surfaces shall be prevented from direct contact with dissimilar materials as follows.

1. Dissimilar metals except stainless steel, white bronze, and solid zinc, shall be painted with a heavy bush or spray coat of zinc-chromate primer and one coat of aluminum paint: or shall be separate from the aluminum by a heavy coat of mastic caulking compound, or by a non-absorptive tape gasket.

2. Dissimilar metals used in locations where drainage from them passes over aluminum shall be painted to prevent staining of aluminum.

3. Aluminum surfaces in contact with mortar, concrete, plaster, or other masonry materials shall be given one heavy brush coat of bituminous paint.

4. Aluminum surfaces in contact with wood, or other similar absorptive materials which may become repeatedly wet, shall be given two oats of aluminum metal and masonry paint, or one heavy brush coat of bituminous paint. In place of painting the aluminum. The contractor shall have the option of painting the wood and other absorptive surfaces with two coats of aluminum house paint and sealing joints with caulking compound. Handrails and guard rails are to be painted in accordance with Section 09 91 00 – Painting.

2.6 PAINTING AND PROTECTIVE COATING

A. All ferrous metal, except galvanized surfaces, shall be properly cleaned and given one shop coat of Sherwin-Williams Steel Spec 3013 Universal Primer, or approved equal primer. Anchors that are built into masonry shall be coated with asphalt paint unless specified to be galvanized. Metal work to be encased in concrete shall be left unpainted unless specified or noted otherwise.

B. Hot dip galvanizing or zinc coatings applied on products fabricated from rolled, pressed and forged steel shapes, plates, bars, strips, and assembled steel products shall comply with ASTM A123/A123M. Hot dip galvanizing of bolts, nuts, washers and similar hardware shall comply with ASTM A153/A153M. The weight of the coating shall be as required by the applicable ASTM standard for the class and thickness of material to be coated. Except for bolts and nuts, all galvanizing shall be done after fabrication.

C. All field cuts, welds, or damaged areas on galvanized surfaces shall be repaired with a zinc-rich coating complying with ASTM A780/A780M.

D. See Section 09 91 00 - Painting of the specifications for additional field coats of paint.

PART 3 - EXECUTION (Not Used)

END OF SECTION 05 50 00

SECTION 06 10 00 – ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of Rough Carpentry as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.

B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.

C. For additional related information refer to sections:
1. 03 11 00 - Concrete Formwork
2. 06 20 00 - Finish Carpentry
3. 05 40 00 - Cold Formed Metal Framing
4. 07 27 26 - Fluid Applied Membrane Air Barrier
5. Mechanical and Electrical Sections

D. References
1. APA – The Engineered Wood Association
2. American Wood Council (AWC), National Design Specification (NDS) for Wood Construction
3. Southern Forest Products Association (SFPA)
4. International Building Code, 2021 Edition
5. American Wood Protection Association (AWPA U1, Use Category System)

PART 2 - PRODUCTS

2.1 MATERIALS

A. Framing Lumber - generally all lumber not indicated otherwise as trim, hardwood, treated wood, plywood, millwork, etc., shall be #2 structural grade southern yellow pine, S4S. The rough carpentry shall be used for nonexposed or hidden wood framing, furring, stripping, blocking, backing or bracing where wood is shown to be used on the plans.
1. Interior framing shall be #2 Southern Yellow Pine, or better.
2. Dimensional lumber shall have a maximum moisture content of 19%.

B. Treated wood - **Treated wood shall meet the requirements of American-Wood Preservers' Association AWPA U1. Acceptable Borate compounds and formulations shall be sodium octaborate, sodium tetraborate, sodium pentaborate, boric acid, and FR-1.**
1. All wood plates, blocking, framing, stripping, blocking or backing that touch concrete, masonry and/or that may be subject to humid conditions shall be Borate Pressure treated Southern Yellow Pine, in size as indicated; S4S.
2. Wood specifically shown on the plans as treated wood. Borate Pressure treated wood of grade and species indicated on plans or as specified above shall be used. Minimum treatment as recommended by the American-Wood Preservers' Association (AWPA).
3. Interior treated wood framing and blocking, etc., shall be Borate Pressure Treated #2 Southern Yellow Pine in areas kept free from rainwater, standing water, and ground contact.
4. Exterior framing and blocking, etc., shall be Alkaline Copper Quaternary (ACQ) Treated #2 Southern Yellow Pine in areas exposed to rainwater, standing water, and ground contact. **In no case shall this type of treated wood be in direct contact with metals other than Type 304 or Type 316 stainless steel.** Verify with Architect on the job.

C. Plywood - generally all plywood not indicated as trim, hardwood, millwork or paneling shall be APA PS 1, Structural I Rated Sheathing, Exterior exposure, plywood of thickness indicated on plans, southern yellow pine
   1. All plywood, regardless of location, shall be exterior grade, with exterior type glue, in thickness and grade as indicated on the Drawings.
   2. Specialty items such as sheathing, floor subsheathing, roof sheathing, structural and marine plywood shall be furnished and installed where specifically shown on the plans and/or specified elsewhere.
   3. All sheathing shall be installed to withstand wind loading forces indicated for the area in which sheathing is applied. (Current International Building Code [IBC], chapter 16 & 23)
   4. Treated plywood shall be Borate Pressure treated.

D. Glass Mat Gypsum Board Sheathing - shall be 1/2" thick exterior glass-mat gypsum sheathing as indicated on the Drawings, complying with ASTM C1177/C1177M.
   1. Glass Mat Gypsum Board Sheathing shall be exterior sheathing intended for use behind the fluid-applied membrane air barrier and exterior wall systems shown on the Drawings.
   2. Panels shall be 1/2 inch thick unless another thickness is specifically indicated on the Drawings.
   3. Provide products compatible with the specified air barrier, flashing, sealants, insulation, and adjacent exterior wall materials.
   4. Install sheathing in accordance with manufacturer's written instructions and to withstand wind loading forces indicated for the area in which sheathing is applied.

E. Miscellaneous items - as required provide and install items materials obviously necessary to complete the work (such as pegboard, fiberboard, blackboard, felt, building paper, fasteners, hangers and hardware) whether or not shown in the Contract Documents.
   1. Nails - Bright common wire nails, galvanized for exterior work. Subdrill where necessary to avoid splitting. Split members shall be rejected. All fasteners in treated wood shall be stainless steel (Type 304 or 316).
      a. Power nailing will be permitted where nails are specified and installation does not mar or damage the wood members. Nails shall have full head. Do not overdrive nails.
         1. For power-driven nails to be substituted for specified common nail sizes, contractor shall submit proposed manufacturer, collation type, nominal diameter, length, and head style for each substitute.
         2. Each proposed substitute shall be listed in ICC-ES ESR-1539 as meeting head area ratio requirements for use in LFRAs for the specified common nail size. Alternatively, substitute may be listed in ICC-ES ESR-1768 as having the same diameter and length as the specified common nail size.
      b. Not Used.
         1. Bolts - Drill bolt holes 1/32" larger than bolt diameter. Use square plate or malleable iron washers under heads and nut where they bear against wood. Retighten exposed bolts immediately prior to final inspection. Perform final bolting after structural members have been properly aligned.
         2. Lag Screws and Screws - Subdrill, use square plate or malleable iron washer under lag screw head when they bear on wood.
         3. Fabricated Connections
            a. Sheet metal galvanized of size and type shown on drawings
            b. Sheet metal galvanized hurricane straps. (Re: Structural Drawings)
            c. Structural Steel connections: (Re: Structural Drawings)

F. Provide wood blocking for all shelving, curtain tracks, window shades, acoustical baffles, grab bars, handrails, casework, accessories, and Owner-furnished medical, dental, pharmacy, imaging, and other equipment where required. Consult Architect during framing.

G. Fire Blocking - Not Used.

PART 3 - EXECUTION

3.1 WORKMANSHIP

A. Produce joints which are true, tight, and well nailed with all members assembled in accordance with the drawings. Notch, cope and miter meeting members so members have full bearing. Accurately cut, fit, and frame lumber.

B. Jointing: Make joints to conceal shrinkage; miter exterior joints; cope interior joints; miter or scarf end-to-end joints. Install trim in pieces as long as possible, jointing only where solid support is obtained.

C. Fastening: Install items straight, true, level, plumb, and firmly anchored in place. Where blocking or backing is required, coordinate as necessary with other trades to insure placement of required backing and blocking in a timely manner. On exposed work, set nails for putty. Screw, do not drive, wood screws; except that screws may be started by driving and then screwed home.

D. Framing Construction and Tolerances - Not Used.

E. Warped and twisted structural framing members shall be discarded. Pieces with serious defects shall be discarded regardless of grading. Set horizontal and sloped members with the crowns up.

F. Clean up of debris, dust and scraps in rough framing shall be completed prior to covering up of work.

G. Not Used.

H. **In treated wood, stainless steel Type 304 and Type 316 shall be the only fastener finish allowed. (Hot dipped galvanized fasteners or other finishes besides stainless steel mentioned above shall not be used in treated wood on this project.)**

3.2 MEASUREMENTS

A. Before commencing work, check all lines and levels indicated and such other work as has been completed. Should there be any discrepancies, immediately report in writing to Architect. In event of failure to do so, the Contractor shall be responsible for correction of any errors.

3.3 COORDINATION

A. Coordinate work with other trades, (electrical, mechanical, plumbing, etc.) and do all cutting and patching required to accommodate their work. Protect adjacent work.
   1. Cutting is limited at structural walls. See structural drawings for hole location requirements and maximum hole sizes.

3.4 DELIVERY, STORAGE & SELECTION OF PIECES

A. Deliver and store lumber on sills and cover for protection. Carefully select members so that knots and obvious defects will not interfere with the placing of bolts or proper nailing, and will allow making of proper connections.

B. A member may be rejected by the Architect, whether or not it has been installed, for excessive warp, twist, bow, crook, mildew, fungus or mold, as well as for improper size, grade, species, treatment, cutting and fitting.

C. All material shall be stored on the site in a waterproof manner, and after, installation shall be protected against inclement weather conditions. Stack lumber to allow good air drying. Position separators at each layer and at grade to keep material elevated.

END OF SECTION 06 10 00

SECTION 06 16 43 - GYPSUM SHEATHING (EXTERIOR)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Fiberglass-mat faced, moisture and mold resistant gypsum sheathing.

B. Related Sections:
1. Section 05 40 00 Structural Metal Stud Framing.
2. Section 06 10 00 Rough Carpentry.
3. Section 09 21 16 Gypsum Board Assemblies.

1.2 REFERENCES

A. ASTM International (ASTM):
1. ASTM C473 Standard Test Methods for Physical Testing of Gypsum Panel Products.
2. ASTM C518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
3. ASTM C1002 Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
4. ASTM C1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
5. ASTM C1280 Standard Specification for Application of Gypsum Sheathing.
6. ASTM D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
7. ASTM D6329 Standard Guide for Developing Methodology for Evaluating the Ability of Indoor Materials to Support Microbial Growth Using Static Environmental Chambers**.**
8. ASTM E72 Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
9. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.
10. ASTM C1396 Standard Specification for Gypsum Board
11. ASTM E 136 Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C
12. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials

B. Gypsum Association (GA): GA-253 Application of Gypsum Sheathing.

1.3 SUBMITTALS

A. Product Data: Manufacturer’s specifications and installation instructions for each product specified.

B. Submit fastener information, including corrosion resistance details.

C. Submit manufacturer’s installation instructions.

1.4 WARRANTY

A. Provide products that offer twelve months of coverage against in-place exposure damage (delamination, deterioration and decay)

B. Manufacturer’s Warranty:
1. Five years against manufacturing defects from the date of substantial completion of the project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Georgia-Pacific Gypsum LLC:
   1. Fiberglass-Mat Faced Gypsum Sheathing: DensGlass Sheathing.

B. National Gypsum
   1. Fiberglass-Mat Faced Gypsum Sheathing: Gold Bond eXP Sheathing.

C. Other manufacturers may be submitted for review in accordance with Division 01 Substitution Procedures.

2.2 MATERIALS

A. Fiberglass-Mat Faced Gypsum Sheathing: ASTM C1177:
   1. Thickness: 5/8 inch.
   2. Width: 4 feet.
   3. Length: 8 feet
   4. Weight: 1.9 lb/sq. ft.
   5. Edges: Square.
   6. Surfacing: Fiberglass mat on face, back, and long edges.
   7. Racking Strength (Ultimate, not design value) (ASTM E72): Not less than 540 pounds per square foot, dry.
   8. Flexural Strength, Parallel (ASTM C473): 80 lbf, parallel.
   9. Humidified Deflection (ASTM C1177): Not more than 2/8 inch.
   10. Permeance (ASTM E96): Not less than 23 perms.
   11. R-Value (ASTM C518): 0.56.
   12. Mold Resistance (ASTM D3273): 10, in a test as manufactured.
   13. Microbial Resistance (ASTM D6329, UL Environmental GREENGUARD 3-week protocol): Will not support microbial growth.
   14. Acceptable Products:
      a. 5/8 inch DensGlass Sheathing, Georgia-Pacific Gypsum LLC.
      b. Or Prior Approved Equals.

2.3 ACCESSORIES

A. Screws: ASTM C1002, corrosion-resistant coating suitable for use with exterior gypsum sheathing.

B. Joint treatment (if required): Manufacturer’s recommended exterior joint tape or sealant system.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:
   1. Inspection: Verify that project conditions and substrates are acceptable, to the installer, to begin installation of work of this section.
   2. Do not begin installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install sheathing in accordance with ASTM C1280, GA-253, and manufacturer’s written instructions.

B. Install panels with long dimension perpendicular to supports unless otherwise indicated.

C. Stagger end joints and locate over framing members.

3.3 PROTECTION

A. Protect installed sheathing from damage and deterioration. Remove and replace damaged panels.

END OF SECTION 06 16 43

SECTION 06 20 00 – FINISH CARPENTRY

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor shall furnish all labor, materials, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of finish carpentry as shown on drawings and as specified in accordance with provisions of the contract documents and completely coordinated with that of all other trades.

B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.

C. For additional information refer to sections:
05 40 00 - Cold Formed Metal Framing
06 10 00 - Rough Carpentry

D. Submittals:
1. Product data for each type of finish carpentry material.
2. Shop drawings where custom millwork is required.
3. Samples of finish materials (minimum 12” length of trim, 8” x 10” veneer panels).
4. Certificates of compliance with AWS and sustainability requirements (if applicable).

E. Quality Standards:
1. Comply with current Architectural Woodwork Standards (AWS) for premium grade architectural woodwork.

F. Delivery and Storage:
1. Deliver finish carpentry materials dry, bundled, and protected. Store inside, off ground, and in conditioned spaces. Protect from humidity extremes.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Interior hardwood trim - #1 clear premium white maple, stain grade.

B. Stain grade clear white maple windowsill / stool and apron trim with jamb trims (Re: 3, 9 and 9A-3.1).

C. Provide stainless steel fasteners where exposed to moisture, otherwise provide finish nails to match adjacent wood color when possible.

2.2 QUALITY STANDARDS

A. All finish lumber shall be kiln dried or otherwise seasoned to moisture content of approximately that which it will attain in service.

B. Dimensions - Nominal sizes are given in these standards unless otherwise noted. Minimum dressed dimensions shall comply with the applicable product standard.

PART 3 - EXECUTION

3.1 WORKMANSHIP

A. Install finish carpentry in accordance with AWS Premium Grade requirements. Set work plumb, level, and true to line. Install trim with tight-fitting joints; miter corners accurately. Countersink nails and fill with wood putty compatible with finish

B. Maximum variation from plumb or level: 1/8” in 8’-0”. Maximum offset at matching veneer joints: 1/32”.

C. All finish carpentry shall be supplied, stored and placed using industry standards, good building practice and according to the recommendations of the manufacturer and supplier. All joints, cuts and installation shall be in strict accordance with the A.W.I. (American Woodwork Institute) Standards. Spliced or saw-toothed jointed lumber shall not be used. All stained finish lumber shall be of generally matching patterns, colors, hues and tones when finished.

D. All finish lumber shall be dressed free of tool marks and other objectional defects. Wood shall be trimmed, sanded and generally finished to size by the carpenter. The painter shall fine sand and rub to prepare the surface for finishes as required.

E. Note on stainless steel nails in Section 06 10 00 - Rough Carpentry (3.1 H.), applies here also.

END OF SECTION 06 20 00

SECTION 07 11 00 - DAMPPROOFING (DAMPCOURSING)

PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install dampcoursing and flashing materials as indicated on drawings and used in conjunction with Section 04 21 13 - Brick Masonry and Section 07 27 26 - Fluid Applied Membrane Air Barrier. Contractor may submit equals to items specified herein for prior approval.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Dampcoursing and flashing shall be Mighty-Flash™ SA Self-Adhering Stainless Steel Composite Flashing, as manufactured by Hohmann & Barnard, Inc., (T: 800-645-0616 | www.h-b.com) or prior approved equal.

1. Composition: Self-adhering stainless steel composite flashing with removable release liner.
2. Stainless steel type: Type 304
3. Thickness: Stainless steel sheet 0.003 in. bonded to polymeric fabric.
4. Width: Manufacturer's standard width as required for conditions indicated; 12", 16", 18", 24", and 36" widths available in 60 ft. rolls.
5. Performance:
   a. Puncture Resistance: 2,500+ PSI (ASTM E154).
   b. Tensile Strength: 100,000+ PSF (ASTM D412).
   c. Fire Resistance: Pass (ASTM E84).
   d. Mold Resistance: Pass (ASTM D3273).
   e. UV Resistance: 180 days exposure.
6. Features: Clear non-asphaltic adhesive, heat resistant, recyclable (60% recycled content), lifetime warranty.

B. Accessories (as recommended by manufacturer):

1. Stainless Steel Drip Plate (DP)
2. HB Sealant
3. PRIMER-SA Water-Based Primer
4. Termination Bar (T1 or T2)
5. Stainless Steel Corners and End Dams
6. X-SEAL Tape

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all wall flashings in one continuous piece along masonry ledge, brick sills, lintel openings, etc., with white woven printed material facing out, per manufacturer's instructions.

B. Overlap flashing minimum 6 inches at all joints. Seal with manufacturer's approved accessories (Primer SA, HB Sealant, or X-SEAL Tape) to ensure continuous waterproof barrier.

C. At surface mount applications, secure flashing with stainless steel or aluminum termination bar and sealant at top edge.

D. Install stainless steel drip plate where indicated to divert moisture to outside of wall assembly.

E. Coordinate installation with masonry work. Provide weep holes at 32 inches on center at base of walls, above window and door lintels, and other locations indicated on drawings.

END OF SECTION 07 11 00

SECTION 07 21 00 - THERMAL PROTECTION (BUILDING INSULATION)

PART 1 - GENERAL

1.1 SCOPE

A. Furnish building insulation where indicated on drawings and/or specified herein. Contractor may submit equals to items specified herein for prior approval.

PART 2 - PRODUCTS

2.1 MATERIALS

A. In exterior walls where indicated on drawings, install R-19 unfaced friction-fit fiberglass batt insulation sized to fit the stud cavity as manufactured by Owens Corning PINK Next Gen® Fiberglas™ Insulation or prior approved equal. Shall meet ASTM C665 for mineral-fiber blanket thermal insulation.

B. At interior walls where indicated on drawings, install 2-1/2" PINK Next Gen® Sound Attenuation Batts. (meeting **ASTM C423** for sound absorption) .Typical locations are sound/smoke partitions and other interior metal stud walls where sound insulation is indicated on the drawings. Sound attenuation batts shall be unfaced, lightweight, flexible fiberglass insulation batts. (Manufactured by Owens Corning or prior approved equal.)

C. Rigid insulation to be installed within the standing-seam metal roof assembly: Provide polyisocyanurate roof insulation complying with ASTM C1289, minimum 6-1/2 inches total thickness, installed in two layers consisting of one 4-inch layer and one 2-1/2-inch layer, with joints staggered between layers. Insulation shall provide a minimum Long-Term Thermal Resistance (LTTR) of R-38 for the roof insulation assembly. Refer to Specification Section 07 41 00 for insulation included as part of the roof system assembly.

D. At exterior walls where indicated on drawings, rigid continuous insulation shall be installed exterior of the wall sheathing / air barrier, including 1" rigid insulation where specifically indicated. Rigid insulation shall be suitable for the exterior wall assembly and compatible with the fluid-applied membrane air barrier, masonry anchors, flashings, storefront / curtain wall framing, sealants, and exterior cladding.

E. Not Used.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All materials specified above shall be installed as indicated on drawings and manufacturer’s instructions.

B. Unfaced fiberglass insulation shall have a flame-spread index of 25 or less and a smoke-developed index of 50 or less when tested in accordance with ASTM E84. All insulation shall meet applicable requirements of the Louisiana State Fire Marshal's Office and authorities having jurisdiction.

3.2 WORKMANSHIP

A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until satisfactory conditions are corrected.

B. Remove or protect against projections in construction framing which may damage or prevent proper insulation.

C. Install the work of this section in strict accordance with the original design, and the manufacturer's recommended installation and storage procedures as approved by the Architect, anchoring all components firmly into position.

D. Extend insulation full thickness as shown over entire surface to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation and mastic.

E. Comply with manufacturer's instructions for the particular conditions of installation in each case. If printed instructions are not available or do not apply to the project conditions, consult the manufacturer's technical representative for specific recommendations before proceeding with work.

F. Apply a single layer of insulation of the required thickness, unless otherwise shown or required to make up the total thickness.

G. Batt insulation specified herein shall be unfaced. Vapor barriers / vapor retarders, where indicated, shall be separate components installed in the locations shown on the Drawings and coordinated with the air-barrier and wall-assembly requirements.

H. Not Used.

END OF SECTION 07 21 00

SECTION 07 27 26 – FLUID APPLIED MEMBRANE AIR BARRIER

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of Fluid Applied Membrane Air Barrier as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.

B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.

C. Senergy products manufactured by Sika Corporation US are listed in this specification to establish a standard of quality. Any substitutions to this specification shall be submitted to and receive approval from the Architect at least 10 days before bidding. Proof of equality shall be borne by the submitter.

NOTE: The Fluid Applied Membrane Air Barrier shall be continuous behind all exterior claddings, including brick veneer and metal siding, and shall be coordinated at storefront / curtain wall openings, roof-to-wall transitions, flashings, penetrations, and other changes in exterior wall construction.

1.2 RELATED SECTIONS

A. Section 05 40 00 Cold-formed metal framing
B. Section 06 10 00 Rough Carpentry / Exterior Glass-Mat Gypsum Sheathing
C Section 07 21 00 Thermal Protection (Building Insulation)
D Section 07 92 00 Joint Sealants

1.3 DEFINITIONS

A. Air Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

B. Water-Resistive Barrier Assembly: The collection of water-resistive materials and accessories that direct incidental water that may pass the primary rainscreen, or condense within the drain plane, out of the wall cladding while providing protection for underlying sheathing materials.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 23 – Shop Drawings, Product Data and Samples.

B. Product Data: Provide data on Senergy Senershield-R/RS Air/Water-Resistive Barrier, product characteristics, performance criteria and limitations.

C. Code Compliance: Provide manufacturer’s applicable code compliance report.

D. Certificate: System manufacturer’s approval of applicator.

E. Sealant: Sealant manufacturer’s certificate of compliance with ASTM C1382.

F. System manufacturer’s current specifications, typical details and related product literature which indicate preparation required storage, installation techniques and jointing requirements.

1.5 PERFORMANCE REQUIREMENTS

A. General: Air barrier shall be capable of performing as a continuous vapor-permeable air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. At wall cladding transitions, the air/water-resistive barrier shall form a continuous air barrier and shall make provision for water drainage, either by creation of an unobstructed drainage plane that extends across the cladding transition or by flashing to discharge to the exterior at the transition. Air barrier assemblies shall be capable of accommodating substrate movement and sealing substrate expansion and control joints, construction material changes and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits or interruption of the drainage plane.

B. 2021 International Energy Conservation Code Requirements: Comply with IECC Section C402.5.1 for a continuous air barrier throughout the building thermal envelope.
   1. Air Barriers: The building thermal envelope shall be designed and constructed with a continuous air barrier to control air leakage into or out of conditioned space. The air barrier shall have the following characteristics:
      a. It must be continuous, with all joints made airtight.
      b. Air-barrier materials shall have an air permeability not to exceed 0.004 cfm/sq. ft. under a pressure differential of 0.3 in. water (1.57 psf) (0.02 L/sq. m @ 75 Pa) when tested in accordance with ASTM E2178. Air-barrier assemblies shall have an average air leakage not to exceed 0.04 cfm/sq. ft. at 1.57 psf (0.2 L/sq. m @ 75 Pa) when tested in accordance with ASTM E2357 or another method permitted by the 2021 IECC.
      c. It shall be capable of withstanding positive and negative combined design wind, fan and stack pressures on the envelope without damage or displacement and shall transfer the load to the structure. It shall not displace adjacent materials under full load.
      d. It shall be durable or maintainable.
      e. The air barrier shall be joined in an airtight and flexible manner to the air barrier material of adjacent systems, allowing for the relative movement of systems due to thermal and moisture variations and creep. Connection shall be made between:
         i. Foundation and walls.
         ii. Walls and windows or doors.
         iii. Different wall systems.
         iv. Wall and roof.
         v. Wall and roof over unconditioned space.
         vi. Walls, floor and roof across construction, control and expansion joints.
         vii. Walls, floors and roof to utility, pipe and duct penetrations.
      f. All penetrations of the air/water resistive barrier and paths of air infiltration/exfiltration shall be made airtight.

C. Testing:

   1. General Air/Water-Resistive Barrier Minimum Performance:

TEST	METHOD	CRITERIA	RESULTS
Water-resistive barrier coatings used under EIFS	ASTM E2570		Meets all performance requirements
Air Leakage of Air Barrier Assemblies	ASTM E2357	0.2 l/(s.m2) @75 Pa (0.04 cfm/ft2 @ 1.57 psf)	Senershield-R: 0.0007 l/s.m^2 (0.0001 cfm/ft2) @ 75 Pa (1.57 psf) positive / post conditioning Senershield-RS:0.0001 cfm/ft2 @ 1.57 psf (0.0007 l/s.m^2) @ 75 Pa) positive / post conditioning Senershield-R: 0.0014 l/s.m^2 (0.0003 cfm/ft2) @ 75 Pa (1.57 psf) negative / post conditioning SENERSHIELD-RS: 0.0003 cfm/ft^2 @ 1.57

			psf (0.0014 l/s.m2 @ 75 Pa) negative / post conditioning
Air Permeance of Building Materials	ASTM E2178	0.02 l/(s.m2) @75 Pa (0.004 cfm/ft2 @ 1.57 psf)	0.0049 l/s.m^2 @ 75 Pa (0.00098 cfm/ft2 @ 1.57 psf)
Rate of Air Leakage	ASTM E283		0.0185 l/s·m2 @ 75 Pa (0.0037 cfm/ft2 @ 1.57 psf)
Water Vapor Transmission	ASTM E96	Report value	SENERSHIELD-R - 18 Perms (grains/Hr. in Hg. ft^2) @ 10 mils wet film thickness SENERSHIELD-RS 18 Perms (grains/Hr. in Hg. ft^2) @ 12 mils wet film thickness SENERSHIELD-R/RS - 14 Perms (grains/Hr. in Hg. ft^2) @ 20 mils wet film thickness
Pull-Off Strength of Coatings	ASTM D4541	Min. 110 kPa (15.9 psi) or substrate failure	Pass - Tested over exterior gypsum sheathing, ASTM C1177 glass-mat sheathing, cement board, OSB, plywood; pvc and galvanized flashing
Nail Sealability (without Sheathing Fabric)	ASTM D1970	No water penetration at galvanized roofing nail penetration under 127 mm (5") head of water after 3 days at 4° C (40° F)	Pass
Surface Burning	ASTM E84	Flame Spread < 25 Smoke Development < 450	Meets Class A: Flame spread =15 Smoke developed = 95
Radiant Heat Multi-Story Tests	NFPA 268 & NFPA 285		Pass using many wall designs; including Senergy EIFS cladding with 12" EPS insulation
Water Resistive Barrier under EIFS	ASTM E2570	Meets all criteria in the standard	Pass
Compound Stability (Elevated Temperature	ASTM D5147 Section 15	No flowing, dripping, or drop formation up to 177° C (350° F)	Pass
Fire Resistance	ASTM E119/UL 263		Will not add or detract from the rating of a fire resistive wall assembly
Drainage Efficiency	ASTM E 2273		99%

2. SENERSHIELD-R/RS Air/Water-Resistive Barrier ICC-ES AC-212:

TEST	METHOD	CRITERIA	RESULTS
Sequential Testing: 1. Structural 2. Racking 3. Restrained Environmental Conditioning 4. Water Penetration	1. ASTM E 1233 Procedure A 2. ASTM E 72 3. ICC-ES AC-212 4. ASTM E 331	No cracking at joints or interface of flashing No water penetration after 15 min @ 137 Pa (2.86 psf)	Pass - Tested over OSB and gypsum sheathing No water penetration after 90 min @ 299 Pa (6.24 psf)
Sequential Testing: 1. UV Light Exposure 2. Accelerated Aging 3. Hydrostatic Pressure Test	1. ICC-ES AC-212 2. ICC-ES AC-212 3. AATCC 127-1985	No cracking or bond failure to substrate No water penetration after 21.7 in (550 mm) water for 5 hours	Pass
Freeze-Thaw	ASTM E 2485 (Method B)	No sign of deleterious effects after 10 cycles	Pass - Tested over exterior gypsum sheathing, ASTM C1177 glass-mat sheathing, cement board, OSB, plywood
Water Resistance	ASTM D2247	No deleterious effects after 14-day exposure	Pass - Tested over exterior gypsum sheathing, ASTM C1177 glass-mat sheathing, cement board, OSB, plywood
Tensile Bond	ASTM C 297	Minimum 103 kPa (15 psi)	Pass - Tested over exterior gypsum sheathing, ASTM C1177 glass-mat sheathing, cement board, OSB, plywood, CMU; pvc and galvanized flashing
Tensile Bond (after freeze-thaw)	ASTM C 297	Minimum 103 kPa (15 psi) avg; no failure after 10 cycles freeze-thaw	Pass

3. SENERSHIELD-R/RS Air/Water-Resistance Barrier ICC-ES AC 148:

TEST	METHOD	CRITERIA	RESULTS
Sequential Testing: 1. UV Light Exposure 2. Accelerated Aging 3. Hydrostatic Pressure Test	1. ICC-ES AC 148 2. ICC-ES AC 148 3. AATCC 127-1985	No cracking or bond failure to substrate No water penetration after 21.7 in (550 mm) water for 5 hours	Pass
Peel Adhesion	ASTM D 3330	After UV Exposure	Pass - tested over ASTM C1177 glass-mat

	Method F	After Accelerated Aging After Elevated Temperature Exposure After Water Immersion	sheathing, OSB, plywood, PVC and uncoated aluminum
Nail Sealability after Thermal Cycling	ASTM D 1970 (Modified), AAMA 711	No water penetration at galvanized roofing nail penetration under 31 mm (1.2") head of water after 24 hours at 4° C (40° F)	Pass
Tensile Strength after UV Exposure	ASTM D 5034, AAMA 711	Minimum 0.5 N/mm (2.9 lbs./in)	Pass
Cold Temperature Pliability	ASTM D 1970, AAMA 711	No cracking after bending around a 25 mm (1") mandrel after 2-hour exposure to -18° C (0° F)	Pass
Resistance to Peeling	AAMA 711	No signs of distress or failure after 24 hours of exposure at room temperature, 50° C (122° F), 65° C (149° F), 80° C (176° F)	Pass

4. SikaWall MaxFlash AAMA 714-15:

TEST	METHOD	CRITERIA	RESULTS
Peel Adhesion	ASTM C794 Control AAMA 714 Sec 5.1 UV exposure Sec 5.3, ASTM G154 Elevated temperature AAMA 714 Sec 5.4 Thermal cycling AAMA 714 Sec 5.5 7 day water immersion AAMA 714 Sec 5.7	Tested over ASTM C1177 sheathing, plywood, OSB, concrete (mortar), CMU, galvanized steel, aluminum	Pass control and after conditioning, min. 5 pli
Crack Bridging	AAMA 714 Sec 5.6, ASTM C1305	No failure after 10 cycles with 1/8" gap and water holdout of 550 mm (21.7") for 24 hours, tested at 60 mils per ASTM C1305	Pass
Nail Sealability	AAMA 714 Sec 5.2 (AAMA 711 Sec 5.2), modified ASTM D1970 sec 7.9	No failure before and after thermal cycling, 24 hours at 40°F with 31.75 mm (1 ¼") head of water	Pass
Accelerated Aging	AAMA 714 Sec 5.3, ASTM G154, Cycle 1	No deleterious effects such as wrinkling, distortion, blistering, expansion, shrinkage or warpage after 14 days (336 hours) to Cycle 1 of G154	Pass
Elevated Temperature	AAMA 714 Sec 5.4	No deleterious effects such as wrinkling, distortion, blistering, expansion, shrinkage or warpage at 50°C (122°F), 65°C (149°F) and 80°C (176°F)	Pass
Thermal Cycling	AAMA 714 Sec 5.5	No deleterious effects such as wrinkling, distortion, blistering, expansion, shrinkage or warpage after 10 cycles	Pass
Water Immersion	AAMA 714 Sec 5.7	No deleterious effects such as wrinkling, distortion, blistering, expansion, shrinkage or warpage after 7 days	Pass
Adhesion to Damp Substrates	AAMA 714 Sec 6.1 and 6.2	Minimum 5 pli, over OSB and mortar (absorptive substrates)	Pass
Water Vapor Permeability	AAMA 714 Sec 6.3, ASTM E96 Method B	0.2 l/(s.m2) @75 Pa (0.04 cfm/ft2 @ 1.57 psf)	19.9 perms @ 12 mils 7.2 perms @ 30 mils

Note: all testing with MaxFlash at 12 mils unless otherwise noted

5. SikaWall MaxFlash AAMA 711-13 - Voluntary Specification for Self-Adhering Flashing Used for Installation of Exterior Wall Fenestration Products

TEST	METHOD	CRITERIA	RESULTS

Peel Adhesion	ASTM D3330 Method F Control AAMA 711 Sec 5.3 UV exposure Sec 5.4, ASTM G154 Elevated temperature AAMA 711 Sec 5.5 Thermal cycling AAMA 711 Sec 5.6 7 day water immersion AAMA 711 Sec 5.8	Tested over ASTM C1177 sheathing, plywood, OSB, PVC, galvanized steel, aluminum	Pass control and after conditioning, minimum 1.5 pli
Tensile Strength	AAMA 711 Sec 5.1 ASTM D 1970 Sec. 7.9	Minimum 2.9 pli	Pass at 42 and 30 mils
Nail Sealability	AAMA 711 Sec 5.2 (AAMA 711 Sec 5.2), modified ASTM D1970 sec 7.9	No failure before and after thermal cycling, 24 hours at 40°F with 31.75 mm (1 ¼") head of water	Pass
Accelerated Aging	AAMA 711 Sec 5.4, ASTM G154, Cycle 1	No deleterious effects such as wrinkling, distortion, blistering, expansion, shrinkage or warpage after 14 days (336 hours) to Cycle 1 of G154	Pass
Elevated Temperature	AAMA 711 Sec 5.5	No deleterious effects such as wrinkling, distortion, blistering, expansion, shrinkage or warpage at 50°C (122°F), 65°C (149°F) and 80°C (176°F)	Pass
Thermal Cycling	AAMA 711 Sec 5.6	No deleterious effects such as wrinkling, distortion, blistering, expansion, shrinkage or warpage after 10 cycles	Pass
Cold Temperature Pliability	AAMA 711 Sec. 5.7 ASTM D1970 Sec 7.6	No cracking of samples bent around 25 mm (1") mandrel at -18°C (0°F) and -29°C (-20°F)	Pass at 12 and 30 mil
Water Immersion	AAMA 711 Sec 5.8	No deleterious effects such as wrinkling, distortion, blistering, expansion, shrinkage or warpage after 7 days	Pass
Peeling Resistance	AAMA 711 Sec 5.9, Annex 2	No signs of peeling after 7 days exposure to elevated temperatures - 50°C (122°F), 65°C (149°F) and 80°C (176°F)	Pass

6. SikaWall MaxFlash ICC-ES AC-212

TEST	METHOD	CRITERIA	RESULTS
Sequential Testing: 1. Structural 2. Racking 3. Restrained Environmental Conditioning 4. Water Penetration	AC-212 Sec 4.2 1. ASTM E 1233 2. ASTM E 72 3. AC-212 Sec. 4.7.3 4. ASTM E 331	No cracking at joints or interface of flashing No water penetration after 15 min @ 137 Pa (2.86 psf)	Pass - Tested over OSB and gypsum sheathing No water penetration after 90 min @ 299 Pa (6.24 psf) or 575 Pa (12psf)
Weather Testing Sequential: 1. UV Light Exposure 2. Accelerated Aging 3. Hydrostatic Pressure Test	AC-212 Sec 4.8 1. AC-212 Sec. 4.8.1 2. AC-212 Sec 4.82.2 3. AATCC 127	No cracking or bond failure after 210 hrs. No cracking or bond failure after 25 cycles No water penetration under 550 mm (21.7") head of water	Pass
Freeze-Thaw	AC-212 Sec. 4.2	10 cycles, no deleterious effects such as cracking, checking, crazing or erosion, viewed at 5x magnification	Pass
Water Resistance	AC-212 Sec. 4.3 ASTM D2247	No deleterious effects after 14-day exposure	Pass - Tested over exterior gypsum sheathing, ASTM C1177 glass-mat sheathing, cement board, OSB, plywood

Tensile Bond	ASTM C 297	Minimum 103 kPa (15 psi)	Pass - Tested over exterior gypsum sheathing, ASTM C1177 glass-mat sheathing, cement board, OSB, plywood, CMU; pvc and galvanized flashing
Tensile Bond	AC-212 Sec. 4.1 ASTM C 297	Minimum 103 kPa (15 psi) avg; no failure after 10 cycles freeze-thaw	Pass 105 kPa (15 psi) - Tested over ASTM C1177 sheathing, plywood, OSB, cement board, PVC, aluminum, galvanized steel and stainless steel
Water Vapor Permeability	AC-212 Sec. 4.4 ASTM E96 Method B	Report Value	19.9 perms @ 12 mils 7.2 perms @ 30 mils
Water Penetration	AC-212 Sec, 4.5 ASTM E331	No water penetration at: 137 Pa (2.86 psf) 299 Pa (6.24 psf) 575 Pa (12 psf)	Pass, testing performed with MaxFlash exposed over sheathing joints.
Air Permiance of Building Materials	ASTM E2178	0.02 l/(s.m2) @75 Pa (0.004 cfm/ft2 @ 1.57 psf)	0.00410 L/s-m2 @ 75 Pa (0.00082 cfm/ft2 @ 1.57 psf) Performed on 12 mil thick free film sample

Note: all testing with MaxFlash at 20 mils unless otherwise noted

7. General Liquid Flashing Minimum Performance:

TEST	METHOD	CRITERIA	RESULTS
Air Permiance of Building Materials	ASTM E2178	0.02 l/ (s.m2) @75 Pa (0.004 cfm/ft2 @ 1.57 psf)	0.00410 L/s-m^2 @ 75 Pa (0.00082 cfm/ft^2 @ 1.57 psf), performed on free film sample
Air Leakage of Air Barrier Materials	ASTM E2357	0.2 l/ (s.m2) @75 Pa (0.04 cfm/ft2 @ 1.57 psf)	TBD
Nail Sealability	ASTM D1970 Sec. 7.9	No water penetration at galvanized roofing nail penetration under 127 mm (5") head of water after 3 days at 4° C (40° F)	Pass, before and after thermal cycling, 3 days at 40°F with 127 mm (5") head of water
Surface Burning	ASTM E84	Flame Spread < 25 Smoke Development < 450	Pass, tested at 30 mils

1.6 QUALITY ASSURANCE

A. Manufacturer: More than 10 years in the air/water-resistive barrier and exterior wall systems industry, with demonstrated successful installations on projects of similar type and scope.

B. Applicator: Approved by Sika Facades in performing work of this section.

C. Regulatory Requirements: Conform to applicable code requirements for air/water resistive barriers.

D. Source Limitations: Obtain primary air-barrier material and through wall flashing through one source from or approved by a single manufacturer.

E. Mockups: Before beginning installation of air barrier, provide air barrier work for exterior wall assembly mockups, incorporating backup wall construction, external cladding, window, door frame and sill, insulation, and flashing to demonstrate surface preparation, crack and joint treatment, and sealing of gaps, terminations, and penetrations of air barrier membrane.
   1. Coordinate construction of mockup to permit inspection by Owner's testing agency of air barrier before external insulation and cladding is installed.
   2. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.

F. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Pre-installation conference shall include the Contractor, installer, Architect, and system manufacturer's field representative. Agenda for meeting shall include but not be limited to the following:
   1. Review of submittals.
   2. Review of surface preparation, minimum curing period and installation procedures.
   3. Review of special details and flashings.

4. Sequence of construction, responsibilities and schedule for subsequent operations.
5. Review of mock-up requirements.
6. Review of inspection, testing, protection and repair procedures.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle products per manufacturer's instructions.

B. Deliver Senergy Senershield-R/RS and associated materials in original unopened packages with manufacturer's labels intact.

C. Protect Senergy Senershield-R/RS and associated materials during transportation and installation to avoid physical damage.

D. Store Senergy Senershield-R/RS in cool, dry place protected from freezing. Store at no less than 4°C/40°F.

E. Store Senergy Senershield-R/RS and associated materials protected from direct sunlight and extreme heat.

F. Store SikaWall Sheathing Fabric and SikaWall Flash Seal NP flexible flashing in cool, dry place protected from exposure to moisture.

G. Store SikaWall MaxFlash at a minimum of 40°F. In cold weather, keep containers at room temperature for at least 24 hours before using.

1.8 PROJECT/SITE CONDITIONS

A. Do not apply Senergy Senershield-R/RS in ambient temperatures below 25°F(-4°C). Provide properly vented, supplementary heat during installation and drying period when temperatures less than 25°F(-4°C) prevail.

B. Cold temperature application less than 40°F (4°C) down to 25°F (-4°C): expect extended dry time. Final air/water-resistive properties and film durability rely on temperatures rising above freezing (32°F/0°C)

C. Do not apply Senergy Senershield-R/RS and associated materials to frozen surfaces.

D. 40°F (4°C) and rising allow to dry completely, typically 2-10 hours before proceeding with cladding installation. 40°F (4°C) down to 25°F (-4°C): when applied at a 12-mil wet film thickness, typically dry in approximately 12 hours at 32°F (0°C) and 50% relative humidity (RH).

E. Limit exposure of Senergy Senershield-R/RS and associated products to a maximum of 180 days.

1.9 SEQUENCING AND SCHEDULING

A. Coordinate and schedule installation of Senergy Senershield-R/RS and associated materials with related work of other sections.

B. Coordinate and schedule installation of flashing and joint sealers to prevent water infiltration behind the exterior cladding system.

1.10 WARRANTY

A. Material Warranty: Provide Sika standard warranty for Senergy Senershield-R/RS installations under provisions of Section 01 77 00 – Closeout Procedures.

1. Comply with Sika Facades applicator approval requirements and notification procedures to assure qualification for warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Senergy Senershield-R/RS Air/Water-Resistive Barrier manufactured by Sika Corporation US.

2.2 MATERIALS

A. Air/Water Resistive Barrier Components:
   1. Air/Water-Resistive Barrier:
      a. Senershield-R: A one-component fluid-applied vapor permeable air/water-resistive barrier. Senershield-RS may be provided where spray application is proposed and approved.
   2. Rough Opening and Joint Treatment:
      a. SikaWall Sheathing Fabric: A spun-bonded non-woven reinforced polyester web for use with Senergy fluid-applied air/weather-resistive barriers.
      b. SikaWall MaxFlash: A one-component elastomeric material for use as a flexible flashing membrane.
   3. SikaWall Flash Seal NP Transitional Membrane / Expansion Joint Flashing: A 32-mil thick, self-adhering and self-sealing composite membrane of polyester fabric and butyl adhesive. Compatible with Senergy liquid air/weather-resistive barriers.

2.3 ACCESSORIES

A. Sprayed Polyurethane Foam Sealant: 1- or 2-component, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0 lb/cu. ft (24 to 32 kg/cu. m) density; flame spread index of 25 or less according to ASTM E162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

B. Joint Sealant: reference Acceptable Sealant for use with Senergy Air/Water-Resistive Barriers Technical Bulletin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site Conditions:
   1. Verify project site conditions.

B. Walls:
   1. Substrates:
      a. Acceptable substrates for this Project include 5/8-inch ASTM C1177 glass-mat gypsum board sheathing and exterior plywood where specifically indicated on the Drawings. Substrates shall be approved by Sika for the selected Senershield-R/RS application. Consult Sika Facades Technical Services Department for other applications.
      b. Wall sheathing must be securely fastened per applicable building code and sheathing manufacturer’s requirements.
      c. Examine surfaces to receive Senershield-R/RS air/water-resistive barrier and verify that substrate and adjacent materials are dry, clean, sound, and free of releasing agents, paint, or other residue or coatings. Verify substrate is flat, free of fins or planar irregularities greater than 6.4 mm in 3 m (1/4" in 10').
      d. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263.

e. Verify that masonry joints are struck flush and completely filled with mortar.

2. Flashings:
   a. All flashings are by others and must be installed in accordance with specific manufacturer's requirements. Where appropriate, end-dams must be provided.
   b. Openings must be flashed prior to window/door, HVAC, etc. installation. Refer to SikaWall Flash Seal NP product data and the Senergy Air/Water-Resistive/Vapor Barrier Application Guidelines for further information.
   c. Windows and openings shall be flashed according to design and Building Code Requirements.
   d. Individual windows that are ganged to make multiple units require continuous head flashing and the joints between the units must be fully sealed.
3. Roof:
   a. Verify roof and roof-to-wall flashings have been installed and coordinated in accordance with Section 07 41 00, the standing-seam metal roofing manufacturer's requirements, and the Contract Drawings so continuity of the air barrier is maintained.
4. Kick-out flashing:
   a. Kick-out flashing must be installed leak-proof and angled (min 100°) to allow for proper drainage and water diversion.

C. Do not proceed until all unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect all surrounding areas and surfaces from damage and staining during application of Senergy Senershield-R/RS Air/Water-Resistive Barrier.

B. Protect finished work at end of each day to prevent water penetration.

C. Substrate preparation: Prepare substrates in accordance with Senergy / Sika instructions.

3.3 MIXING

General: No additives are permitted unless specified in product mixing instructions. Close containers when not in use. Prepare in a container that is clean and free of foreign substances. Do not use a container which has contained or been cleaned with a petroleum-based product. Clean tools and equipment with water immediately after use. Dried material can only be removed mechanically.

A. Air/Water-Resistive Barriers:
   1. Senershield-R/RS: Mix with a clean, rust-free paddle and drill until thoroughly blended. Do not add water.

3.4 APPLICATION

A. Air/Water Resistive Barrier:
   1. Substrate shall be installed per substrate manufacturer's instructions. Substrate shall be dry, clean, sound and free of release agents, paint or other residue or coatings. Verify substrate is flat, free of fins or planar irregularities greater than 6.4 mm in 3 m (1/4" in 10'). Unsatisfactory conditions shall be reported to the general contractor and corrected before application of the air/water-resistive barrier materials.
   2. Rough Openings:
      a. Apply a bead of SikaWall MaxFlash in each corner of the rough opening, ensuring that corners are fully sealed. Where wood bucks are used, apply a bead of SikaWall MaxFlash into gaps between bucks and

between the buck and building structure. Apply additional SikaWall MaxFlash in a zigzag pattern onto head, sill, jambs and exterior substrate. Spread SikaWall MaxFlash evenly across the rough opening to form a uniform, continuous, void and pinhole-free membrane with a 12-20 mil thickness. Extend SikaWall MaxFlash membrane minimum 4 inches onto the exterior wall, maintaining 12-20 mil thickness. Allow SikaWall MaxFlash to skin before applying fluid-applied air/water-resistive barrier to sheathing. Lap the air/water-resistive barrier a minimum of 2 inches onto SikaWall MaxFlash, creating a continuous, monolithic air/water-resistive barrier membrane. Allow SikaWall MaxFlash to cure prior to installation of windows, doors and other wall assemblies.

3. Sheathing Joints:
   a. SikaWall Sheathing Fabric: Spot all fasteners and precoat sheathing joints, terminations, inside and outside corners with mixed Senershield-R/RS using a 101 mm (4") wide by 20 mm (3/4") nap roller, brush or spray. Immediately place and center SikaWall Sheathing Fabric over wet Senershield-R/RS at all sheathing joints, terminations, inside and outside corners. Ensure SikaWall Sheathing Fabric extends evenly on both sides of the sheathing joint. Completely saturate SikaWall Sheathing Fabric with Senershield-R/RS. Lap SikaWall Sheathing Fabric 63.5 mm (2-1/2") minimum at intersections. If using roller, brush, or trowel application, allow to dry to the touch before applying Senershield-R/RS to the entire wall surface. If spraying, wet-on-wet application is acceptable.
4. Field of Substrate:
   a. Apply Senershield-R/RS to the ASTM C1177 glass-mat gypsum board sheathing and exterior plywood where indicated on the Drawings:
      • Senershield-R: Apply with a 20 mm (3/4") nap roller, stainless steel trowel, brush or spray gun to a consistent minimum 10 wet mil thickness, free of voids and pinholes. Senershield-RS: Apply to ASTM C1177 sheathing at a consistent minimum 12 wet mil thickness, free of voids and pinholes. Back rolling may be required to produce a pinhole-free film. Refer to current Sika spray-application instructions when spray application is used.
5 Limit weather exposure of Senershield-R/RS to a maximum of 180 days for the mechanically attached brick veneer and metal siding assemblies used on this Project. Verify surfaces are free of dirt, contaminants, damage, or other deleterious conditions before installation of insulation or cladding. Report and correct unacceptable conditions prior to covering the air barrier.

B. Transition Membrane Installation
1. Install Senershield-R/RS, SikaWall Sheathing Fabric and/or SikaWall Flash Seal NP and sealant in accordance with project details and specifications to form a seal with adjacent construction and maintain a continuous air/water-resistive barrier.
   a. General Contractor shall coordinate installation of the wall air barrier with the standing-seam metal roofing assembly, roof underlayment / air-control layers, and roof-to-wall flashings to maintain continuity of the building air barrier.
   b. Provide transition membrane with a minimum of 75 mm (3") coverage onto both adjacent substrates, unless a greater lap is required by the manufacturer or Contract Drawings.
2. Remove usable size of the release film immediately before application and center the SikaWall Flash Seal NP over the area to be sealed. Using a wallpaper roller, extension-handled countertop roller or weighted hand roller, firmly roll the SikaWall Flash Seal NP to the area being sealed. As the SikaWall Flash Seal NP is applied, pull more of the release film, exposing the adhesive surface, pressing down with a roller and keeping the SikaWall Flash Seal NP smooth.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Inspections: Air barrier materials and installation are subject to inspection for compliance with requirements. Inspections may include the following:
   1. Continuity of air barrier system has been achieved throughout the building envelope with no gaps or holes.
   2. Continuous structural support of air barrier system has been provided.
   3. Masonry and concrete surfaces are smooth, clean and free of cavities, protrusions, and mortar droppings.
   4. Site conditions for application temperature and dryness of substrates have been maintained.
   5. Maximum exposure time of materials to UV deterioration has not been exceeded.
   6. Surfaces have been primed, if applicable.
   7. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fish mouths.
   8. Termination sealant has been applied on cut edges.
   9. Strips and transition strips have been firmly adhered to substrate.
   10. Compatible materials have been used.
   11. Transitions at changes in direction and structural support at gaps have been provided.
   12. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, preparation and priming of surfaces, structural support, integrity, and continuity of seal.
   13. All penetrations have been sealed.

C. Tests: Testing to be performed will be determined by Owner's testing agency from among the following tests:
   1. Qualitative Testing: Air barrier assemblies will be tested for evidence of air leakage according to ASTM E1186, smoke pencil with pressurization or depressurization.

D. Remove and replace deficient air barrier components and retest as specified above.

3.6 CLEANING AND PROTECTION

A. Protect air barrier system from damage during application and remainder of construction period.

B. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace air barrier exposed beyond the manufacturer’s permitted exposure period; maximum exposure for Senershield-R/RS shall not exceed 180 days.

C. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

D. Remove masking materials after installation.

END OF SECTION 07 27 26

SECTION 07 41 13 - METAL ROOF PANELS 238 T

PART 1 - GENERAL

1.1 SCOPE

A. The contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of Metal Roof Panels 238 T as shown on drawings and as specified in accordance with provisions of the contract documents and completely coordinated with that of all other trades.

B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.

1.2 SUMMARY

A. SECTION INCLUDES
   1. Standing-seam metal roof panels, including trim and accessories
   2. RELATED SECTIONS
      a) Section 07 21 00 – Thermal Protection
      b) Section 07 60 00 – Flashing and Sheet Metal
      c) Section 07 92 00 – Joint Sealants

1.3 REFERENCES

A. AISI S-100 – North American Specification for the Design of Cold-Formed Steel Structural Members.
B. ASCE-7: American Society of Civil Engineers -Minimum Design Loads for Buildings and Other Structures; version adopted by local Building Code authority having jurisdiction.
C. ASTM A792 - Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
D. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding System by Uniform Static Air Pressure Difference
E. ASTM E1646 - Standard Test Method for Rate of Water Penetration Through Exterior Metal Roof Panel Systems By Uniform Static Air Pressure Difference.
F. ASTM E1680 - Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems.
G. ASTM E2140 - Standard Test method for water penetration of metal roof panel systems by static water pressure head.
H. Factory Mutual 4471 Appendix G - Susceptibility to Leakage Test Procedure for Class 1 Panel Roofs.
I. UL 580 - Tests for Uplift Resistance of Roof Assemblies.
J. UL 1897 - Uplift Tests for Roof Covering Systems.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Pre-installation Meetings:
   1. Schedule meeting to discuss roof project requirements, substrate conditions, manufacturer’s installation instructions, and manufacturer’s warranty requirements before start of work onsite.
   2. Required attendees: Contractor, metal deck & roof installer, and any other subcontractors who have equipment penetrating the roof or Work that requires roof access or traffic.

1.5 SUBMITTALS

A. Product Data: Manufacturer literature indicating product specifications, installation instructions, and standard construction details for specified products.

B. Shop Drawings: To be prepared by metal roof system manufacturer.

1. Submit roof plan showing panel layout, profiles, components, accessories, finish colors, gutters and downspouts as applicable.
    a) Indicate layout of roofing panels and roof panel sizes, including custom fabricated roofing panels if indicated, indicate each trim condition.
    b) Include details of each condition of installation, including the locations and types of fasteners, sealants and accessories. Indicate locations, gauges, shapes, and methods of attachment of all panels, accessories and trim.
    c) Indicate products/materials required for construction activities of this section not supplied by manufacturer of products of this section.
    d) Indicate locations of field applied sealant.
    e) Indicate locations of field worked conditions.
2. Roof Panel Attachment:
    a) Roof plan with wind uplift pressure calculations at field, corner and perimeter areas according to version of ASCE-7 referenced by locally-adopted Building Code and the authority having jurisdiction.
    b) Roof plan indication roof clip spacing pattern at field, corner, perimeters and where panels are to be fixed from thermal movement.
    c) Roof panel attachment plan must be stamped by licensed engineer in State in which project is constructed, certifying roof attachment meets local Building Code requirements for wind uplift.

C. Samples:
1. Submit two samples, 12" long, full width panel, showing metal gage, and seam.
2. Two samples each for roof panel clip, bearing plate and clip fastener.
3. Submit color samples for Architect's selection.
4. Submit sample warranties:
    a) Manufacturer Finish Warranty
    b) Manufacturer Weathertightness Warranty complying with this Specification
    c) Installer Warranty

D. Certificates:
1. Submit roof panel manufacturer's certification that fasteners, clips, backup plates, closures, roof panels and finishes meet the specification requirements.
2. Submit roof panel manufacturer’s certification that installer meets requirements to install roof system and is qualified to obtain required warranties.

E. Delegated Design Submittals: Submit engineering calculations indicating wind uplift pressure calculations according to local building code for project location with respect to appropriate Importance Factor, Exposure category and Safety Factor. Calculations shall be sealed by a professional engineer licensed to practice structural engineering in the state in which project is located.

F. Test and Evaluation Reports - Certified test results that indicate roof system meets or exceeds design and performance criteria. Testing to include:
1. Static Water Testing Certification: Manufacturers test data, signed and sealed by a registered professional engineer, in accordance with FM4471 Appendix G, and pass with no leakage. The test specimen must successfully withstand being submerged under 6” of water for a minimum period of 7 days.
2. ASTM E1680 - Manufacturer’s test data, signed and sealed by a registered professional engineer, for air infiltration rates meeting the following:
    a) 16” panel width - 0.0028 cfm/sf maximum at a differential pressure of +/- 20 pounds per square foot.
3. ASTME1646 - Manufacturer’s test data, signed and sealed by a registered professional engineer, indicating no water penetration up to 20 pounds per square foot differential pressure.
4. ASTM E1592 - Manufacturers test data, signed and sealed by a registered professional engineer, substantiating that roof system will meet the allowable wind pressures using an appropriate Factor of Safety in accordance with AISI S-100.

5. ASTM E2140 - Manufacturers test data, signed and sealed by a registered professional engineer, on a test specimen with no end lap, indicating that no water leakage was observed during the testing period of 6 hours with a 6” water head on the specimen.

G. Qualification Statements: For Manufacturer and Installer.

H. The roofing system product supplier shall furnish the Roofing Contractor with Material Safety Data Sheet/Sheets (MSDS), incorporating OHSA approved form, current edition. Said sheets shall be available at the site at all times until project completion.

I. **The Roofing Contractor shall submit to the Architect, in a ring binder, two copies of all roofing data, including manufacturer's catalogs/manuals of materials and accessories used in the Project for distribution to the Owner.**

J. Manufacturer: Submit Assembly letter describing the designed roofing assembly and all associated materials needed to obtain the manufacturer's 20 year warranty. The letter shall be used by the Designer at the Pre-App. Conference to verify that the correct materials are on site prior to work proceeding.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Manual indicating requirements and recommendations, to maintain the roof system, in good working condition.

B. Warranty Documentation: Submit final warranties required in this section.

1.7 QUALITY ASSURANCE

A. Qualifications:
1. Manufacturer Qualifications: Manufacturer shall have a minimum of ten years experience in the manufacturing of metal roof systems similar to those required for this project. Manufacturer must have a current installer training program.
2. Installer Qualifications: Installer ("roofer") to perform the work of this section, shall have no fewer than 5 years of successful experience with the installation of metal roof systems similar to those required for this project. **The installer shall be an approved applicator by manufacturer prior to bid.**

B. Field Measurements: Prior to fabrication of panels, take field measurements of structure or substrates to receive panel system. Allow for trimming panel units, where final dimensions cannot be established prior to fabrication.

C. Mock-Ups: Install a 10 foot wide, quality control area of metal roofing, for review by the Architect. The Architect shall approve the quality of installation for the roof, prior to installing additional metal panels.

D. **Pre-Roofing Conference:** Before the roofing work is scheduled to commence, after shop drawings have been reviewed by the Architect, and before any materials are ordered, **a conference shall be called at the jobsite by the Contractor for the purpose of reviewing the drawings and specifications.** The intent is to resolve questions before the work is started. The conference shall be attended by the roofing contractor, and his foreman, General Contractor's Superintendent roof manufacturer’s representative as well as the Architect's representative.

E. **Pre-application Conference:** Before the roofing work is scheduled and within one week of roofing application is to commence, after shop drawings have been reviewed by the Architect, a conference shall be held at the jobsite for the purpose of a final review of drawings and specifications. The intent is to resolve questions before any work is started. (The manufacturer's representative shall be present.)

F. **At start up, prior to completion and at completion,** the roofing contractor must inspect the roof and issue to the Architect a certificate stating that the material and workmanship on the project are in compliance with the requirements and specifications of the manufacturer for an installation complying with a 20 year unlimited guarantee/warranty. At the completion visit, the contractor shall make a punch list of items to be completed with a dollar value and shall revisit the project to confirm that all punch list items have been completed. **(The Architect shall be sent a copy of this punch list.)**

G. The Owner may, at their option, select and employ at the Owner's expense a roofing system consultant to review the construction documents and/or perform surveillance during any installation of substrate, roofing, flashing and any other part of the total roofing system.
   1. An independent roofing inspection service specializing in performing Non-Destructive Evaluation for moisture detection purposes, before the final acceptance of the roofing or before the end of the roofing Guarantee Period.
   2. Have a full time representative on sit during the roofing installation, Additionally, the Owner will conduct a moisture survey using the Owners own forces and equipment prior to the Department's approval and acceptance of the roof.

1.8 DELIVERY, STORAGE AND HANDLING

A. Delivery and Acceptance Requirements: Deliver panels to jobsite properly packaged to provide protection against transportation damage. Panels too long to ship shall be site formed onto the roof by manufacturer's factory personnel using manufacturer's factory roll forming equipment.

B. Storage and Handling Requirements:
   1. Exercise care in unloading, storing and erecting panels to prevent bending, warping, twisting, and surface damage.
   2. Store all material and accessories above ground on well skidded platforms. Store under waterproof covering. Provide proper ventilation to panels to prevent condensation build-up between each panel.
   3. Remove from site and replace panels which are damaged, or become water-stained during storage and handling.

1.9 WARRANTIES

A. Manufacturer Warranties:

   1. Panel Material: Furnish manufacturers 50 year warranty covering the panel against rupture, structural failure, or perforation.

   2. Panel Coating: Furnish manufacturer's 20-year finish warranty covering the factory-applied finish against cracking, checking, peeling, excessive fading, and excessive chalking.
   3. Metal Roof Weathertightness Warranty:
      a) Manufacturer's Single Source Weathertightness Warranty
         (1) Provide FP&C Twenty (20) Year Weathertightness Metal Roof System - Limited Warranty, State Form 28d, included in the Contract Documents.
         (2) Total manufacturer's liability: NRL (No Repair Limit)
         (3) Warranty shall cover Contractor workmanship and material defects and repair of leaks in the complete roofing system in accordance with State Form 28d.
         (4) Warranty shall include provisions for satisfactorily drying wetted thermal roof insulation caused by covered leaks.

B. Roofing Contractor's Guarantee: Provide FP&C R-3 Roofing Guarantee (Metal) included in the Contract Documents.

1. Guarantee term: Two (2) years commencing on the Acceptance Date of the Project.
2. Guarantee shall cover preformed, prefinished metal roofing, flashing, accessories, and miscellaneous items required for the complete roof system against water entry from faulty or defective materials and workmanship, in accordance with Form R-3.

PART 2 - PRODUCTS

2.1 ROOF PANEL SYSTEM

A. Basis of Design: 238T by McElroy Metal, Inc. Bossier City, LA,
1. Other Approved manufactures:
a. Berridge Manufacturing – Tee-Lock
b. Or prior approved equal.

B. Substitution Limitations
1. Requests for approval must be submitted in writing at least ten (10) days prior to bid date, and are accompanied by all related test reports and design calculations listed in section 1.4 and Design and Performance criteria Section 2.2.
2. Substitute manufactures will be approved by written addendum to all bidders. Voluntary alternates will not be considered. Substitutions will not be permitted after the bid date of this project.
3. Roof panels proposed for substitution shall fully comply with specified requirements in appearance, assembly, and performance.

C. Product Options
1. Factory-formed panel, width of 16” inches. Panels shall be symmetrical in design and shall be mechanically seamed with a field operated electric seaming machine approved by the manufacturer.
2. Minimum seam height 2 3/8 inches. Integral seam, double lock and snap together type panels are not acceptable
3. Seam cap matching panel finish with two rows of integral factory hot applied sealant. Sealant should not come in contact with clip, and clip should not require sealant to maintain a weathertight condition.
4. Galvalume coated sheet steel, Type AZ-50, Grade 50 as described in ASTM A792; 24 gauge.
5. Finish: Two coat coil applied, baked-on full-strength (70% resin, PVF2) fluorocarbon coating consisting of a nominal 0.25 mil dry film thickness primer, and a nominal dry film thickness of 0.7 - 0.8 mil color coat for a total 0.9 to 1.1 mil total system dry film thickness. Finish to be selected from manufacturer’s standard color selection. The back side of the material should be 0.25 mil primer and 0.25 mil polyester wash coat.
6. Roof panel system must allow individual roof panel removal and replacement from any point on the roof without damage to adjacent roof panel(s).
7. Roof panel system must be approved by manufacturer to be installed on slopes as low as ½:12.
8. Panels must be furnished and installed in continuous lengths from ridge to eave with no overlaps. Panels too long to ship will be manufactured on site using manufacturer’s employees and equipment.
9. Panel surface characteristics to be Striated.
10. Manufacturer weathertightness warranty meeting requirements of this Section.

2.2 PERFORMANCE/DESIGN CRITERIA

A. Thermal Movement: Metal Roofing system, including flashing, shall accommodate unlimited thermal movement without buckling or excess stress on the structure.

B. Roof panel and trim attachments will be designed to satisfy the requirements of the roof design (shown in shop drawings).

C. Maximum wind uplift capacity of roof system shall be determined using ASTM E 1592 test results, with an appropriate Factor of Safety in accordance with AISI S-100.

D. Panel system shall be designed in accordance with the local building code and ASCE7 for project location with respect to appropriate Exposure category, Importance Factor and Factor of Safety in accordance with AISI S-100.

E. Tested and listed by Underwriters Laboratories to comply with UL 580 for wind uplift Class 90 rating.

2.3 ACCESSORIES

A. Panel Clip Screw - screw required in wind uplift rating requirements and design specification for application, with corrosion-resistant coating, in length necessary to penetrate substrate minimum 3/4 inch., as supplied by roof panel manufacturer.

B. Roof Panel Clip:
1. Intermittent Clip: 16 gauge galvanized steel, one-piece, designed to allow roof panel thermal movement and not contact roof panel cap, as supplied by roof panel manufacturer, meeting wind uplift requirements and design criteria of this section.
2. Intermittent Clip Bearing Plate: If required, in gauge, size and finish as supplied by and approved by roof panel manufacturer for use in roof panel manufacturer's full assembly warranted systems.
3. Multi-Span Clip: as provided by roof panel manufacturer for full assembly warranted systems.

C. Trim and flashing will be of the same gauge and finish unless approved otherwise by the metal roof system manufacturer.
1. Ridge closures, consisting of metal channel surrounding factory precut closed cell foam, will not be secured through the field of the panel.
2. Trim will be installed specifically as displayed in the manufacturer provided shop drawings. Proposed changes must be approved in writing by the metal roof system manufacturer.

D. Concealed supports, angles, plates, accessories and brackets: gauge and finish as recommended, and furnished by manufacturer.

E. Accessory Screw: Size and screw type as provided by panel manufacturer for each use, with prefinished hex washer head in color to match panels where exposed to view.

F. Rivets: full stainless steel, including mandrel, in size to match application.

G. Field Sealant:
1. Exposed Sealant: Color coordinated urethane or polymer sealant as supplied by panel manufacturer.
2. Non-exposed Sealant: Non-curing, non-skinning, butyl tape or tube sealant as supplied by manufacturer.

H. Sealant Tape: non-drying, 100 percent solids, high grade butyl tape, as supplied by panel manufacturer, in sizes to match application.

I. Pipe Penetration Flashings: 20 year warranted flexible boot type, with stainless steel compression ring. Use silicone type at hot pipes.

J. Metal Roof Curbs: 0.063 minimum thickness welded aluminum, or 18 gauge minimum welded stainless steel, factory-insulated, with integral cricket, and designed to fit roof panel module, sized to meet application.

PART 3 - EXECUTION

3.1 INSTALLERS

A. Must be certified and qualified by Manufacturer.

3.2 EXAMINATION

A. Verification of Conditions
   1. Ensure surfaces are ready for panel application.
   2. Inspect and ensure surfaces are free from objectionable warp, wave, and buckle before proceeding with installation of pre-formed metal roofing.
   3. Ensure substrate is ready to receive metal roofing. Report items for correction and do not proceed with metal roof panel system installation until resolved.

3.3 PREPARATION

A. Install substrate boards, hat channels, purlins, or furring channels in accordance with manufacturer’s recommendations.

B. Coordinate Work, with installation of other associated Work, to ensure quality application.

C. Coordinate Work with installation of associated metal flashings and building walls.

D. Coordinate Work to minimize foot traffic and construction activity on installed finished surfaces.

E. Coordinate location of pipe penetrations to allow centering of pipe in panel.

F. Coordinate location of roof curbs, to allow proper integration with roof panel seams.

3.4 INSTALLATION

A. Comply with and install roofing and flashings in accordance with all details shown on manufacturer’s approved shop drawings and manufacturer's product data, instructions, and installation manuals, within specified erection tolerances.

B. Install field panels in continuous lengths, without endlaps

C. Do not install panels damaged by shipment or handling.

D. Install intermittent clips with bearing plates, if required, and continuous clips, if required, according to the engineered design pattern in the field, perimeter, and corner areas of the roof.

E. Fix panels at location depicted on reviewed shop drawing(s).

F. Fold up pan of panel at ridge, hip and headwalls. Commonly referred to as breadpanning.

G. Allow for required panel clearance at penetrations for thermal movement.

H. Install concealed supports, angles and brackets as furnished by manufacturer to form complete assemblies.

I. Remove roof panel and flashing protective film prior to extended exposure to sunlight, heat, and other weather elements.

J. Field-apply sealant tape and gun-grade sealant according to reviewed shop drawings and manufacturer’s requirements for airtight, watertight installation.

K. Ensure sealant beads and tapes are applied prior to sheet metal installation to achieve a concealed bead. Neatly trim exposed portions of sealant without damaging roof panel or flashing finish.

L. Align pipe penetrations to occur at center of roof panel. Report and have corrected improperly-placed penetrations before proceeding with panel installation. Remove and replace roof panels which have improperly-placed penetration flashings.

M. Align roof curbs to fit roof panel module and overlap standing seam(s). Allow for proper drainage on both sides of curb.

N. Install sheet metal flashings according to manufacturer's recommendations, reviewed shop drawings and in accordance with provision of Section 07 62 00.

3.5 CLEANING

A. Clean exposed surfaces of work promptly after completion of installation.

B. Clean mud, dirt, and construction-related debris from panels before panels are scratched or marred.

3.6 PROTECTION

A. Protect Work as required to ensure roofing will be without damage at time of final completion.

B. Do not allow excessive foot traffic over finished surfaces.

C. Do not track mud, dirt, or construction-related debris onto panel surfaces.

D. Replace damaged Work before final completion.

E. Touch-up Paint: **NOT ALLOWED, RPLACE ALL DAMAGED PANELS REGARDLESS OF LOCATION**

R-3 ROOFING GUARANTEE (Metal)

OWNER: Lady of the Sea General Hospital
200 W 134th Pl, Cut Off, LA 70345

Whereas _____

Address _____

Telephone _____ Email _____

herein called the Contractor, has provided pre-formed, pre-finished metal roofing, flashing, accessories and miscellaneous items required for a complete roof system installation in accordance with the Contract Documents for the PROJECT:

Name of Project:_____

Project No. & WBS: _____

User Agency: _____

Location/Address: _____

Name and Type of Building(s):_____ State I.D. _____

Type of System: (Standing Seam, Flat Seam, etc.) _____

Total Roof Area: _____ SF; Total Length of Ridge _____LF

Total Length of Valley: _____LF; Total Length of gutter/fascia trim: _____LF

Date of Acceptance _____ Two year Guarantee Expiration _____

AND WHEREAS the Contractor has contracted to guarantee said work against water entry from faulty or defective materials and workmanship for the designated Guarantee period of TWO (2) YEARS from the Acceptance Date of the Project;

NOW THEREFORE the Contractor guarantees, subject to the terms and conditions herein set forth, that during the Guarantee Period the Contractor will at his own cost and expense, make or cause to be made with approved procedures and materials such repairs to or replacements of said work (including any wetted thermal insulation) resulting from water entry or faults or defects of said Work as are necessary to maintain said Work in watertight conditions and further, respond on or within TWO (2) working days upon written notification of leaks or defects by the Owner/User Agency.

This Guarantee is made subject to the following terms and conditions:

1. Damage to the roof caused by the following items are excluded from this warranty: wind exceeding 73 mph, lightning, hail, fire or physical damage from falling or wind-blown objects. When the Work has been damaged by any of the foregoing causes, the Guarantee will be null and void until such damage has been repaired by the Roofing Contractor, and until the cost and expense thereof has been paid by the Owner or another responsible party so designated.

2. During the Guarantee Period, if the Owner/ User Agency allows alteration of the Work by anyone other than a Contractor approved in writing by the original Contractor and/or Roofing Material Supplier prior to the work being performed, including cutting, patching and maintenance in connection with penetrations, attachment of other work, and positioning of anything (i.e. signs) onto the roof, this Guarantee shall become null and void as of the date of said alterations. If the Owner/ User Agency engages the original Contractor for said alterations, the Guarantee shall be maintained in force unless the Contractor presents written notification to the Owner that the intended work will likely damage or cause deterioration of the base work, thereby justifying a termination of the original Guarantee.

3. The Owner/User Agency shall promptly notify the Contractor in writing of observed, known or suspected leaks, defects, or condition deterioration and shall afford a reasonable opportunity for the Contractor to inspect the work and examine evidence of such leaks, defects or deterioration.

4. This Guarantee is recognized to be the only guarantee of the Contractor of said work, and shall not operate to restrict or cut-off the Owner from any other remedies and recourse lawfully available to him in case of roofing failure to any cause or degree. Specifically, this Guarantee shall not operate to relieve the Contractor of his responsibility for the performance of the original work.

IN WITNESS THEREOF, this instrument has been duly executed
this _____ day of ,_____ 20 .

Contractor's Signature: _____

Typed Name: _____

Telephone: _____ Email: _____

Witness: _____ Witness:_____

And if applicable, is countersigned by the following Sub Contractor, Installer, or other party (as indicated) who acted as agent or represented the Contractor during the performance of the work:

Countersignee Name: _____
(Type or Print)
Date:_____ Signature: _____

Representing: _____

Address:_____

Telephone: _____ Email: _____

Witness:_____ Witness: _____

END OF SECTION 07 41 13

SECTION 07 46 16 - PREFORMED METAL SIDING / SOFFIT

PART 1 - GENERAL

1.1 SCOPE

A The Contractor shall furnish labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of metal siding and metal soffit systems as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.

B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, and complete installation shall be furnished and installed as part of this work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Panel

1 Coil and flat sheet metal: 24 gage, pre-coated steel sheet complying with ASTM A653/A653M, G90 zinc-coated galvanized steel, minimum 50,000 psi yield strength where required for the panel system. (Use all U.S. steel, no foreign steel allowed.)

2. Finish: 70% PVDF fluoropolymer coating based on Kynar 500 or Hylar 5000 resin, 1.0 mil total dry film finish for exterior and the reverse side a wash coat of 0.3 to 0.4 mil dry film thickness as per warranty.

3. Color: As selected by Owner/Architect from manufacturer’s full range of colors. (Minimum of 10 standard colors.)

4. Texture: Smooth at walls, Smooth and unvented at soffits.

5. Panel Height: 1"

6. Panel Style: Flush Panel, concealed fastener. utilizing male and female configuration.

7. Gauge: 24 gauge

8. Substrate: Galvanized steel sheet.

9. Film: Manufacturer's protective, removable film sheet.

10. Profile: Metal siding / soffit system shall receive two (2) “Pencil” grooves equally spaced in each panel.

B. Fasteners.

1. Shall be installed to meet the metal panel manufacturer's recommendations and the 2021 International Building Code (IBC). Refer to structural drawings “Components and Cladding Design Pressures” chart for loading requirements. Panel system shall demonstrate capacity for applicable design pressures by testing in accordance with ASTM E1592 or ASTM E330, as applicable to the submitted system.

    a. Metal siding / soffit system shall be attached to 7/8" light gauge hat channels as indicated on the Drawings and in Section 09 26 00, spaced as required by the panel manufacturer and approved engineering to meet project wind loading.

C. Related Sheet Metal Flashing

1. Provide all components required per the Premanufactured Metal Soffit/Wall System manufacturer’s recommendation for a complete Metal Soffit/Wall System to include panels, trim/flashing, closured, sealants, and any other required items.

D. Fabrication

1. Material shall be in-line tension leveled prior to roll forming panel profile.

2. Fabricate trim/flashing from same material as panel.

3. Fabricate trim/flashing and accessories to detailed profiles.

4. Apply specified finishes in conformance with manufacturer's standard, and according to manufacturer's instructions.

E Air Barrier

1. Refer to Specification Section 07 27 26 - Fluid Applied Membrane Air Barrier.

2. Fluid Applied Membrane Air Barrier shall be installed over 5/8" glass-mat gypsum board sheathing as specified in Section 06 10 00 and detailed in the Contract Documents.

F. Accessories

1. General: Provide all necessary accessories required and/or approved by the manufacturer to accommodate the job site conditions for a complete, secure and watertight soffit/wall system for the "Scope of the Work" items stated above.

2. Fasteners: No exposed fasteners will be allowed, unless specifically indicated in the contract documents.

3. Touch-up Paint: Kynar 500 or Hylar 5000 paint. (NO SPRAY CANS!)

2.2 MANUFACTURERS

A Metal Siding / Soffit Panel System shall be PAC-CLAD Flush Wall Panel, 12" wide x 1" deep, 24 ga. prefinished steel panels with two (2) pencil ribs and PAC-CLAD 70% PVDF finish (color to be selected by Architect), or prior approved equal.

B Ultra Seam US-100FP, 24 ga. prefinished steel flush panel system suitable for wall and soffit applications (color to be selected by Architect), as manufactured by Ultra Seam, or prior approved equal.

C Not Used.

D Not Used.

Or prior approved equal.

2.3 DELIVERY, STORAGE AND HANDLING

A. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

B. Deliver components, sheets, metal wall panels and other manufactured items so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling.

C. Unload, store and erect metal wall panels in a manner to prevent bending, warping, twisting and surface damage.

D. Stack metal wall panels on platforms or pallets, covered with suitable weather tight and ventilated covering. Store metal wall panels to ensure dryness. Do not store metal wall panels in contact with other materials that might cause staining, denting or other surface damage.

E. Protect strippable protective coating on any metal coated product from exposure to sunlight and high humidity, except to the extent necessary for material installation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All surfaces on which the work is to be applied shall be examined for flatness as appropriate to application.

B. Panels shall be installed so that horizontal lines are level and vertical lines are even.

C. All sheet metal work shall conform to standards wet forth in SMACNA architectural sheet metal manual.

D. Fasteners shall be concealed as provided by manufacturer.

E Field Measurements: Verify actual dimensions of construction contiguous with metal siding and soffit panels by field measurements before fabrication.

F. Compliance: Comply with manufacturer's product data, recommendations and installation instructions for substrate verification, preparation requirements and installation.

G. Install metal panels, fasteners, trim and related sealants in accordance with approved shop drawings and as may be required for a weather-tight installation.

H. Provide uniform, neat seams.

3.2 TOUCH-UP

A. Only minor scratches and abrasions shall be allowed to be touched up. Any other damaged materials shall be replaced.

3.3 CLEAN-UP

A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damage installed products. Clean installed products in accordance with manufacturer's instruction prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.

END OF SECTION 07 46 16

SECTION 07 60 00 - FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of sheet metal as shown on drawings and as specified in accordance with provisions of the contract documents and completely coordinated with that of all other trades.

B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.

C. For additional information, refer to Section:
05 50 00 - Metal Fabrications
07 41 00 - Standing-Seam Metal Roofing
07 92 00 - Joint Sealants

PART 2 - PRODUCTS

2.1 MATERIALS

A. Expansion shields shall be lead bronze or equal NON-FERROUS METALLIC Alloy for a minimum screw length of 3/4.

B. Caulking - (Refer to specification section 07 92 00) The appropriate manufacturer-recommended sealant specified in Section 07 92 00 shall be used on this project. Use the appropriate sealant recommended for the various materials applied to in this construction project. Also use the recommended sealant for applications in vertical or horizontal uses and in applications where the width of the joint, the elongation, curing time, etc., requires a specific sealant. Any special materials or application procedures, such as primers, curing materials, etc. that are recommended by the manufacturer for a proper installation shall be adhered to. Important! At standing-seam roofing and associated roof flashings, use sealants recommended by the roofing manufacturer and compatible with the roofing system warranty. Colors are to be selected by Architect. Material must comply with ASTM C920, Type S or M as appropriate, Grade NS or P as appropriate, Class 25 minimum, and Uses required for substrates encountered. Backup material must be used to control the depth of sealant; provide backer rod compatible with the specified sealant and joint conditions. Store material in strict accordance with the manufacturer's instructions.

C. Screws, bolts, nails and accessories for fastening flashing - Galvanized. Minimum nail size is 12 stubs gauge, and of sufficient length to penetrate 7/8". Nails not in contact with metals may be galvanized or shereadized. All nails shall have large flat heads. All exposed fasteners shall be painted to match metal it is attaching.

D. All flashing shall be the same material and gauge as indicated on drawings.

E. All coil flat sheet metal and sheet metal fabrications shall be min. 24 gage, pre-coated, ASTM A653/A653M, Type SS, Grade 50, Class 1, G90 zinc-coated galvanized steel. Exposed sheet metal shall receive a factory-applied 70% PVDF fluoropolymer finish based on Kynar 500 or Hylar 5000 resin, color as selected by Architect to coordinate with the standing-seam metal roofing and preformed metal siding / soffit systems.

F. All gutters, downspouts, fascia enclosures, and drip edge metal shall be the same material, gauge, and finish as indicated on drawings. Coordinate roof-related flashing and trim interfaces with Section 07 41 00 - Standing-Seam Metal Roofing.

G. All steel gutter support brackets shall be 1-1/2" wide x 1/8" thick at 36" O.C. maximum, or closer spacing as required by the gutter / roofing manufacturer and applicable project wind loads, powder coated to match gutters. Support brackets shall be shaped as required to tightly follow contours of gutters as indicated on the contract documents. Secure using stainless steel fasteners.

H. If stainless steel is indicated in the Drawings, provide ASTM A240/A240M Type 304 stainless steel with finish as indicated.

PART 3 - EXECUTION

3.1 WORKMANSHIP

A. Fabricate metal flashing, trim, expansion joints, and similar items to comply with profiles, and sizes shown, and to comply with standard industry details as shown on SMACNA in the "Architectural Sheet Metal Manual".

B. Comply with manufacturer's instructions and recommendations for handling and installation of flashing and sheet metal work.

C. Performance - Coordinate flashing work with other work for the correct sequencing of items which make up the entire membrane or system of weatherproofing or waterproofing and rain drainage. It is required that the flashing and sheet metal work be permanently watertight and deteriorate in excess of manufacturer's published limitations.

D. For non-moving seams provide flat-lock or lapped seams except as otherwise indicated. Comply with metal producer's and finish manufacturer's recommendations for joining, sealing, fabrication, and cleaning the joints. Do not solder factory-finished steel unless specifically approved by the metal manufacturer.

E. Provide for thermal expansion of all exposed sheet metal work exceeding 15'-0" running length.

F. Provide for thermal expansion of 10'-0" maximum spacing, and 2'-0" from corners and intersections. Lap moving joints 2" in and seal with sealant.

G. Conceal fasteners and expansion provisions wherever possible. Fold back edges on concealed side of exposed edges, to form a hem.

H. Insert flashing into reglets minimum 1" as read. Anchor by mechanical means, including driven wedges of lead or other compatible metal, spaced 2'-0". Seal the joint with sealant.

I. Separate aluminum work for dissimilar metals and from cementitious materials. Separate with a course of roofing felt where possible. **Apply 15-mil dry film thickness bituminous coating to either the substrate or aluminum where roofing felt cannot be used for separation.**

J. Join sheet metal using flat locked seams or lapped joints, sealed as required for a permanently watertight installation. Make allowance at all joints for contraction. At exposed edges, sheet metal shall be hemmed and returned upon itself 1/2" for strength. At lap joints, make hems together so that one slides inside the other.

K. Not Used.

L. All flashing joints shall have 4" wide joint cover that locks onto the flashing on the fascia drip edge and is nailed into the deck.

M. All roof penetrations shall be flashed and sealed by the standing-seam metal roofing installer in accordance with Section 07 41 00, the roofing manufacturer's requirements, and the Contract Drawings. Refer to architectural drawings for determining the complete scope of the work.

N. Install sheet metal as detailed on drawings and as recommended by the Sheet Metal and Air Conditioning Contractors National Association, Inc., Architectural Sheet Metal Manual.

O. Protection of Aluminum from Dissimilar Materials

1. General - In addition to the coating specified, aluminum surfaces shall be prevented from direct contact with dissimilar materials as follows:
    a. Dissimilar metals except stainless steel, white bronze, and solid zinc, shall be painted with a heavy brush or spray coat of zinc-chromate primer and one coat of aluminum paint; or shall be separated from the aluminum by a heavy coat of mastic caulking compound, or by a non-absorptive tape or gasket.
    b. Dissimilar metals used in locations where drainage from them passes over aluminum shall be painted to prevent staining of aluminum.
    c. Aluminum surfaces in contact with mortar, concrete, plaster, or other masonry materials shall be given one heavy brush coat of bituminous paint.
    d. Aluminum surfaces in contact with wood, or other similar absorptive materials which may become repeatedly wet, shall be given two coats of aluminum metal and masonry paint, or one heavy brush coat of bituminous paint. In place of painting the aluminum, the Contractor shall have the option of painting the wood and other absorptive surfaces with two coats of aluminum house paint and sealing joints with caulking compound.

P. Install all pre-manufactured aluminum components as recommended by the specified manufacturer.

END OF SECTION 07 60 00

SECTION 07 84 00 - FIRESTOPPING

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor shall furnish labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete of firestopping and smoke seals as indicated on drawings and as well the following areas whether shown on the drawings or not.

B. Drawings and General Provisions of this contract, bidding requirements, contract forms, and conditions of contract applicable requirements of Division 1 - General Requirements, govern this section.

C. The General Contractor shall be required to have all firestopping on the job provided by a single source manufacturer for all trades. There shall be only one manufacturer of firestopping on this project. The Contractor shall provide, at the State Fire Marshal or other Authority Having Jurisdiction walkthrough inspection, a copy of the specifications, product data, and listed systems for firestopping materials used.

1.2 DESCRIPTION OF WORK

A. Provide firestopping and smoke seals as indicated on the drawings as well as the following areas; including:

1. Through-penetration firestopping fire-rated construction.

2. Construction-gap firestopping at connections of the same or different materials in fire-rated construction.

3. **Construction-gap firestopping occurring within fire-rated wall, floor or floor-ceiling assemblies**.

4. Construction-gap firestopping occurring at the top of fire-rated walls.

5. Through-penetration smoke-stopping in smoke partitions.

6. Construction-gap smoke-stopping in smoke partitions.

7. Around all ducts, pipes, and conduit openings in fire-rated construction (walls, floors and ceilings).

B. Related Sections

1. Coordinate all work of this section with the work of the following sections to properly execute the work in order to maintain the hourly ratings of the walls, ceilings, and floors where firestopping and smoke seals are applied:
   a. 03 30 00 - Cast-In-Place Concrete
   b. 05 40 00 - Cold Formed Metal Framing
   c. 07 92 00 - Joint Sealants
   d. 09 26 00 - Gypsum Board Assemblies
   e. Division 21, 22, 23 and 26 Sections: Fire Suppression, Plumbing, Mechanical and Electrical Work

1.3 REFERENCES

A. Underwriters Laboratories (UL)

1. U.L. Fire Resistance Directory
   a. Through-penetration firestop devices (XHCR)
   b. Fire resistance ratings (BXUV)

c. Through-penetration firestop systems (XHEZ)
d. Fill, void, or cavity material (XHHW)

2. UL 1479 - Fire Tests of Penetration Firestops, including optional air-leakage testing.

3. U.L. Component Listing Test Criteria

4. Intertek Listed Building Products (Warnock Hersey)

B. American Society for Testing and Materials Standards:

1. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.

C. ASTM E1966 / UL 2079 - Fire-Resistive Joint Systems.

1.4 DEFINITIONS

A. Assembly: Particular arrangement of materials specific to given type of construction described or detailed in referenced documents.

B. Barriers: Fire-resistance-rated walls and partitions, smoke partitions, rated ceiling/floor assemblies and structural floors where indicated.

C. Firestopping: Methods and materials applied in penetrations and unprotected openings to limit spread of heat, fire, gasses, and smoke.

D. Penetration: Opening or foreign material passing through or into barrier or structural floor such that full thickness of rated materials is not obtained.

E. Construction Gaps: Gaps between adjacent sections of walls, exterior walls, at wall tops between top of wall and ceiling, and structural floors or roof decks; and gaps between adjacent sections of structural floors.

F. System: Specific products and applications, classified and numbered by Underwriters Laboratories, Inc. to close specific barrier penetrations.

G. Sleeve: Metal fabrication or pipe section extending through thickness of barrier and used to permanently guard penetration. Sleeves are described as part of penetrating system in other sections and may or may not be required.

1.5 SYSTEM DESCRIPTION

A. Design Requirements

1. Fire-rated construction: Maintain barrier and structural floor fire resistance ratings including resistance to cold smoke at all penetrations, connections with other surfaces or types of construction, at separations required to permit building movement and sound or vibration absorption, and at other construction gaps.

2. Smoke partition construction: Maintain resistance to the passage of smoke at all penetrations, connections with other surfaces and types of construction and at all separations required to permit building movement and sound or vibration absorption, and at other construction gaps.

1.6 SUBMITTALS

A. Product data: Manufacturer’s specifications and technical data including the following:

1. Detailed specification of construction and fabrication.
2. Manufacturer’s installation instructions.

B. Shop drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, plus the following specific requirements.

1. Details of each proposed assembly identifying intended products and applicable UL System number, or UL classified devices.

2. Manufacturer or manufacturer's qualified fire-protection engineering representative shall provide engineering judgments and drawings relating to non-standard applications as needed. Engineering judgments shall be based on tested systems and shall be submitted to the Architect and Authority Having Jurisdiction where acceptance is required before installation.

C. Quality control submittals:

1. **Statement of qualifications**

D. Applicator's qualifications statement:

1. **List past projects indicating required experience**

1.7 QUALITY ASSURANCE

A. Firestopping materials and systems shall be tested by nationally recognized testing agencies in accordance with ASTM E814 / UL 1479 for penetration firestops and ASTM E1966 / UL 2079 for fire-resistive joint systems. F ratings shall not be less than the fire-resistance rating of the assembly penetrated. Provide T, L, W, or other ratings where required by the applicable code, the tested assembly, or the Contract Documents.

B. Installer's qualifications: Firm experience in installation or application of systems similar in complexity to those required for this project, plus the following:

1. Acceptable to or licensed by manufacturer, State or local authority.

2. At least 3 years' experience with systems.

3. Successfully completed at least 5 comparable scale projects using this system.

C. Local and State regulatory requirements: Submit forms or acceptance for proposed assemblies not conforming to specific UL Firestop System numbers, or UL classified devices.

D. Materials shall have been tested to provide fire rating at least equal to that of the construction.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Packing and shipping:

1. Deliver products in original, unopened packaging with legible manufacturer's identification. (Manufacturer's name, trade name, and UL label.)

2. Coordinate delivery with scheduled installation date, allow minimum storage at site.

B. Storage and protection: Store materials in a clean, dry, ventilated location. Protect from soiling, abuse, moisture, and freezing when required. Follow manufacturer's instructions.

1.9 PROJECT CONDITIONS

A. Job Conditions:

1. Verifying existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

2. Proceed with installation only after penetrations of the substrate and supporting brackets have been installed.

3. Conform to manufacturer's printed instructions for installation and when applicable, curing in accordance with temperature and humidity.

B. Environmental requirements:

1. Furnish adequate ventilation if using solvent.

2. Furnish forced air ventilation during installation if required by manufacturer.

3. Keep flammable materials away from sparks or flame.

4. Provide masking and drop clothes to prevent contamination of adjacent surfaces by firestopping materials.

5. Comply with manufacturing recommendations for temperature and humidity conditions before, during and after installation of firestopping.

1.10 GUARANTEE

A. Submit copies of written guarantee agreeing to repair or replace joint sealers which fail in joint adhesion, extrusion resistance, migration resistance, or general durability or appear to deteriorate in any other manner not clearly specified by submitted manufacturer's data as an inherent quality of the material for the exposure indicated. **The guarantee period shall be one year from date of substantial completion.**

B. Firestop contractor shall warrant that firestopping systems used meet firestopping requirements as herein specified. All firestopping shall comply with the 2021 International Building Code, NFPA 101, 2015 Edition, applicable UL or Intertek listed systems, and requirements of the Louisiana State Fire Marshal and other Authorities Having Jurisdiction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Manufacturers
1. 3M Fire Protection Products
2. Hilti, Inc.
3. Specified Technologies Inc. (STI)
4. RectorSeal - Metacaulk
5. Or prior approved equal.
NOTE: Prior approvals shall be reviewed as indicated in Article 3.3.2 of Instructions to Bidders.

B. Through-Penetration Firestopping of Fire-Rated Construction shall meet ASTM E814:

1. Systems or devices listed by UL or Intertek may be used, providing that they conform to the construction type, penetrant type, annular space requirements and fire rating involved in each separate instance, and that the system is approved for the orientation and application in which it is installed. Systems or devices must be asbestos-free.

2. Additional requirements: Withstand the passage of cold smoke either as an inherent property of the system, by an L-rated listed system where required, or

by use of a separate product included as part of the listed system and designed to perform this function.

3. Acceptable manufacturers and products:
   a. Those listed by UL or Intertek for the firestop system involved.

4. All firestopping products must be from a single manufacturer. All trades shall use products from the same manufacturer.

C. Construction-Gap Firestopping of Fire-Rated Construction

1. Not Used.

2. Firestopping at construction gaps between tops of fire-resistance-rated partitions and underside of structural systems.

3. Firestopping at construction gaps between tops of fire-resistance-rated partitions and underside of ceiling or ceiling assembly where required by the listed assembly.

4. Not Used.

5. Firestopping expansion joints.

6. Acceptable manufacturers and products - those listed by UL or Intertek for the fire-resistive joint system involved.

7. Fire-resistive joint treatment systems shall meet ASTM E1966 / UL 2079.

D. Smoke-Stopping at Smoke Partitions

1. Through-penetration smoke-stopping: Any system complying with the requirements for through-penetration firestopping in fire-rated construction, is acceptable, provided that the system includes the specified smoke seal or will provide a smoke seal.

2. Construction-gap smoke-stopping: Any system complying with the requirements for construction-gap firestopping in fire-rated construction, is acceptable, provided that the system includes the specified smoke seal or will provide a smoke seal.

2.2 ACCESSORIES

A. Fill, void or cavity materials: As classified under category XHHW in the U.L. Fire Resistance Directory.

B. Forming materials: As classified under category XHKU in the U.L. Fire Resistance Directory.

PART 3 - EXECUTION

3.1 EXECUTION

A. Examination

1. Verification of conditions: examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

2. Verify barrier penetrations are properly sized and in suitable condition for application of materials.

3. Do not proceed until unsatisfactory conditions have been corrected.

B. Preparation

1. Clean surfaces to be in contact with penetration seal materials of dirt, grease, oil, loose materials, rust, or other substances that may affect proper fitting, adhesion, or the required fire resistance.

C. Installation

1. Install penetration seal materials in accordance with the applicable UL or Intertek listed system and manufacturer's written installation instructions.

2. Seal holes or voids made by penetrations to ensure an effective smoke barrier.

3. Where floor openings without penetrating items are more than four inches in width and subject to traffic or loading, install firestopping materials capable of supporting same loading as floor.

4. Protect materials from damage on surfaces subject to traffic.

5. Where large openings are created in walls or floors to permit installation of pipes, ducts, cable tray, bus duct or other items, close unused portions of opening with firestopping material tested and listed for the application.

6. Install smoke stopping as specified for firestopping.

7. Not Used.

D. Field Quality Control

1. Examine penetration sealed areas to ensure proper installation before concealing or enclosing areas.

2. Keep areas of work accessible until inspection by the Louisiana State Fire Marshal, building official, or other applicable code authorities where inspection is required.

3. Perform under this section patching and repairing of firestopping caused by cutting or penetration by other trades.

4. All areas of work requiring authority inspection must remain accessible until inspection has been completed or authorization to conceal has been received.

5. Correct unacceptable firestops and provide additional inspection to verify compliance with this specification at no additional cost.

6. Submit data sheets and listed-system details on all proposed materials prior to installation. Upon completion, certify in writing that firestop and smoke-seal assemblies have been installed in accordance with the approved listed systems, manufacturer's instructions, and Contract Documents, and submit required closeout documentation.

E. Adjusting and Cleaning

1. Clean up spills of liquid components.

2. Neatly cut and trim materials as required.

3. Remove equipment, materials, and debris, leaving area in undamaged, clean condition.

3.2 QUALIFICATIONS

A. Installers of firestopping shall be manufacturer certified trained with a minimum of three years' experience installing firestop systems. The installers shall submit to the Architect their certification as part of shop drawings.

END OF SECTION 07 84 00

SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SCOPE

A. The work to be done under this heading consists of furnishing all labor, and materials to caulk all opening frames, expansion joints, joints where masonry joins concrete, joints in architectural changes in materials and any other locations as shown on the drawings or requiring caulking. Installation of all sealant joints as required to provide a watertight exterior envelope.

B. Joint preparation to receive sealant shall comply with these specifications unless the manufacturer's requirements exceed these specifications.

1.2 SUBMITTALS

A. **Shop Drawings indicating the product name, number and manufacturer shall be submitted before any material is ordered. All sealants used on this project shall be indicated with the material that it is sealed to. A letter from the sealant manufacturer indicating the appropriateness of sealants and their recommended uses with various materials on this project shall be required. A sample tube of each type of sealant used on this project shall be submitted with shop drawings.**

B. Submit letters from the sealant manufacturer stating that the contractor is pre-approved by the manufacturer for application of products for this specific project with anticipation of issuing the specified warranty at the completion of the project.

C. Submit manufacturer's technical data for each joint sealer product required including instructions for joint preparation and joint sealer application. Submit data on cleaning materials, primers, and related products.

D. Submit manufacturer's standard color samples showing full range of colors for each product exposed to view.

E. Certificates: Submit certificates for manufacturer of joint sealer products attesting:

1. That the manufacturer has reviewed this specification and that their products comply with these requirements and are suitable for the project purposes.

2. That upon review of the product specifications, the manufacturer agrees with specified provisions for joint preparation and sealant application.

3. That the manufacturer has visited the job site, has performed such tests as they deem necessary, and that the use of their products shall result in the issuance of the specified warranty.

F. **Submit sample of sealant manufacturer's warranty to be supplied at completion of project.**

G. Submit sealant manufacturer's guidelines for material storage.

1.3 QUALITY ASSURANCE

A. Installation qualifications: Work shall be performed by a firm having not less that (5) years successful experience in comparable waterproofing projects, employing personnel skilled in the operations indicated.

B. During the course of sealant work the contractor shall perform field adhesion tests in addition to testing performed by the manufacturer. Continuous testing shall be performed as scheduled by the manufacturer to allow issuance of the manufacturer's warranty.

C. Single source responsibility for joint sealer materials: Obtain joint sealer materials from a single manufacturer for each different product required.

D. Preconstruction field testing of sealants: Prior to installation of joint sealant, the contractor and manufacturer shall perform testing on actual substrates at the project site to determine the proper field preparation required to obtain optimum adhesion and compatibility on each different substrate condition. Manufacturers shall approve installation conditions and procedures in writing to the Contractor and Architect.

E. Manufacturer's technical representative shall make an inspection of the Contractor's work at intervals required by the manufacturer to assure issuance of the manufacturer's warranty on completion of the project.

1.4 DELIVERY STORAGE AND HANDLING

A. Deliver materials to the project site in original, unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi component material.

B. Store and handle materials to prevent their deterioration or damage due to moisture, temperature change, contaminants, or other causes.

1.5 PROJECT CONDITIONS

A. Environmental conditions: Do not proceed with installation of sealants when ambient and substrate temperature are outside the limits permitted by the joint sealer manufacturer, or when joint substrates are wet due to rain, snow, frost, condensation, or other causes.

B. Joint width conditions: Do not proceed with installation of joint sealers when joint widths are less than those allowed by joint sealer manufacturer for the application required.

1.6 WARRANTY

A. Manufacturers shall provide the owner a written warranty against leakage and defects in materials for a period of (10) years from the date of substantial completion. The warranty shall state that the manufacturer shall pay unrestricted costs for labor and materials to replace sealant joints that have failed due to faulty materials.

B. Failure of materials and workmanship shall include, but are not limited to:

1. Water penetration into the building

2. Adhesive or cohesive failure of sealant

3. Premature or abnormal deterioration of sealant material.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Compatibility: Provide joint sealers, joint fillers, and other related materials that are compatible with one another and with joint substrate under the conditions of service and applications and warranty by manufacturer.

B. Colors: Provide color of joint sealer as selected by the architect. Available colors shall extend to all standard colors.

C. EXTERIOR SEALANT: Use premium grade, high performance, one-component, low-modulus, high-movement, fast-curing, moisture-curing, silyl-terminated hybrid or ultra-low-modulus silicone, non-sag elastomeric sealant. Materials shall comply with ASTM C920, Type S, Grade NS, Class 50 minimum, with Uses required for the substrates and applications encountered.

1. Use the appropriate sealant recommended in use with the various materials applied to in this construction project. Also use the recommended sealant for applications in vertical or horizontal uses and in applications where the width of the joint, the elongation, curing time, etc., requires a specific sealant. Any special materials or application procedures, such as primers, curing materials, etc. that are recommended by the manufacturer for a proper installation shall be adhered to.

2. Important! At standing-seam metal roofing and associated flashings, use the sealant recommended by the roofing system manufacturer and compatible with the roofing system warranty.

3. **Not Used.**

4. **Acceptable Manufacturers:**
   a. Subject compliance with single source materials for sealant products and warranty requirements manufacturers are as follows:
      1. Sikaflex® HY 150 by Sika Corporation US
      2. Pecora 890NST by Pecora Corporation
      3. Prior approved equals.

D. INTERIOR CAULKING MATERIAL: Shall be premium acrylic latex caulking compound such as Pecora AC-20® +Silicone or approved equal.

E. HORIZONTAL SEALANTS: At horizontal joints, pitch pans, and other areas indicated on the Drawings as requiring a pourable or self-leveling sealant, use Sikaflex® SL 1 by Sika Corporation US (formerly MSeal SL 1), Pecora DynaTrol® II-SL by Pecora Corporation, or approved equal. At standing-seam roofing, use only sealants approved by the roofing system manufacturer.

2.2 PREPARATION:

A. Joint surfaces must be structurally sound, dry clean, free of dirt, moisture, loose particles, oil, grease, asphalt, tar, paint, wax, rust, release agents.

B. Wipe joints surfaces clean with solvents or cleaner recommended by sealant manufacturer using clean cloths to eliminate residue.

C. PRIMER - Where required, shall be used as recommended by manufacturer of sealant in writing to Architect, having been tested for staining and durability on samples of actual surfaces to be sealed.
   1. Do not thin primer apply at appropriate rate as indicated by manufacturer
   2. Allow primer to dry to a tack feel before applying sealant
   3. Sealant shall be installed the same day as primer
   4. Do not apply primer to backer rod or bond breaker tape

D. BACKUP MATERIALS AND PERFORMED JOINT FILLERS - Shall be non-staining, compatible with sealant and primer, and of a resilient nature, such as closed cell resilient foam; or of a supporting type, such as closed cell rigid foam, cork or nonimpregnated fiberboard. Materials impregnated with oil, bitumen or similar materials shall not be used. Size and shape shall be as indicated by joint details in drawings. Sealant shall not adhere to backup materials and shall be as recommended by sealant manufacturer. Backer-Rod must be installed so as to maintain a suitable width to depth ratio as recommended by the manufacturer. Minimum joint width is 1/4". Minimum joint depth is 1/4".

E. BOND BREAKERS - Where required, shall be as recommended by manufacturer of sealant.

F. SOLVENTS, CLEANING AGENTS - And other accessory materials shall be as recommended by sealant manufacturer.

PART 3 - EXECUTION

3.1 WORKMANSHIP, INSTALLATION

A. GENERAL - Use Contractors specializing in the application of sealants and apply in conformance with manufacturer's written directions.

Sealant subcontractor shall examine all other work and surfaces to receive the work of this section and report to the General Contractor all conditions not acceptable.

Apply sealant under pressure with power actuated gun or other appropriate means. Gun shall have nozzle of proper size and provide sufficient pressure to completely fill joints as detailed. All joint surfaces shall be neatly pointed or tooled to provide the contour as indicated drawings.

For application of sealant when air temperature is below 40 degrees F., consult sealant manufacturer for recommendations.

B. PREPARATION - Thoroughly clean all joints, removing all foreign matter such as dust, oil, grease, water, surface dirt and frost. Sealant must be applied to the base surface; all old caulking material must be removed. Previously applied paint or primer must adhere permanently or be entirely removed.

Porous materials such as concrete, masonry, or stone should be cleaned where necessary by grinding, blast-cleaning, mechanical abrading, acid washing or combination of these methods as required to provide a clean, sound base surface for sealant adhesion:

1. Laitance shall be removed by grinding or mechanical abrading.

2. Form oils shall be removed by sandblast-cleaning.

3. Loose particles present or resulting from grinding, abrading, or blast-cleaning shall be removed by blowing out joints with compressed air, oil free, prior to application of primer or sealant.

Non-porous surfaces, such as metal and glass, shall be cleaned mechanically or chemically, protective coatings or metallic surfaces shall be removed by a solvent that leaves no residue. Solvent shall be used with clean, white cloths and wiped dry with clean, dry white cloths. Do not allow solvent to air dry without wiping. Joint areas protected with masking tape or strippable films shall be cleaned as above after removal of tape or film.

All joints to receive sealant shall be as indicated on drawings. Do not seal joints until they are in compliance with drawings or meet with the approval of the Architect.

1. Joints to receive sealant shall be minimum of 1/4" wide by 1/4" deep, unless otherwise approved.

2. For joints in concrete, masonry, or stone: Depth of sealant may be equal to the width in joints up to ½" wide. For joints ½ to 1 inch wide: Depth shall not be greater than ½ the applied sealant width. For joints exceeding 2" in width: Depth shall be as directed by sealant manufacturer.

3. For joints in metal, glass and other non-porous surfaces: Sealant depth shall be a minimum of ½ the applied sealant width and shall in no case exceed the applied sealant width.

Joints to receive sealant, backup material or performed joint filler shall be cleaned out, raked to full width and depth as required.

Joints shall be of sufficient width and depth to accommodate specified backup material or performed joint filler and sealant. Concrete shall be fully cured and free of laitance, loose

aggregate, mold release agents, curing compounds, water repellents, and other surface treatments. If surface treatments are present, test for adhesion before proceeding with sealant work.

C. APPLICATION - Install backup material or joint filler, of type and size specified, at proper depth in joint to provide sealant dimensions as detailed. Backup material shall be of suitable size and shape so that when compressed (25 to 50%), it will fit in joints as required. Sealant shall not be applied without backup material and, if necessary, bond breaker strip. When using backup of hose or rod stock, roll the material into the joint to avoid lengthwise stretching. Hose or rod stock shall not be twisted or braided. Use specified bond breaker strip between sealant and supporting type backup material. Bond breaker strip shall be used in all joints where sufficient room backup does not exist.

Apply masking tape, where required, in continuous strips in alignment with joint edge. Remove tape immediately after joints have been sealed and tooled as directed.

Prime surfaces, where required, with primer as recommended by sealant manufacturer.

Follow sealant manufacturer's instructions regarding mixing, surface preparation, priming, application life, and application procedure.

D. TOOLING:

1. Tool joints to required configuration in accordance with manufacturer’s recommendations.

2. Completed sealant application shall resemble an extruded product.

3. Use tools of proper widths to coordinate with each individual joint width at project site.

4. Tooling Non-Sag Sealant:
   a. Immediately after sealant application and prior to time skinning or curing begins, tool sealant to a smooth, uniform bead of required configuration.
   b. Eliminate air pockets and ensure contact and adhesion with the bond line at sides of joint.
   c. Remove excess sealant from surfaces adjacent to joint.
   d. Do not use tooling tools or procedures which discolor sealant or adjacent surfaces or affect sealant curing/adhesion. Use procedures approved by sealant manufacturer.
   e. Protect fresh sealant from impact and dust until surface sets.

E. CLEANING: Clean adjacent surfaces free of sealant or soiling resulting from this work as work progresses. Use solvent or cleaning agent as recommended by sealant manufacturer. All finished work shall be left in a neat, clean condition.

END OF SECTION 07 92 00

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Standard and custom hollow metal doors and frames.
2. Steel sidelight, borrowed lite and transom frames.
3. Louvers installed in hollow metal doors.
4. Light frames and glazing installed in hollow metal doors.

B. Related Sections:

1. Division 01 Section "Sustainable Design Requirements".
2. Division 01 Section "General Conditions".
3. Division 04 Section "Masonry".
4. Division 06 Section "Rough Carpentry".
5. Division 06 Section "Finish Carpentry".
6. Division 08 Section "Operations and Maintenance".
7. Division 08 Section "Flush Wood Doors".
8. Division 08 Section "Lead Lined Doors and Frames".
9. Division 08 Section "Aluminum-Framed Entrances and Storefronts".
10. Division 08 Section "Glazing".
11. Division 08 Section "Door Hardware".
12. Division 09 Sections "Painting".
13. Division 26 Section "Electrical"

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.

6. ANSI/SDI A250.13 - Testing and Rating of Severe Windstorm Resistant Components for Swing Door Assemblies.
7. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
8. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
9. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
10. SDI-113 Standard Practice for Determining the Steady-State Thermal Transmittance of Steel Door & Frame Assemblies.
11. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
12. ASTM C1199 - Standard Test Method for Measuring the Steady-State Thermal Transmittance of Fenestration Systems Using Hot Box Methods
13. ASTM E1423 - Practice for Determining Steady State Thermal Transmittance of Fenestration Systems.
14. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
15. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Windborne Debris in Hurricanes.
16. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
17. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
18. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
19. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
20. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
21. TAS-201-94 - Impact Test Procedures.
22. TAS-202-94 - Criteria for Testing Impact and Non-Impact Resistant Building Envelope Components using Uniform Static Air Pressure.
23. TAS-203-94 - Criteria for Testing Products Subject to Cyclic Wind Pressure Loading.
24. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
25. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.

B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

C. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.

5. Details of anchorages, joints, field splices, and connections.
6. Details of accessories.
7. Details of moldings, removable stops, and glazing.
8. Details of conduit and preparations for power, signal, and control systems.

D. Samples for Verification:

1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

E. Informational Submittals:

1. Hurricane Resistant Openings: Exterior hurricane opening assemblies to be tested according to ASTM E330, ASTM E1886, ASTM E1996, TAS 201, TAS 202, and TAS 203 standards, and certified by a qualified independent third party testing agency acceptable to authority having jurisdiction, with labeling indicating compliance with the design pressure level and debris impact resistance requirements specified for the Project.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".

C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40” above sill) or UL 10C.

1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
3. Smoke Control Door Assemblies: Comply with NFPA 105.

a. Smoke "S" Label: Doors to bear “S” label and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.

E. Hurricane Resistant Exterior Openings: Provide exterior hollow metal doors and frames as complete and tested assemblies, or component assemblies, including approved hardware

specified under Section 087100 "Door Hardware", to meet the design pressures, debris impact resistance, and glass and glazing requirements applicable to the Project.

1. Test units according to ASTM E330, ASTM E1886, ASTM E1996M TAS 201, TAS 202 and TAS 203 standards, certified by a qualified independent third party agency acceptable to authority having jurisdiction, and bearing a third party certification agency permanent label indicting windstorm approved product.

F. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Building Information Modeling (BIM) Support: Utilize designated BIM software tools and obtain training needed to successfully participate in the Project BIM processes. All technical disciplines are responsible for the product data integration and data reliability of their Work into the coordinated BIM applications.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:

1. CECO Door Products (C).
2. Curries Company (CU).
3. Steelcraft (S).

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 HOLLOW METAL DOORS

A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.

B. Exterior Doors (Energy Efficient): Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A924 A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model, ANSI/SDI A250.4 for physical performance level, and HMMA 867 for door construction.

1. Design: Flush panel.
2. Core Construction: Foamed in place polyurethane and steel stiffened laminated core with no stiffener face welds or thermally enhanced stiffened laminated core with no stiffener face welds, in compliance with HMMA 867 “Laminated Core”.

    a. Provide 22-gauge steel stiffeners at 6 inches on-center internally welded at 5" on-center to integral core assembly, foamed in place polyurethane core chemically bonded to all interior surfaces. No stiffener face welding is permitted.
    b. Thermal properties to rate at a fully operable minimum U-Factor 0.34 and R-Value 2.92, including insulated door, thermal-break frame and threshold.
    c. Kerf Type Frames: Thermal properties to rate at a fully operable minimum U-Factor 0.38 and R-Value 2.6, including insulated door, kerf type frame, and threshold.

3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053 inch - 1.3-mm) thick steel, Model 2.
4. Vertical Edges: Vertical edges to be mechanically interlocked with hairline seam. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9".
7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.

    a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.

2. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053-inch - 1.3-mm) thick steel, Model 2.
3. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
4. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
5. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Manufacturers Basis of Design:

1. Curries Company (CU) - Polystyrene Core - 707 Series.
2. Curries Company (CU) - Energy Efficient - 777 Trio-E Series.

2.4 HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Thermal Break Frames: Subject to the same compliance standards and requirements as standard hollow metal frames. Tested for thermal performance in accordance with SDI-113, ASTM C1363, ASTM C1119, ASTM E1423, NFRC 102 and resistance to air infiltration in accordance with ASTM-E283. Where indicated provide thermally broken frame profiles available for use in both masonry and drywall construction. Fabricate with 1/16” positive thermal break and integral vinyl weatherstripping.

C. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
3. Manufacturers Basis of Design:

a. Curries Company (CU) - Mercury 3 Thermal Break TQ Series.
b. Curries Company (CU) - Kerfed Weatherstripped WM Series.

D. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
3. Manufacturers Basis of Design:

a. Curries Company (CU) - CM Series.
b. Curries Company (CU) - M Series.

E. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

F. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.
3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.
4. Hurricane Opening Anchors: Types as tested and required for indicated wall types to meet specified design pressure and impact rating criteria.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.6 LOUVERS

A. Metal Louvers: Unless otherwise indicated provide louvers to meet the following requirements.

1. Blade Type: Vision proof inverted V or inverted Y.

2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

B. Louvers for Fire Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire protection rating of 1-1/2 hours and less.

1. Manufacturers: Subject to compliance with requirements, provide louvers to meet rating indicated.
2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

2.7 LIGHT OPENINGS AND GLAZING

A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.

C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.

D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

2.8 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.9 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Doors:

1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".

D. Hollow Metal Frames:

1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

    a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.

3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
8. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
9. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches on-center and as follows:

        1) Two anchors per jamb up to 60 inches high.
        2) Three anchors per jamb from 60 to 90 inches high.
        3) Four anchors per jamb from 90 to 120 inches high.
        4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

    b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

1) Three anchors per jamb up to 60 inches high.
2) Four anchors per jamb from 60 to 90 inches high.
3) Five anchors per jamb from 90 to 96 inches high.
4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.

c. Storm Shelter Openings: Provide jamb, head, and sill anchors in accordance with manufacturer's certified assembly listings.

10. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
11. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.

E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.10 STEEL FINISHES

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.

C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

E. Verify tolerances against manufacturers installations instructions for tornado and hurricane storm shelter openings.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.

1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

    a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
    b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.

c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

3.5 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

END OF SECTION 081113

SECTION 08 14 00 - WOOD DOORS

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete of Wood Doors as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.

B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, and complete installation shall be furnished and installed as part of this work.

C. Related Documents

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

D. Related Sections
1. Section 08 11 13 - Hollow Metal Doors and Frames
2. Section 08 71 00 - Door Hardware
3. Section 08 80 00 - Glazing
4. Section 09 91 00 - Painting

E. Standards and References: Comply with the version year adopted by the Authority Having Jurisdiction.
1. ANSI A208.1 - Wood Particleboard. Intertek Listed Building Products (Warnock Hersey) - Certification Listings for Fire Doors.
2. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; National Fire Protection Association.
3. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
4. UL 10C - Positive Pressure Fire Tests of Door Assemblies; UL 1784 - Standard for Air Leakage Tests of Door Assemblies.
5. Window and Door Manufacturers Association - ANSI/WDMA I.S.1A-21, Industry Standard for Interior Architectural Wood Flush Doors.
6. International Building Code (IBC), 2021 Edition.

1.2 SUBMITTALS

A. Shop drawings: Submit schedules indicating door elevations and sections, door sizes, construction, thickness, door swing, label, stile and rail dimensions, veneers, undercuts, storage and erection details, applicable hardware blocking, locations of finish hardware by dimension and locations/details of all openings and louvers. Do not proceed with any fabrication until all details are approved. Dimension and detail openings for glass lites, louvers, and grills. Shop drawings shall indicate location, size and hand of each door; elevation of each kind of door; construction details not covered in product data; location and extent of hardware blocking; and other pertinent data.
1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.
5. Indicate fire protection ratings for fire doors.
6. At lead-lined wood doors, indicate lead thickness / equivalence, extent of shielding, core and edge construction, door weight, hardware preparations, and coordination with lead-lined frames and adjacent radiation-shielded construction.

B. Certification of compliance; Submit any information necessary to indicate compliance to all of these specifications as requested.

C. Submit samples of veneer and door construction.
   1. Furnish three corner samples, 8" x 10" in the veneer specified showing door faces and edges and the construction of each door type for approval.
      a. Provide samples for each species of veneer and solid lumber required.
      b. Finish veneer faced door samples with same materials proposed for factory finished doors.
      c. Frames for light openings, 6 inches long, for each material, type, and finish required.

   2. For factory pre-finished doors furnish three veneer samples of the veneer specified depicting color range to establish color variation allowed. Factory finish shall be applied to actual door face materials, approximately 8" x 10", for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finish work. Furnish samples in finish selected by Architect.

D. All labeled fire door assemblies shall be classified and listed in accordance with NFPA 80 and tested in compliance with NFPA 252 or UL 10C under positive pressure. A permanent label shall be affixed to each fire door at an authorized facility. Provide manufacturer’s listed edge construction and reinforcing required for the fire-protection rating indicated.

E. Submit manufacturer’s product description showing compliance with the specifications, along with finishing instructions, installation instructions, and any general recommendations manufacturer may have for the care and maintenance of each door type.

1.3 QUALITY ASSURANCE

A. Wood door supplier to be a qualified direct distributor of products to be furnished. In addition, the distributor is to have in their regular employment an A.H.C./C.D.C. or person of equivalent experience who is to be made available at reasonable times to consult with the Architect, Contractor and/or Owner regarding any matters affecting the wood doors in this project.

B. Source Limitations: Obtain flush wood doors through one source from a single manufacturer wherever possible.

C. Provide doors meeting or exceeding the minimum standards as set forth by the following organizations unless standards are modified or exceeded by this specification.
   1. ANSI/WDMA I.S.1A-21 - Industry Standard for Interior Architectural Wood Flush Doors.
      ANSI/AWI 0620-2024 - Finish Carpentry/Installation.
      National Fire Protection Association (NFPA).

D. Fire Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on positive-pressure testing according to NFPA 252 or UL 10C.
   1. Smoke Control Door Assemblies: Comply with NFPA 105.
      a. Smoke "S" Label: Doors to bear “S” label and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.
   2. Blocking: When through-bolts are not to be used, indicate size and location of blocking in 45-minute fire-rated doors.

E. All doors shall be the product of the same manufacturer to insure uniformity of quality and appearance throughout the project.

F. Fire doors shall bear labels approved by Underwriters Laboratories, Inc., Intertek, or another qualified testing agency acceptable to authorities having jurisdiction. Any

discrepancies between the architectural drawings and the procedures and limitations set forth by the testing agency shall be brought to the attention of the Architect.

G. Provide each fire rated door with a label permanently attached to the hinge side of the door, showing testing agency approval for classification scheduled.

H. The top of each door shall bear a label from the manufacturer indicating the door construction, face veneer species, cut and grade. If the doors are factory finished the label shall also have the finishing information.

I. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for receiving, handling, and installing flush wood doors.

J. The door manufacturer shall provide a letter, signed by an authorized company representative, to the Architect stating that the doors have been manufactured in compliance with this specification.

1.4 COORDINATION

A. Contractor shall be responsible for coordination and acquiring of all necessary information from hardware and frame suppliers. Door manufacturer shall be responsible for coordinating this information in order that doors be properly prepared to receive hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect doors during transit, storage and handling to help prevent damage, soiling and deterioration.

B. Comply with manufacturer’s instructions and ANSI/WDMA I.S.1A-21 requirements for jobsite storage, handling, care, and installation.

C. Deliver pre-finished components in manufacturer’s original unopened protective covering or container, clearly marked with manufacturer’s name, brand name and identifying number on the covering.

D. Do not walk or stack other materials on top of stacked doors. Do not drag doors across one another.

E. For all doors not factory finished - seal all four edges (stiles and rails) immediately after delivery.

F. Doors shall be palletized at factory in stacks of no more than thirty doors per pallet. Doors edges shall be protected with heavy corner guards. Factory finished doors shall be individually wrapped in poly bags.

1. Contractor shall provide a dry, weatherproof, storage area having a controlled temperature and humidity range between 30 and 60 percent. Stack doors flat and off the floor, supported to prevent warpage. Protect doors from damage and direct sunlight.
2. Do not walk or place other material on top of stacked doors. Do not drag doors across one another. Contractor shall use all means necessary to protect doors from damage prior to, during, and after installation. All damaged doors shall be replaced by the Contractor at no cost to the Owner.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Delamination in any degree.
      b. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
      c. Telegraphing of stile, rail or core through face to cause surface variation in excess of 1/100 inch (.25) in any 3 inch (76.2) span.
      d. Telegraphing of core construction and delaminating of face in decorative laminate-faced doors.
      e. Any defect which may, in any way, impair or affect performance of the door for the purpose which it is intended.
      f. Replacement under this warranty shall include hanging, installation of hardware, and finishing.
   2. When hanging doors, do not subject them to extremes of heat and/or humid conditions. Relative humidity shall not be less than 30% nor more than 60%.
   3. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.
   4. Warranty Period for Solid Core Interior Doors: Warranty to be in effect starting from substantial completion for the life of the original installation. Life of installation according to manufacturer's written warranty.
   5. Doors must be stored, finished, hung and maintained per manufacturer’s recommendations set forth in their full door warranty.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. DOOR CONSTRUCTION – GENERAL

   1. ANSI/WDMA I.S.1A-21 Performance Duty Level: Extra Heavy Duty; Aesthetic Grade: Premium.
   2. Fire Rated Doors: Provide construction and core specified above as needed to provide fire ratings indicated.
      a. Category A Edge Construction: Provide 45-minute fire-rated door edge construction with intumescent seals concealed by outer stile (Category A) where required by the listed assembly. Comply with specified requirements for exposed edges.
      b. Not Used.

B. CORE CONSTRUCTION

   1. Particleboard Core Doors:
      a. Particleboard: Wood fiber based materials complying with ANSI A208.1 Particleboard standard. Grade LD-2.
      b. Adhesive: Fully bonded construction using Polyurethane (PUR) glue.
      c. Blocking: When through-bolted hardware is not used, provide wood blocking in particleboard core doors as follows:
         1. 5-inch (125-mm) top-rail blocking, in doors indicated to have closers.
         2. 5-inch (125-mm) mid-rail blocking, in doors indicated to have exit devices.
            a. Optional Cores for Blocking: Provide doors with either glued-wood-stave or structural-composite-lumber core instead of particleboard core for doors indicated to receive closers and exit devices.
      d. Basis of Design:
         1. Forte Opening Solutions - Aspiro® Series.

2. VT Industries, Inc. - Heritage Collection.
3. Approved equal.

2. Mineral Core Doors:
   a. Core: Non-combustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire protection rating indicated.
   b. Blocking: Provide composite blocking with improved screw holding capability approved for use in doors of fire protection ratings indicated as needed to eliminate through-bolting hardware.
   c. Edge Construction: At hinge stiles, provide laminated edge construction with improved screw holding capability and split resistance. Comply with specified requirements for exposed edges.
   d. Basis of Design: Forte Opening Solutions - Aspiro® Series, listed mineral-core fire-door construction.
   e. Approved Equals
      a. VT Industries, Inc.
3. Lead-Lined Doors: At Doors 201A and 201B, provide factory lead-lined solid-core wood doors with lead thickness / equivalence required by the final radiation-shielding design. Coordinate shielding at door edges, hollow-metal frames, hardware preparations, and adjacent lead-shielded construction. Basis of Design: Forte Opening Solutions Aspiro® Series Radiation-Shielded Doors; VT Industries lead-lined doors; or approved equal.

C. VENEERED DOORS FOR TRANSPARENT FINISH

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Forte Opening Solutions - Aspiro® Series
   b. VT Industries, Inc. - Heritage Collection
   c. Other ANSI/WDMA I.S.1A-21 compliant manufacturer, subject to prior approval
   d. Approved equal

2. Interior Solid Core Doors:
   a. Grade: Premium
   b. Faces: Veneer grades as noted below; veneer minimum 1/50-inch (0.5mm) thickness at moisture content of 12% or less.
      1. Plain Sliced Clear Maple Mill grade faces.
   c. Match between Veneer Leaves: Book match.
   d. Assembly of Veneer Leaves on Door Faces:
      1. Running Match.
   e. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
   f. Room Match: Match door faces within each separate room or area of building. Corridor door faces do not need to match where they are separated by 10 feet or more.
   g. Transom Match: Continuous match.
   h Vertical Edges: Matching same species as faces. Wood or composite material, one piece, laminated, or veneered. Meet applicable edge requirements of ANSI/WDMA I.S.1A-21.
   i. Horizontal Edges: Solid wood or structural composite material meeting applicable requirements of ANSI/WDMA I.S.1A-21.
   j. Construction: Five plies. Stiles and rails are bonded to core, then entire unit sanded before applying face veneers.
   k. At doors over 40% of the face cut-out for lights and or louvers, furnish engineered composite lumber core.

D. LIGHT FRAMES AND GLAZING

1. Metal Frames for Light Openings in all Doors: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and shall also be approved for use in doors of fire protection rating indicated.

2. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with the flush wood door manufacturer's written instructions.

E. FABRICATION

1. Factory fit doors to suit frame opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
   a. Comply with requirements in NFPA 80 for fire rated doors.

2. Factory machine doors for hardware that is not surface applied. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA A156.115W, and hardware templates.
   a. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
   b. Metal Astragals: Factory machine astragals and formed steel edges for hardware for pairs of fire rated doors.

3. Openings: Cut and trim openings through doors in factory.
   a. Light Openings: Trim openings with moldings of material and profile indicated.
   b. Glazing: Comply with applicable requirements in Division 08 Section "Glazing."
   c. Louvers: Not Used.

4. Electrical Raceways: Provide flush wood doors receiving electrified hardware with concealed wiring harness and standardized Molex™ plug connectors on both ends to accommodate up to twelve wires. Coordinate connectors on end of the wiring harness to plug directly into the electrified hardware and the through wire transfer hardware or wiring harness specified in hardware sets in Division 08 "Door Hardware". Wire nut connections are not acceptable.

F. FACTORY FINISHING

1. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
   a. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

2. Transparent Finish: Provide a clear protective coating over the wood veneer allowing the natural color and grain of the selected wood species to provide the appearance specified. Stain is applied to the wood surface underneath the transparent finish to add color and design flexibility.
   a. Grade: Premium.
   b. Finish: Meet or exceed ANSI/WDMA I.S.1A-21 TR-6 factory finish performance requirements.
   c. Staining: As selected by Architect from manufacturer's full range.
   d. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXECUTION

A. EXAMINATION

1. Examine doors and installed door frames before hanging doors.

a. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
b. Reject doors with defects.

2. Proceed with installation only after unsatisfactory conditions have been corrected.

B. INSTALLATION

1. Hardware: For installation, see Division 8 Section "Door Hardware."

2. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
a. Install fire rated doors in corresponding fire rated frames according to NFPA 80.

3. Factory Fitted Doors: Align in frames for uniform clearance at each edge.

4. Factory Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

C. ADJUSTING

1. Operation: Re-hang or replace doors that do not swing or operate freely.

2. Finished Doors: Replace doors that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08 14 00

SECTION 08 33 16 - COILING COUNTER GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Interior, manually operated, vertically coiling, open-bar aluminum counter grille assembly complete with curtain, guides, bottom bar, counterbalance, hood, mounting accessories, and cylinder-operated security locking hardware.

B. Location: Pharmacy transaction opening identified as Door 104B. Nominal opening size is 5 feet 0 inches wide by 4 feet 0 inches high; provide actual opening dimensions indicated by Door Schedule and verified field dimensions.

C. Related Requirements:

1. Section 06 10 00 - Rough Carpentry: Concealed blocking and supports in framed partitions.
2. Section 08 71 00 - Door Hardware: Building keying system, keying schedule, and compatible cylinder requirements.
3. Architectural Drawings: Pharmacy millwork, counter surfaces, partition framing, and opening details.

1.2 REFERENCE STANDARDS

A. ASTM B221-21: Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

B. AAMA 611-24: Specification for Anodized Architectural Aluminum.

1.3 ACTION SUBMITTALS

A. Product Data: Manufacturer’s published information describing grille, curtain construction, manual counterbalance, guides, locking system, hardware, finishes, installation requirements, and maintenance.

B. Shop Drawings: Show dimensioned opening, method of attachment, headroom and coil clearances, hood/fascia, guide size and location, counter relationship, operating clearances, and lock/strike arrangement. Clearly distinguish rough opening dimensions from clear opening dimensions.

C. Locking Hardware: Submit proposed keyed-cylinder and latch arrangement, cylinder manufacturer/keyway compatibility, access side, and written confirmation that lock can be keyed into the building master key system. Show how locking parts are protected against manipulation through the open grille.

D. Finish Sample: Representative clear-anodized aluminum sample.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer’s installation instructions and standard written warranty.

B. Operation and maintenance instructions, including lock operation, manual adjustment, cleaning, and recommended lubrication.

1.5 QUALITY ASSURANCE

A. Manufacturer: Regularly engaged in production of commercial coiling security grilles of similar construction.

B. Installer: Experienced in installing the specified manufacturer’s coiling grille systems.

1.6 COORDINATION

A. Coordinate dimensions and locations with pharmacy casework, countertop, wall framing, head support, surrounding finishes, and building door hardware supplier before fabrication.

B. Verify building keyway, master keying hierarchy, and cylinder format with Owner and hardware supplier. Do not fabricate a lock configuration that requires a separate, nonmaster-keyed key.

C. Do not use the counter grille as a required means-of-egress door. Verify required exits from the pharmacy are maintained independently of the grille.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer’s original protective packaging. Protect anodized finishes, moving components, and locking hardware from damage and construction debris.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers, subject to compliance with requirements:
1. Cornell Iron Works; 5015 or Visionaire-type open-design rolling grille configured for counter opening.
2. Cookson Door; 5015 or comparable open-design rolling grille configured for counter opening.
3. Clopay; commercial rolling security grille configured for counter opening.
4. Other comparable commercial coiling-grille manufacturer, subject to review and approval.

B. Products from named manufacturers are acceptable only when the specified manual operation, finish, security locking, and building master-key compatibility are provided.

2.2 MANUALLY OPERATED ALUMINUM COUNTER GRILLE

A. Description: Factory-fabricated, interior, non-fire-rated, vertical coiling grille with open-bar curtain. Fabricate assembly to suit Pharmacy Door 104B and to close securely at the finished countertop.

B. Size: Approximately 5 feet 0 inches wide by 4 feet 0 inches high; final dimensions as scheduled and field verified.

C. Curtain: Commercial-grade open-bar aluminum grille formed of horizontal aluminum rods and manufacturer’s standard linked vertical members and spacers. Provide uniform straight-lattice appearance with components mechanically retained to resist normal handling and attempts at unauthorized opening.

D. Bottom Bar: Continuous heavy-duty extruded aluminum bottom member, reinforced as required for straight and secure closing, furnished with nonmarring contact material where it meets finished countertop.

E. Guides: Extruded aluminum guide channels sized by manufacturer to retain curtain and prevent disengagement under normal operation. Provide guides and mounting components suitable for indicated wall and counter construction.

F. Counterbalance: Manufacturer’s enclosed torsion-spring counterbalance assembly, with steel shaft/barrel, supporting brackets, adjustment provisions, and stops; sized for controlled, smooth hand operation.

G. Operation: Manual push-up and pull-down by a single person using accessible grip at bottom bar; no electric motor, power connection, hand chain, or crank. Balance curtain to remain at the fully open position without uncontrolled movement.

H. Hood and Trim: Provide complete enclosing hood/fascia over coiling mechanism where exposed to view; coordinate shape and dimensions with architectural details and ceiling/casework. Conceal structural steel and mechanical parts to the extent practical.

I. Mounting Hardware: Manufacturer’s standard brackets, fasteners, anchors, shims, and accessory components of material and strength suitable for supporting construction. Exposed fasteners shall have a finish compatible with adjacent anodized aluminum.

2.3 KEYED SECURITY LOCKING

A. Provide manufacturer’s integrated, positive-engagement, cylinder-actuated lock securing grille in fully closed position by engagement with guides and/or counter strike. Padlocks, surface-mounted hasps, or key-operated accessories using a separate key system are not acceptable.

B. Cylinder: Provide commercial-grade cylinder or manufacturer-approved cylinder adapter compatible with the building keyway and master key system specified in Section 08 71 00. Coordinate cylinder procurement and permanent keying with building hardware supplier.

C. Keyed Access: Provide key operation from the public/transaction side of the counter opening. Coordinate any pharmacy-side locking or release device with Architect and Owner before fabrication; prevent operation of lock from the public side by reaching through the open curtain.

D. Lock shall positively restrain upward movement when engaged and permit normal manual operation only after authorized unlocking. Provide manufacturer’s standard protective trim at cylinder and locking points.

E. Supply cylinders, cores, and keys as required by Section 08 71 00 and Owner’s approved keying schedule. Submit compatibility for review before ordering the grille.

2.4 FINISHES

A. Exposed Aluminum: Factory clear-anodized finish complying with AAMA 611-24, with uniform appearance on grille curtain, bottom bar, guides, and exposed aluminum trim.

B. Exposed Hood/Fascia: Clear-anodized aluminum or manufacturer’s visually matching factory finish, subject to Architect’s approval.

C. Concealed Steel Components: Manufacturer’s corrosion-protective factory finish.

2.5 FABRICATION

A. Factory fabricate and preassemble components to greatest practical extent, including formed curtain, matching guides, counterbalance assembly, locking assembly, and trim.

B. Fabricate for alignment of bottom bar with finished counter and for full opening without projecting unsecured hardware into the transaction opening.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify framing, blocking, attachment surfaces, finished counter elevations, and actual dimensions are suitable for the approved grille assembly.

B. Do not proceed until deficiencies affecting secure mounting, clearances, or locking have been corrected.

3.2 INSTALLATION

A. Install grille plumb, level, square, rigidly anchored, and in accordance with approved Shop Drawings and manufacturer’s written instructions.

B. Install guides and mounting members securely without damaging surrounding casework, countertop, or finishes. Provide reinforcement and concealed blocking required for sustained use.

C. Install and adjust counterbalance, travel stops, and bottom bar for smooth manual operation throughout full travel without binding or uncontrolled movement.

D. Install cylinder and locking hardware after coordinating keying with building door hardware supplier. Adjust lock and strikes for positive engagement without forcing grille against countertop.

3.3 FIELD QUALITY CONTROL

A. Demonstrate at least five complete cycles of manual opening and closing; verify smooth movement and fully supported open position.

B. Demonstrate positive locking and unlocking using key(s) from the approved building key system. Verify that grille cannot be raised when locked and that lock cannot be defeated by ordinary reach-through access from public side.

C. Correct binding, rattling, scraping, finish damage, or failure of hardware; retest until satisfactory.

3.4 CLEANING AND PROTECTION

A. Remove temporary labels and debris; clean finished aluminum using manufacturer-approved nonabrasive products.

B. Protect installed grille against construction damage. Replace scratched or damaged visible components that cannot be repaired to Architect’s acceptance.

3.5 DEMONSTRATION

A. Instruct Owner’s designated pharmacy personnel in opening, closing, locking, unlocking, routine cleaning, and basic adjustments.

END OF SECTION 08 33 16

SECTION 08 41 00 - ENTRANCES AND STOREFRONT

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor shall furnish labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of aluminum storefront and curtain wall systems (fixed glazing only) as shown on the Drawings and as specified herein, in accordance with the Contract Documents and coordinated with all other trades. Automatic sliding entrances are specified separately.

B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure, code-compliant, and complete installation shall be furnished and installed as part of this Work.

1.2 SUMMARY

A. Related Documents: Conditions of the Contract, Division 01 – General Requirements, and Drawings apply to this Section.

B. Section Includes:

1. Thermally broken aluminum storefront framing systems, including 4-1/2-inch and 6-inch deep systems.

2. Exterior 6-inch deep aluminum curtain wall framing system and fixed glazed storefront / curtain wall assemblies.

3. Anchorage, reinforcement, sill flashing, perimeter transitions, drainage, sealants, and accessories.

C. Basis of Design: Interior storefront - YKK AP YES 45 TU / YES 60 TU as indicated. Exterior storefront - YKK AP ProTek® hurricane-impact-resistant storefront system, including YHS 50 TU where its tested pressure capacity is adequate. Exterior curtain wall - YKK AP YHC 300 OG ProTek® impact-resistant curtain wall, with mullion depth, reinforcing, glazing, anchors, and accessories selected to satisfy the project design pressures.

D. This specification establishes minimum standards of quality, performance, and appearance and is not proprietary.

E. Products of other manufacturers meeting the requirements of this Section and approved prior to bid will be considered.

1.3 RELATED SECTIONS

A. Section 05 50 00 - Metal Fabrications.

B. Section 07 27 26 - Fluid Applied Membrane Air Barrier.

C. Section 07 92 00 - Joint Sealants.

D. Section 08 80 00 - Glass and Glazing.

1.4 REFERENCES

A. AAMA 501 – Methods of Test for Exterior Walls.

B. AAMA 611 and 612 – Anodized Architectural Aluminum.

C. AAMA SFM-1 – Aluminum Storefront and Entrance Manual.

D. ASTM E283 – Air Infiltration.

E. ASTM E330 – Structural Performance.

F. ASTM E331 – Water Penetration.

G. AAMA 1503 and NFRC 100 – Thermal Performance.

H. International Building Code (IBC) as adopted by the State of Louisiana.

1.5 SYSTEM REQUIREMENTS

A. Design Requirements:

1. Drawings are diagrammatic and do not purport to identify or solve problems of thermal movement, structural movement, glazing, anchorage, or moisture disposal.

2. Provide concealed fastening and provisions for expansion and contraction.

3. Framing system shall accommodate surface temperature differentials of 180°F without detrimental effects.

B. Performance Requirements:

1. Wind Loads: Design all exterior storefront and curtain wall assemblies for ASCE/SEI 7-16, Risk Category III, with ultimate design wind speed Vult = 164 mph (3-second gust). Determine positive and negative Components and Cladding design pressures in accordance

with ASCE/SEI 7-16 for the actual building height, exposure, enclosure classification, wall zone, effective wind area, opening size, and location on the building. Design framing, glazing, reinforcing, anchors, fasteners, perimeter attachments, and supporting components for the calculated pressures or the pressures indicated in the Structural Contract Documents, whichever are more stringent. Provide delegated-design calculations signed and sealed by a professional engineer licensed in the State of Louisiana.

2. Air Infiltration: For exterior systems, maximum 0.06 cfm/sf when tested per ASTM E283 at 6.24 psf.

3. Water Penetration: For exterior systems, no uncontrolled leakage when tested per ASTM E331 at 12 psf.

4. Structural Performance: Exterior storefront and curtain wall systems shall be tested in accordance with ASTM E330 and shall resist the project-specific positive and negative design pressures without failure. Test pressure shall be 1.5 times the applicable design pressure where required by the referenced standard, code, or approved product listing.

5. Deflection Limits: L/175 or L/240 + 1/4 inch for spans greater than 13'-6", whichever is more restrictive.

6. Thermal Performance:

a. IECC Climate Zone 2A - Lafourche Parish, Louisiana.

b. Overall fenestration U-Factor and SHGC: Comply with the 2021 IECC and final approved energy design; coordinate framing performance with Section 08 80 00 glazing.

c. Condensation Resistance: Submit manufacturer thermal / condensation performance data for each exterior storefront and curtain wall system.

7. Hurricane Impact / Wind-Borne Debris: The site is in a hurricane-prone wind-borne debris region. All exterior storefront, curtain wall, and glazing assemblies shall be hurricane-impact resistant and shall comply with ASCE/SEI 7-16 Section 26.12.3 and ASTM E1886 / ASTM E1996. Provide large-missile impact resistance for glazed openings located 30 feet or less above grade and small-missile impact resistance where applicable above 30 feet. Assemblies shall also successfully complete the required cyclic pressure testing. Impact resistance shall be provided by the complete tested assembly, including framing, impact glazing, gaskets, sealants, anchors, reinforcing, and perimeter attachments; field-created or non-tested combinations are not acceptable.

1.6 SUBMITTALS

A. Product Data: Manufacturer’s descriptive literature, installation instructions, and system details.

B. Shop Drawings: Fully dimensioned plans, elevations, sections, anchorage, reinforcements, expansion provisions, drainage paths, perimeter transitions, sill flashings, system depths, and finish schedules. For exterior systems, identify the calculated positive and negative design pressures at each opening / wall zone, the impact-resistant system and missile classification, glazing make-up, mullion reinforcing, and anchorage. Include delegated-design calculations signed and sealed by a Louisiana professional engineer.

C. Samples: Two (2) samples of clear anodized aluminum, minimum 2" x 3".

D. Test Reports: Certified laboratory test reports for the exact exterior systems proposed, demonstrating compliance with ASTM E283, ASTM E330, ASTM E331, ASTM E1886, and ASTM E1996 as applicable. Reports shall demonstrate that the submitted assembly is tested / approved for design pressures equal to or greater than those required for its actual project location and for the applicable wind-borne-debris missile level.

E. Manufacturer's Installation Instructions.

F. Warranty Submittals.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum twenty (20) years documented experience producing thermally broken storefront and curtain wall systems.

B. Installer Qualifications: Certified by manufacturer with minimum five (5) years storefront and curtain wall installation experience.

C. Single Source Responsibility: Storefront and curtain wall framing shall be supplied by a single manufacturer.

1.8 PRIOR APPROVALS AND SUBSTITUTIONS (PUBLIC BID REQUIREMENTS)

A. This specification is written to comply with Louisiana Revised Statutes Title 38 and is not proprietary.

B. Basis of Design manufacturer is named to establish minimum acceptable standards of quality, performance, and appearance.

C. Manufacturers requesting prior approval shall submit complete technical data, test reports, and finish information not less than ten (10) calendar days prior to bid date.

D. Approved manufacturers will be listed by written addendum prior to bid.

E. Substitutions after bid will not be permitted except as allowed by Louisiana Public Bid Law.

1.9 WARRANTY

A. Manufacturer's standard one (1) year warranty from date of Substantial Completion, not to exceed six (6) months from date of shipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Manufacturer:

1. YKK AP America Inc., Atlanta, Georgia.

B. Approved Manufacturers:

1. YKK AP America Inc.

2. Other manufacturers receiving prior approval by addendum.

2.2 STOREFRONT AND CURTAIN WALL SYSTEMS

A. Systems: Interior storefront - YKK AP YES 45 TU Center Set, 2-inch x 4-1/2-inch storefront, and YES 60 TU, 2-inch x 6-inch storefront, where indicated. Exterior storefront - YKK AP YHS 50 TU ProTek® thermally broken hurricane-impact-resistant storefront, or another YKK AP ProTek® impact system specifically engineered and tested for the required project pressures. Exterior curtain wall - YKK AP YHC 300 OG ProTek® impact-resistant curtain wall system, with back-section depth and reinforcing selected for the required pressures; or approved equal.

B. Configuration: Fixed glazed storefront and curtain wall only. Interior systems shall be in the nominal depths indicated on the Drawings. Exterior system depth may be adjusted from the nominal drawing depth where required by the selected tested hurricane-impact system and project design pressures, subject to Architect review and coordination with adjacent wall construction. Maintain indicated sightlines and architectural appearance. Automatic sliding entrances are specified separately.

C. Construction: Interior storefront systems with continuous vertical mullions and screw-spline, shear-block, or manufacturer-approved joinery. Exterior storefront and curtain wall shall use the manufacturer's tested hurricane-impact assembly, including required mullions, reinforcing, joinery, glazing pockets, pressure plates, anchors, sealants, and accessories. Provide impact-resistant insulating glazing at exterior systems as specified in Section 08 80 00.

D. Thermal Performance: Exterior storefront framing shall be thermally broken; YHS 50 TU uses continuous poured-and-debridged ThermaBond Plus® technology. Exterior curtain wall shall use the manufacturer's impact-rated thermally improved / thermally isolated construction and shall satisfy the overall fenestration thermal requirements specified herein and in Section 08 80 00.

2.3 MATERIALS

A. Aluminum Extrusions: ASTM B221, Alloy 6063-T5.

B. Aluminum Sheet: ASTM B209, Alloy 5005-H14, minimum thickness 0.050 inches.

C. Fasteners: Stainless steel or manufacturer approved corrosion-resistant fasteners.

D. Gaskets: EPDM, compatible with glazing and sealants.

E. Sealants: As recommended by manufacturer and complying with AAMA 800 series.

2.4 FINISHES

A. Finish: Clear Anodized Plus®.

1. Comply with AAMA 612.

2. Minimum anodic coating thickness: 0.7 mils.

B. Finish shall be shop-applied; field-applied finishes are not permitted.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify substrates and openings are acceptable prior to installation.

3.2 INSTALLATION

A. Install storefront and curtain wall systems in accordance with manufacturer’s instructions, approved shop drawings, and Contract Documents.

B. Provide continuous sill flashing, end dams where applicable, and internal drainage to exterior at exterior storefront and curtain wall systems.

C. Align framing plumb, level, and square.

D. Seal all metal-to-metal joints as recommended by manufacturer.

3.3 FIELD QUALITY CONTROL

A. Field testing may be required in accordance with AAMA 501.2.

3.4 CLEANING AND PROTECTION

A. Clean finished aluminum surfaces per AAMA recommendations.

B. Protect installed storefront from damage until Substantial Completion.

END OF SECTION 08 41 00

SECTION 08 42 29 - AUTOMATIC SLIDING ENTRANCES

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor shall furnish labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of automatic sliding entrance systems as shown on the Drawings and as specified herein, in accordance with the Contract Documents and coordinated with all other trades.

B. Provide complete operating assemblies including doors, fixed sidelites where indicated, frames, overhead operators, controls, activation and safety devices, breakout hardware, thresholds, glazing, locks, access-control interfaces, anchorage, flashing, perimeter seals, and all related accessories necessary for complete, code-compliant and operational installations.

1.2 SUMMARY

A. Section Includes:

1. Exterior, hurricane-impact-resistant, full-breakout, bi-parting automatic sliding entrances at Doors 100B and 100C.

2. Interior, full-breakout, bi-parting automatic sliding entrance at Door 100A.

3. Operators, presence and activation sensors, control switches, emergency breakout functions, door seals, glazing, and security/access-control provisions indicated on the Drawings.

B. Basis of Design: Stanley Access Technologies, an Allegion company; exterior Dura-Storm 3000 BP Impact Level E and interior Dura-Glide D/G 3000 BP systems, corresponding to the Owner’s existing hospital systems, subject to the project-specific requirements of this Section.

C. Products by other manufacturers meeting all specified requirements may be considered in accordance with Section 01 33 24 - Substitutions and applicable public bidding requirements. Substitutions shall be based upon the complete tested and approved assembly, not separate components.

1.3 RELATED SECTIONS

A. Section 05 50 00 - Metal Fabrications: Supporting steel members and independent framing above exterior entrances.

B. Section 07 27 26 - Fluid Applied Membrane Air Barrier: Exterior air and water barrier transitions.

C. Section 07 92 00 - Joint Sealants: Perimeter sealants and weatherproofing.

D. Section 08 41 00 - Entrances and Storefront: Adjacent fixed storefront and transom assemblies.

E. Section 08 80 00 - Glazing: Glass requirements coordinated with approved entrance assemblies.

F. Division 26 - Electrical: Power supply, grounding, and electrical connections.

G. Division 27 - Communications: Data and low-voltage interfaces where indicated.

1.4 REFERENCES

A. ANSI/BHMA A156.10 - Power Operated Pedestrian Doors, edition applicable to the Project.

B. ANSI/BHMA A156.19 - Power Assist and Low Energy Power Operated Swinging Doors, only for ancillary swing operators if indicated.

C. ASCE/SEI 7-16 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

D. ASTM E283 - Air Leakage of Exterior Windows, Curtain Walls, and Doors.

E. ASTM E330/E330M - Structural Performance of Exterior Windows, Doors, Skylights, and Curtain Walls by Uniform Static Air Pressure Difference.

F. ASTM E331 - Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

G. ASTM E1886 and ASTM E1996 - Impact and Cyclic Pressure Testing of Exterior Fenestration.

H. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.

I. 2010 ADA Standards for Accessible Design, applicable Louisiana accessibility requirements, and NFPA 101 as adopted for this Project.

J. Current Florida Building Code Product Approval or Miami-Dade Notice of Acceptance (NOA) for the exact exterior entrance assembly proposed.

1.5 PERFORMANCE REQUIREMENTS

A. Automatic Operation: Comply with ANSI/BHMA A156.10 for automatic sliding pedestrian doors, including activation, detection, monitored safety functions, signage, opening/closing speeds, and breakout operation. Comply with accessibility and means-of-egress requirements applicable to each opening.

B. Exterior Wind and Impact Resistance: Design and install each exterior entrance as a tested hurricane-impact-resistant assembly for ASCE/SEI 7-16, Risk Category III, and ultimate design wind speed of 164 mph, consistent with Section 08 41 00. Determine required positive and negative components-and-cladding design pressures from the actual opening size, building height, exposure, wall zone, effective wind area, and enclosure condition. Tested and approved assembly capacity shall meet or exceed the calculated pressures at each opening.

1. Impact Resistance: Impact Level E as identified by manufacturer and evidenced by valid product approval for the exact panel, glazing, frame, hardware, anchors, and dimensional configuration.

2. Provide evidence of compliance with applicable ASTM E1886/E1996 impact and cyclic-pressure testing and the approved product listing. A pressure rating stated in marketing literature alone is not sufficient.

3. Provide connections, reinforcing, and supporting members compatible with the selected product approval and the supporting construction.

C. Independent Structural Support: Exterior automatic sliding entrance assemblies at Doors 100B and 100C shall be structurally independent of storefront and transom assemblies above. Provide horizontal structural steel support between the systems as shown on the Drawings, with separate anchors for each independently approved and tested assembly. Do not impose storefront or transom gravity or wind loads on the automatic sliding entrance header unless expressly permitted by the approved engineering and supporting design.

D. Glazing and Energy Requirements: Exterior Doors 100B and 100C are required to be both hurricane-impact-resistant and insulated per RFI No. 39. The referenced Stanley Dura-Storm 3000 BP Level E hospital submittal, however, identifies 5/8-inch laminated impact glazing and does not document an insulated Level E assembly. Prior to fabrication, submit manufacturer's written confirmation that an insulated glazing assembly is included in a valid Level E tested approval and satisfies applicable energy requirements. If the specified combination is not available, immediately notify the Architect for written resolution. Do not substitute a Level D impact system, non-impact glazing, or an untested insulated glazing assembly without written approval.

E. Air Infiltration and Water Penetration: Exterior assembly shall meet the infiltration and water-resistance criteria established by its tested product approval, applicable building codes, and manufacturer's published assembly limitations. Submit test reports and approved details for the actual configuration.

F. Operating Power: Nominal 120 volts AC, 60 Hz, 5 amperes minimum at each header, or manufacturer's greater listed requirement. Coordinate final electrical load and disconnect requirements with Division 26.

1.6 SUBMITTALS

A. Product Data: Manufacturer's current product literature for each type of automatic sliding entrance, including door and frame profiles, glazing, operators, sensors, controls, hardware, thresholds, seals, finishes, installation instructions, and maintenance information.

B. Shop Drawings: Fully dimensioned plans, elevations, sections, rough openings, clear opening widths, breakout widths, operator housings, supporting framing, anchorage, sill/threshold details, perimeter flashing and seals, electrical and low-voltage rough-ins, sensor locations, access-control wiring, and coordination with storefront and transom construction.

1. Identify each exterior entrance by door number, its required positive and negative design pressures, the proposed impact rating, manufacturer product approval/NOA, glazing make-up, frame reinforcement, and anchor locations and spacing.

2. Indicate separate supports and attachments for the exterior sliding door systems and the storefront/transom systems immediately above them.

3. Indicate full-breakout operating clearances, the required accessible clear width, threshold elevations, and actual interface with adjacent floor finishes.

C. Delegated Design: Submit structural design calculations and attachment details for exterior entrance assemblies and their anchorage, signed and sealed by a professional engineer licensed in Louisiana. Coordinate loads and supporting steel with Structural Drawings.

D. Product Approvals and Test Reports: Submit current Florida Product Approval or Miami-Dade NOA and manufacturer's supporting test data for the exact exterior assembly, including available tested glazing options and stated pressure limits.

E. Samples: Provide two (2) samples of clear anodized aluminum finish, minimum 2 inches by 3 inches, and glazing samples when requested by Architect.

F. Wiring Diagrams: Include point-to-point diagrams identifying 120-volt power, low-voltage controls, access-control hardware, key switches, sensors, safety circuits, and interfaces with the fire alarm system where required.

G. Warranty: Submit manufacturer's specimen warranty identifying coverage, term, conditions, and exclusions.

H. Closeout: Submit operating instructions, maintenance procedures, recommended daily safety checks, equipment identification, keys, authorized control settings, wiring diagrams, manufacturer service contact information, and warranty documentation.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer shall have a minimum of ten (10) years successful experience producing automatic sliding entrance systems of the type required and shall maintain a service organization capable of providing warranty and emergency service for the Project location.

B. Installer Qualifications: Installation shall be performed by the manufacturer, its authorized distributor, or an installer trained and certified to install and service the submitted automatic door systems.

C. Manufacturer's Installation Requirements: Do not combine components or glazing from different tested systems in a manner that invalidates the specified product approval or warranty.

D. Preinstallation Conference: Coordinate entrance dimensions, independent structural support, glazing, impact approvals, power, sensors, access control, finishes, thresholds, weatherproofing, and testing with the Contractor, Architect, Structural Engineer, electrical installer, and automatic door manufacturer's representative.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver entrance components in manufacturer's protective packaging with identification labels. Store off the ground, under cover, dry and protected from damage, condensation, and contamination.

B. Do not install damaged, bent, corroded, or defaced components. Protect anodized finishes and impact-rated glazing during handling and installation.

1.9 WARRANTY

A. Provide manufacturer's written limited warranty for automatic sliding entrance systems for five (5) years from Substantial Completion, consistent with the warranty identified in the Owner's existing hospital submittal, subject to confirmation of the manufacturer's current terms. Submit the manufacturer's written coverage and identify components with different warranty periods before approval.

B. Installer shall correct defective installation and improper operation for not less than one (1) year from Substantial Completion. Warranty does not relieve Contractor of responsibilities under the Conditions of the Contract.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Manufacturer: Stanley Access Technologies, an Allegion company.

B. Basis of Design Products:

1. Exterior automatic sliding entrances: Dura-Storm 3000 BP, Impact Level E, full-breakout, bi-parting configuration.

2. Interior automatic sliding entrances: Dura-Glide D/G 3000 BP, full-breakout, bi-parting configuration.

C. Equivalent products by other manufacturers shall provide equivalent construction, appearance, operational performance, hurricane-impact approvals where required, service support, and warranties, subject to prior approval in accordance with the Contract Documents.

2.2 EXTERIOR HURRICANE-IMPACT-RATED AUTOMATIC SLIDING ENTRANCES

A. Location: Doors 100B and 100C, subject to final Door Schedule and Glazed Opening Elevations.

B. System: Stanley Dura-Storm 3000 BP Impact Level E, full-breakout, bi-parting automatic sliding door with two moving panels and two fixed sidelites designed to break out in an emergency, complete with tested glazing, frame, header, rails, hardware, thresholds, and anchorage.

C. Door and Frame Construction: Heavy-duty extruded aluminum construction with welded panel construction and impact-rated reinforcing, security hooks,

continuous head operator enclosure, and concealed fasteners where permitted by product approval.

1. Stile, rail, intermediate muntin, and frame dimensions shall match the applicable tested and approved Level E assembly. The existing hospital Level E reference incorporates medium stiles, muntins, and laminated glazing; do not reduce or substitute these elements outside the permitted product approval.

2. Operator header: Manufacturer's standard, nominal 8-inch-high by 6-inch-deep enclosed header, or configuration required by the approved assembly and shown on reviewed shop drawings.

3. Transoms: Do not integrate a non-impact transom within the Level E sliding entrance assembly. Coordinate independent glazed storefront/transom construction above the entrance as indicated on Drawings.

D. Exterior Glazing: Manufacturer-furnished laminated, large-missile-impact-rated safety glazing required by the applicable Level E approval. The Owner's 2024 hospital reference uses nominal 5/8-inch (0.625-inch) laminated impact glazing. Provide insulated impact-rated glazing only where the manufacturer documents it as part of the same approved Level E system. Resolve the energy/Level E glazing requirement as stated in Paragraph 1.5.D before ordering.

E. Finish: Clear anodized aluminum, including doors, frames, header covers, thresholds, and exposed aluminum accessories; match approved Owner sample and coordinate adjacent storefront finish.

F. Operation: Automatic bi-parting sliding motion with complete emergency breakout of both moving panels and adjacent sidelite panels, where required for egress; provide manufacturer's approved bottom ball detents, panic release, wind dampers, and door positioning components included in the tested assembly.

G. Threshold: Manufacturer's continuous, clear-anodized, tapered extruded-aluminum threshold designed for the tested assembly, weather resistance, and accessible passage. Coordinate top of threshold, floor elevations, and transitions with architectural details and ADA requirements.

H. Anchorage: Use only manufacturers' approved anchors, plates, reinforcing members, shims, attachment materials, and fastening patterns permitted by the product approval and sealed delegated design. Provide corrosion-resistant anchors suitable for coastal conditions and contact materials.

2.3 INTERIOR AUTOMATIC SLIDING ENTRANCES

A. Location: Door 100A, subject to final Door Schedule.

B. System: Stanley Dura-Glide D/G 3000 BP, full-breakout, bi-parting automatic sliding entrance with aluminum framed moving panels and sidelites, clear anodized finish, overhead operator, activation and safety devices, and necessary full-breakout hardware.

C. Interior entrance is not required to be hurricane-impact-rated or insulated. Provide safety glazing compatible with system and Section 08 80 00. Nominal

1/4-inch glazing is acceptable where permitted by final glazing schedule, manufacturer, and applicable safety requirements.

D. Provide lockset, cylinder/thumbturn, two-point locking, and solenoid options only where identified on the Door Hardware Schedule and coordinated with required egress and access-control functions.

2.4 AUTOMATIC OPERATORS, CONTROLS AND ACCESSORIES

A. Operator: Factory-assembled electro-mechanical overhead operator with nominal 1/4-hp DC motor, gear drive, synchronous drive belt, microprocessor controller, and manufacturer's standard safety logic. Operator shall provide smooth acceleration and deceleration, monitored obstacle detection, and automatic re-opening where required by ANSI/BHMA A156.10.

B. Activation and Safety: Two combined activation/presence sensors, one on each side of each entrance, and doorway presence/holding beams or manufacturer's currently approved monitored safety arrangement. Provide touchless wave devices where indicated, and coordinate locations and activation sequence with Architect and Owner.

C. Controls: Manufacturer's keyed, six-position operation control where required to match Owner's existing hospital standard. Provide operating modes suitable for automatic, open, closed/locked, exit-only, and other functions available on approved equipment. Verify the exact control sequence with Owner before shop drawing approval.

D. Locking and Security: Provide manufacturer-compatible mechanical or electric locking, alarm contacts, keyed controls, and access-control interface where indicated. Electric lock fail-safe or fail-secure function shall comply with approved egress sequence and fire alarm requirements. Loss of power, fire alarm operation, and manual breakout shall not prevent egress where required by code.

E. Power and Interfaces: Provide complete listed connection provisions and manufacturer required low-voltage wiring terminations. Coordinate the furnishing and installation of junction boxes, conduit, power wiring, card reader connections, and fire alarm interfaces with the electrical and low-voltage trades. Do not rely on exclusions contained in the reference hospital vendor's proposal to define the Work of this Contract.

F. Accessories: Manufacturer's standard seals, gaskets, panel guides, rollers, hangers, covers, stops, safety labels, fasteners, and all components required for complete installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify dimensions, substrate conditions, structural supports, adjacent glazing, finish floor elevations, and availability of power and control rough-ins before fabrication and installation. Notify Architect of conditions preventing compliant installation.

B. Confirm that exterior supporting steel, independent transom framing, backing, and structural attachment substrates conform to the approved product listing and delegated-design calculations before installing automatic entrances.

3.2 INSTALLATION

A. Install complete entrance systems in strict accordance with the manufacturer's current written instructions, reviewed shop drawings, tested product approval requirements, and applicable ANSI/BHMA A156.10 requirements.

B. Set assemblies plumb, level, square, and true to line. Provide required clearances, shims, corrosion-resistant anchors, expansion provisions, and adjustments to permit unrestricted sliding and breakout operation.

C. Attach exterior Level E entrances directly to approved independent supporting construction using the exact anchorage methods and spacing permitted by their product approval and sealed engineering. Do not attach the overhead storefront/transom framing to sliding entrance headers unless specifically supported by an approved tested design and project structural engineering.

D. Integrate exterior perimeter seals, head/sill flashing, weather barrier transitions, and sealants with adjacent construction to maintain drainage, air barrier continuity, and watertightness. Refer to Sections 07 27 26 and 07 92 00.

E. Install threshold flush or with accessible compliant transitions and coordinate with completed floor finishes. Do not create projections or raised edges exceeding accessibility limitations.

F. Install sensors, controls, touchless activation switches, locking and alarm contacts, and other interfaces at locations shown on approved shop drawings. Coordinate final power, data, fire alarm, and access-control terminations.

3.3 FIELD QUALITY CONTROL AND TESTING

A. Manufacturer's authorized technician shall start up, adjust, and test each entrance after electrical energization and completion of adjacent construction.

B. Verify full automatic opening and closing cycles; sensor detection fields; safety reversal; obstruction detection; keyed operating modes; touchless activation; locks; access controls; emergency breakout and reset; and proper operation under power-loss and fire-alarm conditions, where applicable.

C. Check accessible clear widths, activation-device locations, closing forces, opening speeds, and thresholds for compliance with ANSI/BHMA A156.10 and applicable accessibility and egress requirements.

D. Demonstrate proper operation of each completed assembly to Owner and Architect. Correct deficiencies and re-test until acceptable.

E. Submit written start-up documentation identifying unit locations, adjustment/settings, test results, and manufacturer's authorized service technician.

3.4 CLEANING AND PROTECTION

A. Clean and protect anodized aluminum, glazing, covers, tracks, and exposed components in accordance with manufacturer's instructions. Do not use abrasive cleaners or materials that damage protective finishes.

B. Protect installed systems against construction traffic, impact, debris, and moisture until Substantial Completion. Replace damaged components and glazing before final acceptance.

3.5 OWNER INSTRUCTION

A. Instruct Owner's designated personnel in operating modes, emergency breakout and reset, lock and control functions, daily safety checks, cleaning, maintenance, and service procedures. Deliver keys, control credentials, O&M manuals, and manufacturer's service contact information.

END OF SECTION 08 42 29

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.
2. Sliding doors.
3. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 01 Section "General Conditions".
2. Division 06 Section “Rough Carpentry”.
3. Division 06 Section “Finish Carpentry”.
4. Division 08 Section “Operations and Maintenance”.
5. Division 08 Section “Hollow Metal Doors and Frames”.
6. Division 08 Section “Flush Wood Doors”.
7. Division 08 Section “Lead Lined Doors and Frames”.
8. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.
9. Division 26 Section "Electrical”

D. Codes and References: Comply with the version adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ANSI/SDI A250.13 - Testing and Rating of Severe Windstorm Resistant Components for Swing Door Assemblies.
3. ASTM E1886 - Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Shutters Impacted by Missiles and Exposed to Cyclic Pressure Differentials.
4. ASTM E1996 - Standard specification for performance of exterior windows, curtain walls, doors and storm shutters impacted by Windborne Debris in Hurricanes.
5. ICC/IBC - International Building Code.
6. NFPA 70 - National Electrical Code.

7. NFPA 80 - Fire Doors and Windows.
8. NFPA 101 - Life Safety Code.
9. NFPA 105 - Installation of Smoke Door Assemblies.
10. TAS-201-94 - Impact Test Procedures.
11. TAS-202-94 - Criteria for Testing Impact and Non-Impact Resistant Building Envelope Components using Uniform Static Air Pressure.
12. TAS-203-94 - Criteria for Testing Products Subject to Cyclic Wind Pressure Loading.
13. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
3. Content: Include the following information:

    a. Type, style, function, size, label, hand, and finish of each door hardware item.
    b. Manufacturer of each item.
    c. Fastenings and other pertinent information.
    d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    e. Explanation of abbreviations, symbols, and codes contained in schedule.
    f. Mounting locations for door hardware.
    g. Door and frame sizes and materials.
    h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
b. Complete (risers, point-to-point) access control system block wiring diagrams.
c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:

1. Hurricane Resistant Openings: Exterior hurricane opening assemblies to be tested according to ASTM E330, ASTM E1886, ASTM E1996, TAS 201, TAS 202, TAS 203 standards, and certified by a qualified independent third party agency acceptable to authority having jurisdiction, with labeling indicating compliance with the design pressure and debris impact resistance level requirements specified for the Project.
2. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

1.4 CLOSEOUT SUBMITTALS

A. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.5 QUALITY ASSURANCE

A. Hardware Supplier and Hardware Installer must obtain a license with the Louisiana Office of State Fire Marshall in accordance to RS 40:1464 and RS 40:1664.

B. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

C. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

D. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

E. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity.

F. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

G. Hurricane Resistant Exterior Openings: Provide exterior door hardware as complete and tested assemblies, or component assemblies, including approved doors and frames specified under Section 081113 "Hollow Metal Doors and Frames", to meet the design pressures, debris impact resistance, and glass and glazing requirements applicable to the Project.

1. Test units according to ASTM E330, ASTM E1886, ASTM E1996, TAS 201, TAS 202, and TAS 203 standards, certified by a qualified independent third party listing agency acceptable to authority having jurisdiction, and bearing a third party certification agency permanent label indicting windstorm approved product.

H. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

I. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

J. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s),

Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

K. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.6 DELIVERY, STORAGE AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.7 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.8 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of

the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 BUTT HINGES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

a. Two Hinges: For doors with heights up to 60 inches.
b. Three Hinges: For doors with heights 61 to 90 inches.
c. Four Hinges: For doors with heights 91 to 120 inches.
d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for all out-swinging lockable doors.

5. Manufacturers:

a. Ives (IV) - 5BB Series, 5-knuckle.
b. McKinney (MK) - TA/T4A Series, 5-knuckle.

2.2 CONTINUOUS HINGES

A. Continuous Double-Acting Hinges (Behavioral Health). ANSI/BHMA A156.26 Grade 1-300 Certified continuous hinges.

1. Manufacturers:

a. Markar Products; ASSA ABLOY Architectural Door Accessories (MR) - DSH1000.
b. Pemko (PE) - DSH1000 Series.

B. Pin and Barrel Continuous Hinges: ANSI/BHMA A156.26 Grade 1-600 pin and barrel continuous hinges with minimum 14 gauge Type 304 stainless steel hinge leaves, concealed stainless pin, and twin self-lubricated nylon bearings at each knuckle separation. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:

a. Hager Companies (HA).
b. Markar Products; ASSA ABLOY Architectural Door Accessories (MR).
c. Pemko (PE).

2.3 FLOOR CLOSERS AND PIVOTS

A. Pivots: ANSI/BHMA A156.4, Grade 1; space intermediate pivots equally not less than 25 inches on center apart or not more than 35 inches on center for doors over 121 inches high. Pivot hinges to have oil impregnated bronze bearing in the top pivot and a radial roller and thrust bearing in the bottom pivot with the bottom pivot designed to carry the full weight of the door. Pivots to be UL listed for windstorm where applicable.

1. Manufacturers:

a. Ives (IV).
b. Norton Rixson (NO).

2.4 SLIDING AND FOLDING HARDWARE

A. Sliding and Folding Door Hardware: Hardware is to be of type and design as specified and should conform with ANSI/BHMA A156.14.

1. Provide sliding door hardware as follows:

a. Sliding Bi-Passing Pocket Door Hardware: Provide complete sets consisting of track, hangers, stops, bumpers, floor channel, guides, and accessories indicated.

b. Cascading: Provide a bi-parting or single direction telescoping system as required with a minimum 200 lb. per door capacity.
c. Bi-folding Door Hardware: Rated for door panels weighing up to 125 lb.
d. Pocket Sliding Door Hardware: Rated for doors weighing up to 200 lb.

2. Manufacturers:

a. Hafele Manufacturing (HF).
b. Pemko (PE).

2.5 POWER TRANSFER DEVICES

A. Electrified Quick Connect Transfer Hinges: Provide electrified transfer hinges with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets with a 1-year warranty. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

a. Ives (IV) - Connect.
b. McKinney (MK) - QC (# wires) Option.

B. Electrified Quick Connect Continuous Geared Transfer Hinges: Provide electrified transfer continuous geared hinges with a removable service panel cutout accessible without de-mounting door from the frame. Furnish with Molex™ standardized plug connectors with sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

a. Ives (IV) - Connect.
b. Pemko (PE) - SER-QC (# wires) Option.

C. Electrified Quick Connect Stainless Steel Continuous Transfer Hinges: Provide electrified transfer stainless steel continuous hinges with electrical transfer access prep accessible without de-mounting door from the frame. Furnish with Molex™ standardized plug connectors with sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

a. Ives (IV) - Connect.
b. Markar Products; ASSA ABLOY Architectural Door Accessories (MR) - MP-ETAP-EL (# wires) Option.

D. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:

    a. McKinney (MK) - Electrical Connecting Kit: QC-R001.
    b. McKinney (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:

    a. McKinney (MK) - QC-C Series.
    b. Von Duprin (VD) - Connect.

2.6 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
5. Manufacturers:

    a. Ives (IV).
    b. Rockwood (RO).

B. Coordinators: ANSI/BHMA A156.3 door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.

1. Manufacturers:

    a. Ives (IV).
    b. Rockwood (RO).

C. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Pulls shall be provided with a 10” clearance from the finished floor on the push side to accommodate wheelchair accessibility.
5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets. When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
6. Manufacturers:

    a. Ives (IV).
    b. Rockwood (RO).

2.7 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

1. Manufacturers:

    a. Corbin Russwin (RU) – Match existing.
    b. No Substitution.

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.
5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
6. Keyway: Match Facility Standard. Reg # 0070532146

C. Large Format Interchangeable Cores: Provide removable cores (LFIC) as specified, core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.

D. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.

3. Existing System: Field verify and key cylinders to match Owner's existing system.

E. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).
4. Construction Control Keys (where required): Two (2).
5. Permanent Control Keys (where required): Two (2).

F. Construction Keying: Provide temporary keyed construction cores.

G. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.8 KEY CONTROL

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:

a. Lund Equipment (LU).
b. MMF Industries (MM).
c. Telkee (TK).

2.9 MORTISE LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:

a. Corbin Russwin Hardware (RU) - ML2000 Series.
b. Sargent Manufacturing (SA) - 8200 Series.
c. Schlage (SC) - L9000 Series.

2.10 CYLINDRICAL LOCKS AND LATCHING DEVICES

A. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed cylindrical locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Electromechanical locksets shall have the following functions and features:

    a. Universal Molex plug-in connectors that have standardized color-coded wiring and are field configurable in fail safe or fail secure and operate from 12vdc to 24vdc regulated.
    b. EcoFlex or equivalent technology that reduces energy consumption up to 92% as certified by GreenCircle.
    c. Options to be available for request-to-exit or enter signaling.
    d. Two-year limited warranty on electrified functions.

2. Manufacturers:

    a. Corbin Russwin Hardware (RU) - CLX3300 Series.
    b. Sargent Manufacturing (SA) - 10X Line.
    c. Schlage (SC) - ND Series.

2.11 MULTI-POINT LOCKS AND LATCHING DEVICES

A. Multi-Point Locksets, Storm Shelter: Provide ANSI/BHMA A156.37, Series 1000, Operational Grade 1 and Security Grade 1 Certified Products Directory (CPD) listed multi-point locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide locksets with functions and features as follows:

    a. Where required by code, provide knurling or abrasive coating on all levers leading to hazardous areas.
    b. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.
    c. Meets Florida Building Code FL2998 and UL Certification Directory ZHEM.R21744 for latching hardware for hurricane requirements.
    d. Approved for usage as part of a complete ICC 500 (2014/2020) and FEMA P-361 (2015/2021) door, frame, and hardware assemblies for storm shelter components.
    e. Lever torque to retract all bolts less than 28 in.lb.
    f. Cycle tested to 1,000,000 cycles.
    g. Seven-year limited warranty for mechanical functions.

2. Manufacturers:

    a. Corbin Russwin Hardware (RU) - FE6600 Series.
    b. Sargent Manufacturing (SA) - FM7300 Series.
    c. Schlage (SC) - LM9300.
    d. Securitech (SR) - Multi-Bolt Series.

2.12 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.13 ELECTROMAGNETIC LOCKING DEVICES

A. Surface Electromagnetic Locks (Heavy Duty): Electromagnetic locks to be surface mounted type conforming to ANSI A156.23, Grade 2 with minimum holding force strength of 1,200 pounds. Locks to be capable of accepting between 12 to 24 volts direct current and be UL listed for use on fire rated door assemblies. Electromagnetic coils are to consume no more than 1.5W during normal operation. Locks are to have an integrated door position switch, tamper switch, and lock bond sensor. Locks are to have integrated motion sensor and/or security camera as indicated in the hardware sets. Locks to be capable of detecting door prop conditions and entering low power mode. Provide mounting accessories as needed to suit opening conditions. Power supply to be by the same manufacturer as the lock with combined products having a lifetime replacement warranty.

1. Manufacturers:

a. Securitron (SU) - M680E Series.

2.14 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. Exit devices shall have a five-year warranty.
2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.
4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.

5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.

    a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.
9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide exit devices with functions and features as follows:

    a. Where required by code, provide knurling or abrasive coating on all levers leading to hazardous areas.
    b. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.
    c. No catch points: addition of applied deflectors or other added components are not allowed.
    d. No visible plastic.
    e. Heavy duty end caps with flush and overlapping options made of stainless steel, brass, or bronze with architectural finishes.
    f. Constructed of all stainless steel.
    g. Stainless steel pullman type latch with deadlock feature.
    h. Narrow or wide style exterior trim as specified in the hardware sets.
    i. Center case adjustability on concealed vertical rod exit devices; single operation with hex key individually adjusts top or bottom latches. No retainer screws or clips required to maintain adjustment.
    j. Ten-year limited warranty for mechanical features.

2. Manufacturers:

    a. Corbin Russwin Hardware (RU) - PED4000 / PED5000 Series.
    b. Sargent Manufacturing (SA) - PE80 Series.
    c. Von Duprin (VD) - 35A/98 XP Series.

2.15 SURFACE DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Large Body Cast Iron): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.

1. Large body cast iron surface mounted door closers shall have a 30-year warranty.
2. Manufacturers:

    a. Corbin Russwin Hardware (RU) - DC8000 Series.
    b. LCN Closers (LC) - 4040XP Series.
    c. Sargent Manufacturing (SA) - 281 Series.

C. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard..

1. Manufacturers:

    a. Corbin Russwin Hardware (RU) - DC6000 Series.
    b. LCN Closers (LC) – 4040XP Series.
    c. Sargent Manufacturing (SA) - 351 Series.

2.16 SURFACE MOUNTED CLOSER HOLDERS

A. Motion Sensor Closer Holder Devices: ANSI A156.15, Grade 1 multi-point electromechanical closers with a programmable motion sensor allowing the door to open manually and remain open when one or more people travel through the opening. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide closer holders with functions and features as follows:

a. UL-cUL listed and UL10C compliant for positive pressure up to 3-hours.
b. Selectable hold open time and sensitivity.
c. Sensor that detects movement in both directions.
d. Push or pull side mounting with the closer mounted on the frame.
e. Standard separate and independent latch, sweep, and backcheck intensity valves.
f. Two-year limited warranty.

2. Manufacturers:

a. Norton Rixson (NO) - 7100SZ Series.
b. LCN Door Closers (LC) - 4310/4410HSA Series.

2.17 ARCHITECTURAL TRIM AND ACCESSORIES

A. Door, Frame and Wall Protective Trim: ANSI/BHMA A156.6, protective products as specified in the hardware sets. Door protection plates shall be not more than 2" less than door width on stop side and 1” less door width on the pull side or on stop side of pairs of doors. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide protective trim with functions and features as follows:

a. Meets ADA requirements for smooth bottom door surfaces.
b. UL Classified options for use on fire-rated doors up to 3 hours.
c. Fabricated from stainless steel, brass, bronze, aluminum, or high-impact plastic.
d. Available in a variety of sizes, finishes, and profiles to suit aesthetic and functional requirements.
e. Designed to protect doors, frames, and adjacent walls from damage due to impact, abrasion, or traffic.
f. Fasteners included; adhesive-backed options available for select models.
g. Ten-year limited warranty.

2. Manufacturers:

a. Ives (IV).
b. Rockwood (RO).

2.18 DOOR STOPS AND HOLDERS

A. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other

types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

    a. Ives (IV).
    b. Rockwood (RO).

2.19 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NFPA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. Pemko (PE).
2. Zero (ZE).

2.20 ELECTRONIC ACCESSORIES

A. Key Switches: Key switches furnished standard with stainless steel single gang face plate with a 12/24VDC bi-color LED indicator. Integral backing bracket permits integration with any 1 1/4" or 1 1/2" mortise type cylinder. Key switches available as momentary or maintained action and in narrow face plate options.

1. Manufacturers:

a. Alarm Controls (AK) - MCK Series.
b. Security Door Controls (SD) - 800 Series.
c. Securitron (SU) - MK Series.

B. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.

1. Manufacturers:

a. Alarm Controls (AK) - CP1-1026 Series.
b. Security Door Controls (SD) - DPS Series.
c. Securitron (SU) - DPS Series.

C. Switching Power Supplies: Provide the least number of power supplies at the appropriate amperage level sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

1. Power supplies shall meet all functions and features as specified herein.

a. UL listed dual voltage 12 or 24 VDC field selectable continuous output.
b. Tolerates brownout or overvoltage input ± 15% of nominal voltage.
c. Thermal shutdown protection with auto restart.
d. Circuit breaker protection against overcurrent and reverse battery faults.
e. Integrated battery charging circuit to prevent overvoltage on locking devices.
f. Available with a single relay fire trigger or individually triggered relayed outputs.
g. Monitoring options as specified.

2. Manufacturers:

a. Altronix (AS) - Maximal 3.
b. Securitron (SU) - AQD Series.

2.21 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.22 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Paint prime coated mullions to match frames.

C. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

D. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

E. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.

F. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

G. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Manufacturer’s Abbreviations:

1. MK - McKinney
2. MR - Markar
3. PE - Pemko
4. NO - Norton Rixson
5. RO - Rockwood
6. RU - Corbin Russwin
7. SU - Securitron
8. OT - Other

Hardware Sets based on plans dated 10/07/2026 – 30%CD

Set: 1.0
Doors: 150, 191
Description: Ext - Pair - Storeroom - SFB - Closer/stop - KP

2	Continuous Hinge	HG305	630	MR
2	Surface Bolt	988CR		RU
1	Multi-Point Lock	FE6665 ASA CT7D	626	RU
1	Interchangeable Core	CR8500-Reg # 0070532146	626	RU
1	Surface Closer/stop	DC8210 A11 M54	689	RU
1	Astragal	S771D		PE
1	Rain Guard	346C		PE
1	Gasketing	S88BL		PE

2	Sweep	345ANB		PE	
1	Threshold	2715A		PE	
1	Position Switch	DPS-M-BK		SU	⚡

Notes:
Door manufacturer to verify and provide hardware to meet approved windstorm approvals.
Hollow metal frame manufacturer to provide weather stripping in the Thermal Break frame.

Set: 2.0
Doors: 119B, 145B, 184B, 203, 204, 206, 209
Description: Ext - Sgl - Rim MELR - Closer/stop

1	Continuous Hinge	HG305 EL*	630	MR	⚡
1	Rim Exit Device, MELR / RX	PED5257T K157ET M107 M92 MELR CT7D	630	RU	
1	Door Pull	RM3310-24 Mtg-Type 12XHD	US32D	RO	
1	Surface Closer/stop	DC6200 A11	689	RU	
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO	
1	Rain Guard	346C		PE	
1	Sweep	315CN		PE	
1	Threshold	274x292AFGPK MS25SS		PE	
1	ElectroLynx Harness	QC-Cxxx sized for door width		MK	⚡
1	ElectroLynx Harness	QC-C1500P		MK	⚡
1	Card Reader	Provided by the security contractor.		OT	
1	Position Switch	DPS-M-BK		SU	⚡
1	Power Supply	AQD Series		SU	⚡

Notes: Coordinate voltage, operation and electrical characteristics with all related trades.

Door manufacturer to verify and provide hardware to meet approved windstorm approvals.

Hollow metal frame manufacturer to provide weather stripping in the Thermal Break frame.

Set: 3.0
Doors: 109B
Description: Ext - Sgl - Rim - EO - Alarm - Closer

1	Continuous Hinge	HG305	630	MR	
1	Rim Exit Device, Exit Only	PED5201 M107 EO	630	RU	
1	Surface Closer/stop	DC8210 A11 M54	689	RU	
1	Rain Guard	346C		PE	
1	Gasketing	S88BL		PE	
1	Sweep	345ANB		PE	
1	Threshold	2715A		PE	
1	Position Switch	DPS-M-BK		SU	⚡
1	Alarm	By security contractor		OT	

Notes:
Door manufacturer to verify and provide hardware to meet approved windstorm approvals.

Hollow metal frame manufacturer to provide weather stripping in the Thermal Break frame.
Alarm is by security contractor.

Set: 4.0
Doors: 138B
Description: Ext - Sgl - 3-Pt Storeroom - Closer

1	Continuous Hinge	HG305	630	MR	
1	Multi-Point Lock	FE6665 ASA CT7D	626	RU	
1	Interchangeable Core	CR8500-Reg # 0070532146	626	RU	
1	Surface Closer	DC8200 A10 M54	689	RU	
1	Wall Stop	400	US26D	RO	
1	Rain Guard	346C		PE	
1	Gasketing	S88BL		PE	
1	Sweep	345ANB		PE	
1	Threshold	2715A		PE	
1	Position Switch	DPS-M-BK		SU	

Notes:
Door manufacturer to verify and provide hardware to meet approved windstorm approvals.
Hollow metal frame manufacturer to provide weather stripping in the Thermal Break frame.

Set: 5.0
Doors: 202A, 208
Description: Pair - SVR/NL - 2 Card Reader

4	Hinge, Full Mortise, Hvy Wt	TA786 FT	US26D	MK	
2	Hinge, Full Mortise, Hvy Wt	TA786 QC*FT	US26D	MK	
2	Magnetic Lock	M680EBD	628	SU	
1	SVR Exit, Nightlatch MELR RX RU	PED5470T PED359 M55 M91 M92 MELR CT7D			630
1	SVR Exit, Exit Only / RX	PED5401 EO M55 M91 M92 MELR	630	RU	
1	Interchangeable Core	CR8500-Reg # 0070532146	626	RU	
2	Door Pull	RM3310-24 Mtg-Type 12XHD	US32D	RO	
2	Surface Closer/stop	DC6200 A4	689	RU	
2	Armor Plate	K1050 36" 4BE CSKCSK	US32D	RO	
1	Astragal	S771D		PE	
1	Gasketing	S88BL		PE	
2	ElectroLynx Harness	QC-Cxxx sized for door width		MK	
2	ElectroLynx Harness	QC-C1500P		MK	
1	Emerg Release Button	EEB2		SU	
2	Card Reader	Provided by the security contractor.		OT	
2	Position Switch	DPS-M-BK		SU	
1	Power Supply	AQD Series		SU	

Notes:
Coordinate voltage, operation and electrical characteristics with all related trades.

Set: 6.0
Doors: 202B
Description: Pair - Storeroom -CFB -Closer / Stop

6	Hinge, Full Mortise	TA714 FT	US26D	MK	
1	Constant Flush Bolt	2845/2945	US26D	RO	
1	Dust Proof Strike	570	US26D	RO	
1	Storeroom Lock	CLX3357 AZD CT7D	626	RU	
1	Interchangeable Core	CR8500-Reg # 0070532146	626	RU	
1	Coordinator	26xx	US28	RO	
2	Mounting Bracket	2601AB / C	US28	RO	
2	Surface Closer/stop	DC6200 A4	689	RU	
2	Kick Plate	K1050 10" 4BE CSK	US32D	RO	
1	Astragal	357SP		PE	
1	Gasketing	S88BL		PE	

Set: 7.0
Doors: 104A, 110, 148B, 189, 190, 196
Description: Sgl - Fail Secure Lock - Card Access - Closer

2	Hinge, Full Mortise	TA714 FT	US26D	MK	
1	Hinge, Full Mortise	TA714 QC* FT	US26D	MK	ϟ
1	Fail Secure Lockset	CLX33905 AZD M92 CT7D	626	RU	ϟ
1	Interchangeable Core	CR8500-Reg # 0070532146	626	RU	
1	Surface Closer	DC6200 A3 / A10 as required	689	RU	
1	Wall Stop	400	US26D	RO	
3	Silencer - Metal Frame	608		RO	
1	ElectroLynx Harness	QC-Cxxx sized for door width		MK	ϟ
1	ElectroLynx Harness	QC-C1500P		MK	ϟ
1	Card Reader	Provided by the security contractor.		OT	
1	Power Supply	AQD Series		SU	ϟ

Notes:
Coordinate voltage, operation and electrical characteristics with all related trades.

Set: 8.0
Doors: 192A, 192B
Description: Sgl - Fail Safe Lock - Card Access - Closer - Keyswitch

2	Hinge, Full Mortise	TA714 FT	US26D	MK	
1	Hinge, Full Mortise	TA714 QC* FT	US26D	MK	ϟ
1	Fail Safe Lockset	CLX33903 AZD M92 CT7D	626C	RU	ϟ
1	Cylinder	Type as required-Reg # 0070532146	626	RU	
2	Interchangeable Core	CR8500-Reg # 0070532146	626	RU	
1	Surface Closer	DC6200 A3 / A10 as required	689	RU	
1	Wall Stop	400	US26D	RO	

3	Silencer - Metal Frame	608		RO
1	ElectroLynx Harness	QC-Cxxx sized for door width		MK
1	ElectroLynx Harness	QC-C1500P		MK
1	Keyswitch	MK Series		SU
1	Card Reader	Provided by the security contractor.		OT
1	Position Switch	DPS-M-BK		SU
1	Power Supply	AQD Series		SU

Notes: Keyswitch turns off power to lockset allowing free entry/exit. Card reader for entry when lock is energized. Upon loss of power, door will allow free entry. Free egress at all times.
Coordinate voltage, operation and electrical characteristics with all related trades.

Set: 9.0
Doors: 105B, 106
Description: Sgl - Fail Secure Mortise Lock x DB- Card Access - Closer - Keyswitch

2	Hinge, Full Mortise	TA714 FT	US26D	MK
1	Hinge, Full Mortise	TA714 QC* FT	US26D	MK
1	Fail Secure Lock	ML20608 x NAC-SEC ASA CT7D	626	RU
1	Cylinder	Type as required-Reg # 0070532146	626	RU
2	Interchangeable Core	CR8500-Reg # 0070532146	626	RU
1	Surface Closer	DC6200 A3 / A10 as required	689	RU
1	Wall Stop	400	US26D	RO
3	Silencer - Metal Frame	608		RO
1	ElectroLynx Harness	QC-Cxxx sized for door width		MK
1	ElectroLynx Harness	QC-C1500P		MK
1	Keyswitch	MK Series		SU
1	Card Reader	Provided by the security contractor.		OT
1	Position Switch	DPS-M-BK		SU
1	Power Supply	AQD Series		SU

Notes: Keyswitch activates badges.
Coordinate voltage, operation and electrical characteristics with all related trades.

Set: 10.0
Doors: 148A, 152, 153, 154
Description: Sgl -Fail Secure Lock - Card Access - Safezone Closer - AP

2	Hinge, Full Mortise	TA714 FT	US26D	MK
1	Hinge, Full Mortise	TA714 QC* FT	US26D	MK
1	Fail Secure Lockset	CLX33905 AZD M92 CT7D	626	RU
1	Interchangeable Core	CR8500-Reg # 0070532146	626	RU
1	Closer	7100SZ - arm as required	689	NO
1	Armor Plate	K1050 36" 4BE CSKCSK	US32D	RO
1	Wall Stop	400	US26D	RO

1	Gasketing	S88BL		PE	
1	ElectroLynx Harness	QC-Cxxx sized for door width		MK	⚡
1	ElectroLynx Harness	QC-C1500P		MK	⚡
1	Card Reader	Provided by the security contractor.		OT	
1	Power Supply	AQD Series		SU	⚡

Notes:
Coordinate voltage, operation and electrical characteristics with all related trades.

Set: 11.0
Doors: 143
Description: Sgl - Fail Secure Lock - Card Access - Safezone Closer

2	Hinge, Full Mortise	TA714 FT	US26D	MK	
1	Hinge, Full Mortise	TA714 QC* FT	US26D	MK	⚡
1	Fail Secure Lockset	CLX33905 AZD M92 CT7D	626	RU	⚡
1	Interchangeable Core	CR8500-Reg # 0070532146	626	RU	
1	Closer	7100SZ - arm as required	689	NO	⚡
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO	
1	Wall Stop	400	US26D	RO	
1	Gasketing	S88BL		PE	
1	ElectroLynx Harness	QC-Cxxx sized for door width		MK	⚡
1	ElectroLynx Harness	QC-C1500P		MK	⚡
1	Card Reader	Provided by the security contractor.		OT	
1	Power Supply	AQD Series		SU	⚡

Notes:
Coordinate voltage, operation and electrical characteristics with all related trades.

Set: 12.0
Doors: 201A, 201B
Description: Sgl - Fail Safe Lock - Card Access -DA Closer- Lead Lined - Keyswitch

1	Pivot Set	L147	626	NO	
1	Electrified Inter Pivot	EML19	626	NO	⚡
1	Fail Safe Lockset LL	CLX33903 AZD M28 M92 CT7D	626C	RU	⚡
1	Cylinder	Type as required-Reg # 0070532146	626	RU	
2	Interchangeable Core	CR8500-Reg # 0070532146	626	RU	
1	Surface Closer - Delayed action	DC6200 A3 A10 as required M71	689	RU	
1	Door Stop	400 / 441 as required	US26D	RO	
1	Gasketing	S88BL		PE	
1	ElectroLynx Harness	QC-Cxxx sized for door width		MK	⚡
1	ElectroLynx Harness	QC-C1500P		MK	⚡
1	Keyswitch	MK Series		SU	⚡
1	Card Reader	Provided by the security contractor.		OT	

1	Position Switch	DPS-M-BK		SU	
1	Power Supply	AQD Series		SU	

Notes: Keyswitch turns off power to lockset allowing free entry/exit. Card reader for entry when lock is energized. Upon loss of power, door will allow free entry. Free egress at all times.
Coordinate voltage, operation and electrical characteristics with all related trades.

Set: 13.0
Doors: 202C, 205
Description: Sgl - Rim/NL - MELR - Card Access - Closer

2	Hinge, Full Mortise, Hvy Wt	TA786 FT	US26D	MK	
1	Hinge, Full Mortise, Hvy Wt	TA786 QC*FT	US26D	MK	
1	Rim Exit Device, MELR / RX Lever	PED5257 A957PT M92 MELR CT7D	630	RU	
1	Cylinder	Type as required-Reg # 0070532146	626	RU	
1	Surface Closer/stop	DC6200 A4	689	RU	
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO	
1	Gasketing	S88BL		PE	
1	ElectroLynx Harness	QC-Cxxx sized for door width		MK	
1	ElectroLynx Harness	QC-C1500P		MK	
1	Card Reader	Provided by the security contractor.		OT	
1	Power Supply	AQD Series		SU	

Notes:
Coordinate voltage, operation and electrical characteristics with all related trades.

Set: 14.0
Doors: 112, 114, 119A, 126, 133, 138A, 145A, 181, 184A
Description: Sgl - Classrooom - Closer - Gasket

3	Hinge, Full Mortise	TA714 FT	US26D	MK
1	Classroom Lock	CLX3355 AZD CT7D	626	RU
1	Interchangeable Core	CR8500-Reg # 0070532146	626	RU
1	Surface Closer	DC6200 A3 / A10 as required	689	RU
1	Wall Stop	400	US26D	RO
1	Gasketing	S88BL		PE

Set: 15.0
Doors: 135, 149
Description: Sgl - Storeroom - Closer - AP

3	Hinge, Full Mortise	TA714 FT	US26D	MK
1	Storeroom Lock	CLX3357 AZD CT7D	626	RU
1	Interchangeable Core	CR8500-Reg # 0070532146	626	RU
1	Surface Closer	DC6200 A3 / A10 as required	689	RU

1	Armor Plate	K1050 36" 4BE CSKCSK	US32D	RO
1	Wall Stop	400	US26D	RO
1	Gasketing	S88BL		PE

Set: 16.0
Doors: 111
Description: Sgl - Storeroom - Closer

3	Hinge, Full Mortise	TA714 FT	US26D	MK
1	Storeroom Lock	CLX3357 AZD CT7D	626	RU
1	Interchangeable Core	CR8500-Reg # 0070532146	626	RU
1	Surface Closer	DC6200 A3 / A10 as required	689	RU
1	Wall Stop	400	US26D	RO
3	Silencer - Metal Frame	608		RO

Set: 17.0
Doors: 105A
Description: Sgl - Storeroom - Closer - Gasket

3	Hinge, Full Mortise	TA714 FT	US26D	MK
1	Storeroom Lock	CLX3357 AZD CT7D	626	RU
1	Interchangeable Core	CR8500-Reg # 0070532146	626	RU
1	Surface Closer	DC6200 A3 / A10 as required	689	RU
1	Wall Stop	400	US26D	RO
1	Gasketing	S88BL		PE

Set: 18.0
Doors: 107, 122, 139, 155, 159, 165A, 169, 173, 176, 193
Description: Sgl - Office, Closer

3	Hinge, Full Mortise	TA714 FT	US26D	MK
1	Entrance Lock	CLX3351 AZD CT7D	626	RU
1	Interchangeable Core	CR8500-Reg # 0070532146	626	RU
1	Surface Closer	DC6200 A3 / A10 as required	689	RU
1	Wall Stop	400	US26D	RO
1	Gasketing	S88BL		PE

Set: 19.0
Doors: 108, 182, 194, 198, 199
Description: Sgl - Privacy/IND - Closer

3	Hinge, Full Mortise	TA714 FT	US26D	MK
1	Privacy Lock w/IND	ML2030 ASA V11	626	RU
1	Surface Closer	DC6200 A3 / A10 as required	689	RU
1	Wall Stop	400	US26D	RO
1	Gasketing	S88BL		PE

Set: 20.0
Doors: 102, 103, 146, 147

Description: Sgl - Push/Pull - Closer

3	Hinge, Full Mortise	TA714 FT	US26D	MK
1	Push Plate	70F	US32D	RO
1	Door Pull	RM3310-24 Mtg-Type 12XHD	US32D	RO
1	Surface Closer	DC6200 A3 / A10 as required	689	RU
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO
1	Wall Stop	400	US26D	RO
3	Silencer - Metal Frame	608		RO

Set: 21.0
Doors: 116, 117, 118, 121, 123, 124, 125, 141, 156, 157, 158, 160, 161, 162, 163, 164, 166, 167, 168, 170, 171, 172, 174, 175, 177, 178, 179, 183, 185, 186, 187, 188, 200A, 200B
Description: Sgl - Passage

3	Hinge, Full Mortise	TA714 FT	US26D	MK
1	Passage Latch	CLX3310 AZD	626	RU
1	Wall Stop	400	US26D	RO
1	Gasketing	S88BL		PE

Set: 22.0
Doors: 109A, 151
Description: Sgl - Passage - Closer/ho

3	Hinge, Full Mortise	TA714 FT	US26D	MK
1	Passage Latch	CLX3310 AZD	626	RU
1	Surface Closer	DC6200 A1 pull side track arm	689	RU
1	Wall Stop	400	US26D	RO
1	Gasketing	S88BL		PE

Set: 23.0
Doors: 115, 120, 136, 142, 195
Description: Sgl - Privacy - Rescue

1	Cont Hinge, Double Swing	HT DSH1000-84C		PE
1	Privacy Lock	CLX3330 AZD	626	RU
1	Wall Stop	400	US26D	RO
1	Emergency Stop	ERS84CxHT		PE
1	Gasketing	S88BL		PE

Notes: Cased open frame required.

Set: 24.0
Doors: 165B, 169B
Description: Pocket - Passage

1	Sliding Door Hdwe	PF28200A		PE
1	Sliding Door Hdwe	PFCDKIT		PE
1	Edge Pull	880	US26D	RO

2	Flush Pull	872	US26D	RO

Set: 25.0
Doors: 100A, 100B, 100C
Description: All hdw by door mfr

1	All Hardware by door manufacturer.			00

Set: 26.0
Doors: 104B, 104C
Description: Cyl only

1	Cylinder	Type as required-Reg # 0070532146	626	RU

END OF SECTION 087100

SECTION 08 80 00 - GLAZING

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete of glass and glazing as shown on drawings and as specified in accordance with provisions of the contract documents and completely coordinated with that of all other trades.

B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, and complete installation shall be furnished and installed as part of this work.

C. All safety glazing shall comply with CPSC 16 CFR 1201, ANSI Z97.1, and Chapter 24 of the 2021 International Building Code. Provide tempered, laminated, or other approved safety glazing at hazardous locations required by code and as indicated on the Drawings. Exterior impact-resistant glazing shall additionally comply with ASTM E1886 and ASTM E1996 and shall be provided as part of the complete tested hurricane-impact opening assembly.

D. For additional information refer to sections:
08 11 13 - Hollow Metal Doors and Frames
08 14 00 - Wood Doors
08 41 00 - Entrances and Storefront / Curtain Wall
08 42 29 - Automatic Entrances

PART 2 - PRODUCTS

2.1 MATERIALS

A. Exterior Glass

1. Not Used.

2. Not Used.

3. Impact-Resistant Exterior Entrance Glazing: At exterior entrance doors, sidelites, transoms, and associated fixed glazing, provide insulating laminated safety glazing matching the appearance and performance of IG-1 and included in the tested hurricane-impact entrance assembly. Glazing shall comply with ASCE/SEI 7-16 for Risk Category III, Vult = 164 mph, and ASTM E1886 / ASTM E1996. Provide Large Missile Level D impact resistance minimum for glazed openings 30 feet or less above grade, and the applicable small-missile classification above 30 feet where required. Glazing make-up, interlayer, heat treatment, and thickness shall be as required by the tested assembly and project design pressures.

4. IG-1 Impact-Resistant Insulating Glass Units: Nominal 1-5/16" thickness, or thickness required by the tested exterior storefront / curtain wall impact assembly, as follows:
   a. Where indicated on Drawings at exterior storefront and curtain wall, provide Vitro Solarcool® (2) Solargray® + Solarban® 60 (3) Clear insulating glass, configured as an impact-resistant laminated IGU. Maintain the specified exterior appearance and performance while complying with the tested framing system.
      1. IG-1 insulating glass units shall be constructed as follows:

a. OB: 1/4" Vitro Solargray® glass with Solarcool® coating on Surface No. 2; heat-strengthened or tempered where required by the tested impact assembly.

b. AS: 1/2" air-filled space, unless another spacer / gas-fill configuration is required by the tested impact assembly and approved glazing make-up.

c. IB: Laminated clear impact lite, nominal 9/16-inch, with Solarban® 60 low-e coating on Surface No. 3. Glass plies and PVB or ionoplast interlayer shall be as required by the tested impact assembly.

d. All exterior IG-1 glazing shall be laminated hurricane-impact glazing tested as part of the complete storefront, curtain wall, or entrance assembly. Provide glazing capable of resisting the project-specific positive and negative design pressures and complying with ASTM E1886 / ASTM E1996.

e. Vitro Architectural Glass or prior approved equal.

2. Performance requirements of insulating glass units

a. Visible light transmittance: approximately 14%

b. Solar heat gain coefficient: 0.17 maximum

c. Light-to-solar gain (LSG): approximately 0.82. Final overall fenestration thermal performance shall comply with the 2021 IECC and Section 08 41 00.

B. Interior Glass

1. Clear Glass: Size and thickness as required (1/4" minimum thickness) single glazing, clear. NOTE: Where required by law and where shown on plans provide laminated safety glass.

2. Clear Safety Glass: Size and thickness as required (1/4" minimum thickness) single glazing laminated safety glass to match (a) above, this subsection.

3. Fire-Rated Glazing: Not Used.

C. Reflective Interior Film - Not Used.

2.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

B. In addition to complying with pertinent codes and regulations of governmental agencies having jurisdiction, comply with pertinent recommendations contained in:

1. National Glass Association (NGA):
   a. "Glazing Manual"
   b. Applicable NGA Glass Technical Papers and glazing guidelines.

C. Flat glass: Comply with ASTM C1036, Type I, Quality-Q3 or better where exposed to view, unless a higher quality is required by the specified product or tested impact assembly.

D. Not Used.

E. Laminated Safety Glass:
1. Provide laminated safety glass where indicated on the drawings, and elsewhere as required by governmental agencies having jurisdiction.
2. Laminated Safety Glass shall comply with ANSI Z97.1 and CPSC 16 CFR 1201. For non-impact safety glazing, provide minimum 0.030-inch PVB interlayer unless a different construction is required by the listed assembly. For exterior hurricane-impact glazing, provide glass plies and PVB or ionoplast interlayer of the type and thickness required by the tested ASTM E1886 / ASTM E1996 assembly and applicable product approval. Provide in color as shown on Drawings or otherwise selected by the Architect.
3. Laminated safety glass shall provide 99% UV light blockage at the wavelength range of ~300-380 nanometers.

PART 3 - EXECUTION

3.1 WORKMANSHIP

A. Surface Conditions

1. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

2. Clean glazing channels, stops, and rabbets to receive the glazing materials, making free from obstructions and deleterious substances which might impair the work.
a. Remove protective coatings which might fail in adhesion or interfere with bond of sealants.
b. Comply with manufacturers' instructions for final wiping of surfaces immediately prior to application of primer and glazing compounds or tapes.
c. Prime surfaces to receive glazing compounds in accordance with manufacturers' recommendations.

B. Installation

1. Inspect each piece of glass immediately prior to start of installation.
a. Do not install items which are improperly sized, have damaged edges, or are scratched, abraded, or damaged in any other manner.
b. Do not remove labels from glass until so directed by the Architect.
c. Install glass so distortion waves, if present, run in the horizontal direction.

2. Locate setting blocks at sills one quarter of the width of the glass in from each end of the glass, unless otherwise recommended by the glass manufacturer.
a. Use blocks of proper size to support the glass in accordance with the manufacturer’s recommendations.
b. Provide spacers for all glass sizes larger than 50 where continuous glazing gaskets or felts are provided.
1. Locate spacers no more than 24" apart, and no closer than 12" to a corner.
2. Place spacers opposite one another.
3. Make bit of spacer on glass 1/4" or more.

3. Set glass in a manner which produces the greatest possible degree of uniformity in appearance.

4. Do not use two different glazing materials in the same joint system unless the joint use is approved in advance by the Architect.

5. Mask, or otherwise protect, surfaces adjacent to installation of sealants.

6. Miter-cut and seal the joints of glazing gaskets in accordance with the manufacturers' recommendations, to provide watertight and airtight seal at corners and other locations where joints are required.

C. Protection

1. Protect glass from breakage after installation by promptly installing streamers or ribbons, suitably attached to the framing and held free from glass. Do not apply warning markings, streamers, ribbons, or other items directly to the glass except as specifically directed by the Architect.

END OF SECTION 08 80 00

SECTION 09 26 00 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of gypsum drywall as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.

B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, and complete installation shall be furnished and installed as part of this work.

PART 2 - PRODUCTS

2.1 Gypsum Board: Provide gypsum wallboard complying with ASTM C1396/C1396M, in 48" widths and in such lengths as will result in a minimum of joints. Where fire-rated gypsum board is indicated, provide gypsum board products and assembly construction complying with UL U419 or other listed fire-resistance design indicated on the Drawings.

A. Moisture Resistant Wallboard: Refers to all interior drywall specifically labeled as “Moisture Resistant” in the room finish schedule. This is to include interior partitions and ceilings as well as the interior face of exterior perimeter walls.

1. Moisture/Abuse Resistant Wallboard from 0 to 4 feet: Provide moisture resistant wallboard from 0 to 4 feet above the finished floor **throughout the entire building (whether or not it is labeled as “Moisture Resistant” in the room finish schedule)**. This board shall be 5/8" Firecode X panels with both mold and abuse resistance:
   a. USG Sheetrock® Brand Mold Tough® AR Firecode® X Panels
   b. National Gypsum - Gold Bond® XP® Hi-Abuse® Gypsum Board
   c. Or prior approved equal

2. Moisture Resistant Wallboard from finish floor to ceiling: Provide moisture resistant wallboard in all wet rooms, janitor’s closets, exterior perimeter walls, and other areas indicated on the finish schedule as “Moisture Resistant”.
   a. USG Sheetrock® Brand Mold Tough® AR Firecode® X Panels
   b. National Gypsum - Gold Bond® XP® Hi-Abuse® Gypsum Board
   c. Or prior approved equal

B. Regular wallboard from 4 foot to ceiling: Refers to all interior gypsum drywall from 4 foot to ceiling not specifically labeled as “Moisture Resistant” in the room finish schedule. This is to include interior partitions and ceilings as well as the interior face of exterior perimeter walls.

1. Regular gypsum wallboard above 4 foot from the finished floor throughout the entire building shall be 5/8" Firecode X panels with mold resistance only, unless another thickness is specifically indicated on the Drawings.
   a. USG Sheetrock® Brand Mold Tough® Firecode® X Panels
   b. National Gypsum - Gold Bond® XP® Fire-Shield® Gypsum Board
   c. Or prior approved equal

2.2 Gypsum Board Sheathing: Not Used under this Section. Exterior 5/8-inch glass-mat gypsum board sheathing is specified in Section 06 10 00 - Rough Carpentry.

2.3 Metal Trim

A. Form from zinc-coated steel not lighter than 26 gauge, complying with ASTM C1047.

B. Casing beads:
   1. Provide channel-shapes with an exposed wing, and with a concealed wing not less than 7/8" wide.
   2. The exposed wing may be covered with paper cemented to the metal but shall be suitable for joint treatment.

2.4 Corner Beads: Provide angle shapes with wings not less than 7/8" wide and perforated for nailing and joint treatment, or with combination metal and paper wings bonded together, not less than 1-1/4" wide and suitable for joint treatment.

2.5 Joining System

A. Provide a jointing system, including reinforcing tape and compound, designed as a system to be used together and as recommended for this use by the manufacturer of the gypsum wallboard approved for use on this work:

B. Jointing compound may be used for finishing if recommended by its manufacturer.

2.6 Fastening Devices

A. For fastening gypsum wallboard in place on metal studs and metal channels, use flat-head screws complying with ASTM C1002, shouldered, specially designed for use with power-driven tools, not less than 1" long, with self-tapping threads and self-drilling points.

B. For fastening gypsum wallboard in place on wood, use 1-1/4" Type W bugle-head screws, or use annular ring type nails complying with ASTM C514 and of the length required by governmental agencies having jurisdiction.

PART 3 - EXECUTION

3.1 WORKMANSHIP

A. Installation
   1. General: Install the gypsum wallboard in accordance with the drawings and with the separate boards in moderate contact but not forced into place.
      At internal and external corners, conceal the cut edges of the boards by the overlapping covered edges of the abutting boards.
      Stagger the boards so that corners of any four boards will not meet at a common point except in vertical corners.
   2. Ceilings: Install the gypsum wallboard to ceilings with the long dimension of the wallboard at right angles to the supporting members.
      Wallboard may be installed with the long dimension parallel to supporting members that are spaced 16" on centers when attached members are provided at end joints.
   3. Walls: Install the gypsum wallboard to studs at right angles to the furring or framing members.
      Make end joints, where required, over framing or furring members.
   4. Attaching: Drive the specified screws with clutch-controlled power screwdrivers, spacing the screws 12" on centers at ceilings and 16" on centers at walls.
      Where framing members are spaced 24" apart on walls, space screws 12" on centers.
      Attach double layers in accordance with the pertinent codes and the manufacturer's recommendations as approved by the Architect.

B. Joint Treatment
   1. General: Inspect areas to be joint treated, verifying that the gypsum wallboard fits snugly against supporting framework.
      In areas where joint treatment and compound finishing will be performed, maintain a temperature of not less than 55 degrees for 24 hours prior to commencing the treatment, and until joint and finishing compounds have dried.
      Apply the joint treatment and finishing compound by machine or hand tool.

Provide a minimum drying time in poorly ventilated areas.

2. Embedding compounds: Apply to gypsum wallboard joints and fastener heads in a thin uniform layer.
   Spread the compound not less than 3" wide at joints, center to reinforcing tape in the joint, and use setting compound to embed the paper tape. Then spread a thin layer of compound over the tape.
   After this treatment has dried, apply a second coat of embedding compound to joints and fastener heads, spreading in a thin uniform coat to not less than 6" wide at joints, and feather edged.
   Sandpaper between coats as required.
   When thoroughly dry, sandpaper to eliminate ridges and high points.
3. Finishing compounds: After embedding compound is thoroughly dry and has been completely sanded, apply a coat of finishing compound to joints and fastener heads. The entire surface shall be floated to give a uniform finish when painted.
   When thoroughly dry, sandpaper to obtain a uniformly smooth surface, taking care to not scuff the surface of the wallboard.
4. Not Used.

C. Corner Treatment
   1. Internal corners: Treat as specified for joints, except fold the reinforcing tape lengthwise through the middle and fit neatly into the corner.
   2. External corners: Install the specified corner bead, fitting neatly over the corner and securing with the same type fasteners used for installing the wallboard. Space the fasteners approximately 6" on centers, and drive through the wallboard into the framing or furring member.
      After the corner bead has been secured into position, treat the corner with joint compound and reinforcing tape as specified for joints, feathering the joint compound out from 8" to 10" on each side of the corner.

D. Control Joint
   At all areas above openings (doors, windows, cased openings, furred openings, etc.) install zinc control joint no. 093. See plans for some locations. Provide control joints at all locations recommended by the manufacturer of gypsum wallboard.

E. Other Metal Trim
   The drawings do not purport to show all locations and requirements for metal trim. Carefully study the drawings and the installation and provide all metal trim normally recommended by the manufacturer of the gypsum wallboard approved for use in this work. And as indicated in the current edition of GA-216, Application and Finishing of Gypsum Panel Products.

3.2 CLEANING UP

A. In addition to other requirements for cleaning, use necessary care to prevent scattering gypsum wallboard scraps and dust, and to prevent tracking gypsum and joint finishing compound onto floor surfaces.

B. At completion of each segment of installation in a room or space, promptly pick up and remove from the working area all scrap, debris, and surplus material of this section.

END OF SECTION 09 26 00

SECTION 09 30 14 - PORCELAIN TILING

PART 1 - GENERAL

1.1 SCOPE

A. GENERAL
1. SECTION INCLUDES
a. Porcelain Mosaic Tile
b. Crack Isolation
c. Transition Trims
d. Porcelain trim
e. Tile and grout sealant

B. REFERENCES
1. ANSI A108.1A - Specifications for Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar.
2. ANSI A108.1B - Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar.
3. ANSI A108.1C - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar -or- Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar.
4. ANSI A108.4 - Specifications for Ceramic Tile Installed with Organic Adhesives or Water-Cleanable Tile Setting Epoxy Adhesive.
5. ANSI A108.5 - Specifications for Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
6. ANSI A108.6 - Specifications for Ceramic Tile Installed with Chemical-Resistant, Water-Cleanable Tile-Setting and -Grouting Epoxy.
7. ANSI A108.8 - Specifications for Ceramic Tile Installed with Chemical-Resistant Furan Mortar and Grout.
8. ANSI A108.9 - Specifications for Ceramic Tile Installed with Modified Epoxy Emulsion Mortar/Grout.
9. ANSI A108.10 - Specifications for Installation of Grout in Tilework.
10. ANSI A118.1 - Standard Specification for Dry-Set Portland Cement Mortar.
11. ANSI A118.3 - Chemical-Resistant, Water-Cleanable, Tile-Setting and -Grouting Epoxy and Water-Cleanable Tile-Setting Epoxy Adhesive.
12. ANSI A118.4 - Latex-Portland Cement Mortar.
13. ANSI A118.5 - Chemical-Resistant Furan Mortar and Grout.
14. ANSI A118.6 - Standard Ceramic Tile Grouts.
15. ANSI A118.7 - Polymer Modified Cement Grouts
16. ANSI A118.8 - Modified Epoxy Emulsion Mortar/Grout.
17. ANSI A118.9 - Test Methods and Specifications for Cementitious Backer Units
18. ANSI A118.10 - Load bearing, Bonded, Waterproof Membranes for Thinset Ceramic Tile and Dimensional Stone.
19. ANSI A118.11 - Exterior Grade Plywood (EGP) Latex-Portland Cement Mortar.
20. ANSI A136.1 - Organic Adhesives for Installation of Ceramic Tile.
21. ANSI A137.1 - Specifications for Ceramic Tile.
22. ASTM C150/C150M - Standard Specification for Portland Cement.
23. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
24. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
25. ASTM C241 - Test Method For Abrasion Resistance of Stone Subjected to Foot Traffic.
26. ASTM C503 - Specification for Marble Building Stone (Exterior).
27. ASTM C615 - Specification for Granite Dimension Stone.
28. ASTM C629 - Specification for Slate Dimension Stone.
29. ASTM C847 - Standard Specification for Metal Lath.
30. ANSI A326.3 - Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials.

31. ASTM D4397 - Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications.
32. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; Tile Council of North America.

C. PERFORMANCE REQUIREMENTS

1. Dynamic Coefficient of Friction: Floor tile in level interior areas expected to be walked upon when wet shall comply with ANSI A137.1 and shall be tested in accordance with ANSI A326.3.
   a. Level Surfaces: Minimum wet DCOF of 0.42.
   b. Step Treads: Not Used.
   c. Ramp Surfaces: Not Used.

D. SUBMITTALS

1. Submit manufacturer's data sheets on each product to be used, including:
   a. Preparation instructions and recommendations.
   b. Storage and handling requirements and recommendations.
   c. Installation methods.

2. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

3. Selection Samples: Color charts illustrating full range of colors and patterns.

4. Selection Samples: Samples of actual tiles for selection.

5. Samples: Mount tile and apply grout on two plywood panels, 12" x 12" in size illustrating pattern, color variations, and grout joint size variations.

6. Submit sample of transition trims with color charts or chips indicating all available colors.

7. Submit profile of threshold indicating compliance with ADAAG 2010.

8. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

E. QUALITY ASSURANCE

1. Maintain one copy each of all Referenced standards and specifications on site. Include the TCNA Handbook, ANSI A108 Series, ANSI A118 Series ANSI A136.1 and ANSI A137.1 and others as specified under paragraph References.

2. Installer Qualifications: Company specializing in performing the work of this section with minimum five (5) years experience.

3. Single Source Responsibility:
   a. Obtain each type and color of tile from a single source.
   b. Obtain each type and color of mortar, adhesive and grout from the same source.

F. DELIVERY, STORAGE, AND HANDLING

1. Deliver and store products in manufacturer's unopened packaging until ready for installation.

2. Protect adhesives and liquid additives from freezing or overheating in accordance with manufacturer's instructions.

3. Store tile and setting materials on elevated platforms, under cover and in a dry location and protect from contamination, dampness, freezing or overheating.

G. ENVIRONMENTAL REQUIREMENTS

1. Do not install adhesives in an unventilated environment.

2. Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.

H. ATTIC STOCK

1. Provide the Owner with 2% of each tile specified (color, size, trims, etc.) in unopened boxes, clearly labeled.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. American Olean.

B. Daltile.

C. Or prior approved equals. The Architect’s decision for equal match shall be final.

2.2 TILE

A. General: Provide tile that complies with ANSI A137.1 for types, compositions and other characteristics indicated. Provide tile in the locations and of the types, colors and patterns indicated on the Drawings, including T-1 porcelain tile and TB-1 tile base where scheduled. Tile shall also be provided in accordance with the following:

1. Factory Blending: For tile exhibiting color variations within the ranges selected under Submittal of samples, blend tile in the factory and package so tile taken from one package shows the same range of colors as those taken from other packages.

2. Mounting: For factory mounted tile, provide back or edge mounted tile assemblies as standard with the manufacturer, unless otherwise specified.

3. Factory Applied Temporary Protective Coatings: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with a continuous film of petroleum paraffin wax applied hot. Do not coat unexposed tile surfaces.

B. Floors: 2" x 2" Unglazed Porcelain Mosaic Tile; ANSI A137.1, and as follows:
1. Product:
American Olean, Unglazed ColorBody Porcelain Mosaics, 2 x 2.
Daltile, ColorBody Porcelain Mosaics - Keystones, 2 x 2.
2. Moisture Absorption: 0 to 0.5 percent.
3. Size and Shape: As indicated on drawings.
4. Thickness: 1/4 inch (6.4 mm).
5. Edges: Cushioned.
6. Surface Finish: Unglazed matte finish suitable for wet, level interior floor applications and meeting the ANSI A137.1 / ANSI A326.3 wet DCOF requirements specified herein.
7. Colors: To be selected from manufacturer's standard range, groups 1 thru 3.

8. Pattern: As indicated on the Drawings.
9. Mounted Sheet Size: 12 by 24 inches (305 by 610 mm).
10. Trim Units: Matching bead, 6" x 12" cove base, and surface bullnose shapes in sizes coordinated with field tile and as indicated in drawings.

C. Walls: 12" x 24" Porcelain Tile; ANSI A137.1 and as follows:
1. Product:
American Olean, ColorBody Porcelain - Theoretical wall tile.
Daltile, Glazed Porcelain - Volume 1.0 wall tile.
2. Moisture Absorption: 0 to 0.5 percent.
3. Size and Shape: As indicated on drawings.
4. Thickness: Manufacturer's standard thickness for the selected 12 x 24 inch product.
5. Edges: Cushioned.
6. Surface Finish: Unglazed without abrasive admixture,
7. Colors: To be selected from manufacturer's standard range. Available accent colors shall include American Olean Theoretical Bold and Daltile Volume 1.0.
8. Pattern: As indicated on the Drawings.
9. Field Tile Size: 12 by 24 inches (305 by 610 mm).
10. Trim Units: Provide matching trim units where available. At exposed edges, outside corners, and transitions where matching factory trim is not available, provide Type 304 stainless steel profiles specified in Paragraph 2.3.

2.3 TRIM AND ACCESSORIES

A. Stone Thresholds shall not be used on this project. Provide type 304 stainless steel Pre-manufactured Transition Profiles for use with ceramic tile or stone of appropriate size and configuration at all floor and wall transitions involving porcelain or mosaic tiles. All transitions shall have fins to permanently embed transitions into tile setting material. All thresholds and transitions shall comply with the ADAAG-2010.

1. Materials:
a. Schluter-SCHIENE, Schluter-RENO-U, Schluter-RENO-TK, Schluter-RONDEC, or appropriate transition profile by Schluter in finish indicated. All transitions shall be sized as required for adjoining materials.
2. Or prior equal as manufactured by Blanke or Mercer
3. Color/Finish:
a. Type 304 stainless steel.

4. Size:
a. Pre-fabricated in the sizes and profiles as required to accommodate adjoining materials.
b. Profile of transitions shall comply with ADAAG 2010.

5. Stainless steel trims shall be used in the following minimum locations:
a. Open edges of floor tiles/ wall tiles.
b. Transitions between floor finishes of differing heights
c. Thresholds at door openings
d. Expansion and control joints
e. Exposed outside wall corners bullnose trim

2.4 SETTING MATERIALS FOR PORCELAIN AND MOSAIC TILE
Shall be products manufactured by LATICRETE International, Inc., or prior approved equal.

A. FLOOR TILE (Thin Set Method; current TCNA Handbook method applicable to substrate and location):
1. Thinset Tile Bonding Coat: shall be LATICRETE 254 Platinum.
2. Waterproofing and Crack Suppression Membrane: shall be LATICRETE HYDRO BAN (liquid applied).

3. Epoxy Grout: shall be LATICRETE SPECTRALOCK PRO Premium Grout. (ANSI A118.3)
4. Expansion and control joint sealant shall be LATICRETE LATASIL; installed in accordance with TCNA EJ171.
5. Grout release agent shall be Miracle 511 Impregnator as manufactured by Miracle Sealants Company.

B. WALL TILE (Thin Set Method; current TCNA Handbook method applicable to substrate and location):

1. Thinset Tile Bonding Coat: shall be LATICRETE 254 Platinum.
2. Waterproofing and Crack Suppression Membrane: shall be LATICRETE HYDRO BAN (liquid applied). (On all walls)
3. Latex Portland Cement Grout: shall be LATICRETE 1500 Sanded Grout. (ANSI A118.6)
4. Expansion and control joint sealant shall be LATICRETE LATASIL; installed in accordance with TCNA EJ171.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are dust-free, and free of substances which would impair bonding of setting materials to surfaces and are smooth and flat within tolerances specified in ANSI A137.1.

B. Verify that concrete surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.

C. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Protect surrounding work from damage.

B. Remove any curing compounds or other contaminates.

C. Vacuum clean surfaces and damp clean.

D. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

E. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.3 INSTALLATION - GENERAL

A. Install tile and grout in accordance with applicable requirements of the ANSI A108 Series, manufacturer's instructions, and current TCNA Handbook recommendations.

B. Lay tile to pattern indicated. Arrange pattern so that a full tile or joint is centered on each wall and that no tile less than 1/2 width is used. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.

E. Form internal angles square and external angles bullnosed.

F. Install ceramic accessories rigidly in prepared openings.

G. Install non-ceramic trim in accordance with manufacturer's instructions.

H. Install thresholds where indicated.

I. Sound tile after setting. Replace hollow sounding units.

J. Keep expansion joints free of adhesive or grout. Apply sealant to joints.

K. Allow tile to set for a minimum of 48 hours prior to grouting.

L. Grout tile joints. Use standard grout unless otherwise indicated.

M. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

N. Grout release agent is required due to the use of epoxy grout on floors. Any tile found to have grout hazing after cleaning and curing shall be removed, regardless of location.

3.4 ESTABLISHING SLOPE TO DRAIN FOR CERAMIC TILE FLOORS

A. Concrete slabs and tile setting beds in toilet room areas scheduled to receive tile shall be sloped to floor drains where drains are indicated. Provide gradual, consistent positive drainage from the perimeters of tiled areas to drains without ponding. Coordinate slopes with the Drawings and accessibility requirements.

B. The floor tile installer shall verify exact heights of all floor drains prior to setting tile. Coordinate adjustments required to maintain positive drainage. In accessible toilet rooms and accessible routes, finished floor slopes shall not exceed 1:48 unless specifically permitted otherwise by the applicable accessibility requirements.

3.5 LOCATION OF EXPANSION JOINTS

A. Locate movement joints in accordance with TCNA EJ171. Interior movement joints shall be spaced a maximum of 24'-0" o.c. in any direction, or closer where required by TCNA EJ171, substrate joints, environmental conditions, or the tile manufacturer.

B. Joints shall be the same width as grout joints but not less than 1/4".

C. Expansion joins shall be located above all construction joints, cold joints, and structural expansion joints.

D. Expansion joints shall continue up wall base in an unbroken run.

3.6 CLEANING

A. Clean excess mortar from veneer surfaces with water before they harden and as work progresses. Do not contaminate open grout/caulk joints while cleaning. Sponge and wash veneers diagonally across joints. Do not use acids for cleaning. Polish with clean dry cloth. Remove surplus materials and leave premises broom clean.

3.7 PROTECTION OF FINISHED WORK

A. Do not permit traffic over finished floor surface for 72 hours after installation.

B. Cover floors with kraft paper and protect from dirt and residue from other trades.

C. Where floor will be exposed for prolonged periods cover with plywood or other similar type walkways.

END OF SECTION 09 30 14

SECTION 09 51 00 - ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SCOPE

A. Furnish all labor, materials, services, equipment and perform all work and services necessary for or incidental to the furnishing and installation complete, of acoustical ceiling panels and suspension systems as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.

B. It shall be the responsibility of this subcontractor to coordinate the acoustical ceiling suspension system with all phases of the work that shall be using the ceiling layout to locate their work such as light fixtures, speakers, A/C grilles, diffusers, sprinkler heads, etc. Coordinate locations with the Reflected Ceiling Plan. Center sprinkler heads in ceiling panels unless shown otherwise. Contractor may submit equals to items specified herein for prior approval.

C. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Armstrong World Industries, Inc.

1. Type I Ceiling / ACT-1 - Shall be Armstrong FINE FISSURED High NRC #1756, 2' x 2' x 7/8" mineral fiber ceiling panels, Angled Tegular edge for 15/16" exposed tee grid, White finish, for Armstrong PRELUDE XL 15/16" hot-dipped galvanized exposed tee suspension system, or prior approved equal. Panels shall have minimum NRC 0.75, CAC 35, AC 170, Light Reflectance 85%, Class A fire performance, HUMIGUARD Plus sag/humidity resistance, and BIOBLOCK mold/mildew resistance.
   a. Use the same Type I / ACT-1 ceiling panel in corridors and hallways unless a different ceiling type or fire-resistance-rated ceiling assembly is specifically indicated on the Drawings.

2. Type II Ceiling / ACT-2 - Not Used unless specifically indicated on the Drawings.

3. Type III Ceiling - Not Used.

4. Extruded Aluminum Perimeter Trim - Not Used.

B. General Notes

1. At areas scheduled to receive acoustical ceiling tile, provide Armstrong PRELUDE XL 15/16" hot-dipped galvanized exposed tee suspension system. Where a more severe environmental or corrosion-resistant suspension system is specifically indicated or required by the room conditions, provide the manufacturer's appropriate compatible suspension system.

2. Provide Armstrong UHDC Universal Hold Down Clips, or prior approved equal, at acoustical ceiling panels within 20 feet of exterior entrances and at other locations indicated on the Drawings or required by the suspension-system manufacturer to resist ceiling-panel uplift.

3. Install extra wire from the structure for the electrical contractor to independently support lighting fixtures. (Install two (2) extra wires per light fixture)
NOTE! Prior approved equals shall be reviewed.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All ceilings shall be installed according to ASTM C636/C636M, Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.

B. Suspension systems shall comply with ASTM C635/C635M and shall be installed according to the general recommended procedures of the Ceilings & Interior Systems Construction Association (CISCA). Where seismic restraint is required by the applicable code or structural criteria, comply with ASTM E580/E580M and the manufacturer's seismic installation requirements.

C. Contractor shall, after the project is complete, furnish Owner with 2% of the total amount of tiles of each type used on the project. All of these tiles shall be in unbroken packages for use by the Owner. No broken tiles will be accepted.

D. Install acoustical tile and panels according to manufacturer recommendations.

E. Suspend exposed metal grid system by not less than #12 gauge galvanized steel wire hangers

3.2 WORKMANSHIP

A. Provide Armstrong's 30-year limited ceiling system warranty against visible sag, mold, and mildew when FINE FISSURED High NRC HUMIGUARD Plus ceiling panels are installed with the compatible Armstrong suspension system in accordance with the manufacturer's warranty requirements.

B. Provide reflected ceiling plan/shop drawings and one sample of finish material for approval prior to installation. (See Section 01 33 23 - Shop Drawings, Product Data and Samples)

C. Upon completion, the acoustical ceiling work shall be left clean, straight and level without sag or buckle and be acceptable to the Architect.

END OF SECTION 09 51 00

SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches long, of each resilient product color, texture, and pattern required.

C. Product Schedule: For resilient products. Use same designations indicated on Drawings.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.5 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:
   1. Forty-eight (48) hours before installation.
   2. During installation.
   3. Forty-eight (48) hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

1.6 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

A. Resilient Base: At locations indicated RB-1 and RB-2 on Drawings.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Tarkett; Johnsonite Traditional Thermoplastic Rubber (Duracove) Wall Base.
      b. Mannington Commercial; BurkeBase Type TP Rubber Wall Base.
      c. Shaw Contract; FinishWorx Thermoplastic Rubber Wall Base.

B. Resilient Base Standard: ASTM F 1861-21(2025).
   1. Material Requirement: Type TP (rubber, thermoplastic).
   2. Manufacturing Method: Group I (solid, homogeneous).
   3. Style: Cove (base with toe) at resilient tile flooring and straight (flat or toeless) at carpeted flooring, as indicated on Drawings.

C. Minimum Thickness: 0.125 inch.

D. Height: 4 inches unless indicated otherwise on Drawings.

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Preformed.

G. Inside Corners: Preformed.

H. Finish: See Drawings.

I. Colors and Patterns: As selected by Owner and Architect.

2.2 RESILIENT MOLDING ACCESSORY

A. Resilient Molding Accessory:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Tarkett; Johnsonite.
      b. Roppe Corporation.
      c. Flexco Corporation.

B. Profiles: Reducer strips and transition moldings where indicated on Drawings.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
   1. Cove Base Adhesives: Not more than 50 g/L VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of tiles, and in maximum available lengths to minimize running joints.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Schluter-Systems L.P.
      b. M-D Pro.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Accessories: Prepare according to ASTM F 710-26.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
   3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.
   4. Moisture Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
      a. Perform anhydrous calcium chloride test, ASTM F 1869, where required by manufacturer. Proceed with installation only after substrates meet limits established by resilient accessory and adhesive manufacturers.
      b. Perform relative humidity test using in situ probes, ASTM F 2170, where required by manufacturer. Proceed with installation only after substrates meet limits established by resilient accessory and adhesive manufacturers.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until they are same temperature as the space where they are to be installed.
   1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of resilient floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Perform the following operations immediately after completing resilient product installation:
1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products until Substantial Completion.

END OF SECTION 09 65 13

SECTION 09 65 19.23 - RESILIENT TILE FLOORING
(LUXURY VINYL TILE / PLANK)

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor shall furnish labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of Resilient Tile Flooring (Luxury Vinyl Tile / Plank) as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.

B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, and complete installation shall be furnished and installed as part of this work. Contractor may submit equals to items specified herein for prior approval.

C. For additional information refer to:
Room finish schedule of plans and all floor plans.

D. Two percent (2%) of each color and type of LVT shall be left on job in unbroken packages.

1.2 SUBMITTALS

A. Submit shop drawings, flooring layout / seaming plan, and manufacturer's technical data, current installation instructions, maintenance instructions, adhesives, moisture limitations, and accessories for flooring.

B. Submit the manufacturer's standard samples showing the required colors for flooring and applicable accessories.

C. If required, submit the manufacturer's certification that the flooring has been tested by an independent laboratory and complies with the required fire tests.

1.3 ENVIRONMENTAL CONDITIONS

A. Deliver materials in good condition to the jobsite in the manufacturer's original unopened containers that bear the name and brand of the manufacturer, project identification, and shipping and handling instructions.

B. Store materials in a clean, dry, enclosed space off the ground, and protected from the weather and from extremes of heat and cold. Protect adhesives from freezing. Store flooring, adhesives and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.

C. Maintain a minimum temperature in the spaces to receive the flooring and accessories of 65ºF (18ºC) and a maximum temperature of 85ºF (29ºC) for at least 48 hours before, during, and for not less than 48 hours after installation. Thereafter, maintain a minimum temperature of 55ºF (13ºC) in areas where work is completed. Protect all materials from the direct flow of heat from hot-air registers, radiators, or other heating fixtures and appliances.

D. Install flooring and accessories after the other finishing operations, including painting, have been completed. Close spaces to traffic during the installation of the flooring. Do not install flooring over concrete slabs until they are sufficiently dry to achieve a bond with the adhesive, in accordance with the manufacturer's recommended bond and moisture tests.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Resilient Tile Flooring (Luxury Vinyl Tile / Plank) Materials:

1. Luxury Vinyl Tile / Plank (LVT): Provide Tarkett iD Latitude Wood or prior approved equal, in design and color as chosen by the Architect from the manufacturer's available options. Flooring shall be commercial-grade, glue-down LVT, nominal 3.0 mm overall thickness, minimum 20 mil wear layer, and shall comply with ASTM F1700, Class III, Type B. Provide Class I critical radiant flux in accordance with ASTM E648, smoke density of 450 or less in accordance with ASTM E662, and FloorScore or equivalent low-emitting-material certification. Provide manufacturer's standard commercial warranty, not less than 15 years.
   a. The following Luxury Vinyl Tile / Plank manufacturers and systems are pre-approved:
      1. Tarkett - iD Latitude Wood
      2. Interface - Natural Woodgrains 3.0 mm
      3. Mannington Commercial - commercial LVT meeting specified performance requirements
      4. Shaw Contract - commercial LVT with minimum 20 mil wear layer meeting specified performance requirements
      3. Or prior approved equals. (Prior approvals are based on color, appearance, dimensions, commercial performance, wear layer, maintenance requirements, and overall performance match of the specified LVT system.)
      4. LVT shall be used throughout the project as indicated in the Room Finish Schedule. Flooring may include borders and simple patterns, including stripes, herringbone, ashlar, or other patterns indicated on the Drawings, which may require additional cutting. Colors and patterns of flooring shall be selected by the Architect.

B. Adhesives:

1. Adhesive shall be moisture-resistant and recommended by the flooring manufacturer for the flooring, substrate, anticipated service conditions, rolling / point loads, and measured concrete moisture conditions.
   a. The Contractor shall report concrete moisture and alkalinity test results to the Architect, Owner, and flooring manufacturer promptly following testing. Use the flooring manufacturer's high-moisture adhesive or moisture-control system where required by test results and the manufacturer's written installation requirements.

C. Concrete Slab Primer:

1. Provide non-staining type as required as recommended by the manufacturer of the material being installed.

D. At all areas requiring transition where LVT terminates at another flooring material, provide a commercial resilient reducer / transition profile appropriate to the adjoining material thicknesses. Reducer shall be anchored securely and permanently to floor. Acceptable manufacturers shall be Burke Mercer Flooring Products, Tarkett Johnsonite, Roppe, or prior approved equal.

PART 3 - EXECUTION

3.1 WORKMANSHIP

A. Surface Conditions
Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

B. **Contractor shall verify compatibility of materials used to produce a sound installation.**

C. Preparation:

1. Subfloors:
   Verify that substrate is smooth, level, at required finish elevation, and without more than 1/8" in 10'-0" variation from level or slopes shown on the drawings.
   Prior to laying materials, broom clean or vacuum the surfaces to be covered, and inspect the subfloors.
   All areas to receive sold vinyl plank / tile shall be free of all voids, bumps, ridges, debris, dust, etc. All tiles laid over debris that reflects through vinyl plank face shall be removed from the area, cleaned and replaced with a new solid vinyl plank / tile.

2. Priming:
   Apply concrete slab primer if so recommended by the resilient flooring manufacturer.
   Apply in accordance with the manufacturer's recommendations as approved by the Architect.

3. Floor patch shall be MAPEI Planipatch or prior approved equal (latex patch shall not be allowed).

D. Installation:

1. General: All materials shall be stored at a minimum temperature of 75°F, for at least 24 hours before installation. A temperature of at least 75°F shall be maintained in the spaces where tile is being installed for at least 48 hours before, during and 48 hours after installation. Adequate ventilation shall be provided to take off moisture and volatile fumes.
   Install materials only after finishing operations, including painting, have been completed and after permanent heating system is operating.
   Verify that concrete slab moisture, pH / alkalinity, building air temperature, and relative humidity are within the limits published by the flooring and adhesive manufacturers before installation.
   a. Testing for moisture condition of concrete slabs shall be performed using in-situ relative humidity testing in accordance with ASTM F2170. Perform pH / alkalinity testing where required by the flooring or adhesive manufacturer and prepare concrete substrates in accordance with ASTM F710.
      1. Relative-humidity test equipment shall comply with ASTM F2170 and shall be installed, conditioned, and read in accordance with the test manufacturer's and ASTM requirements.
      2. Do not install flooring where test results exceed the limits of the selected flooring, adhesive, or moisture-control system.
   b. Execution of Testing
      1. The test site shall be maintained at temperature and humidity conditions representative of normal service conditions for the period required by ASTM F2170 before and during testing.
      2. The minimum number of relative-humidity test locations shall be three (3) in the first 1,000 s.f. and one (1) per each additional 1,000 s.f., or additional testing as required by ASTM F2170 or the flooring manufacturer.
      3. Locate tests to represent the range of slab conditions throughout the project, including areas anticipated to receive LVT in clinical rooms, corridors, imaging, lab, offices, and support spaces.
      4. Execute testing in accordance with ASTM F2170 and the test equipment manufacturer's written instructions.
      5. Report test results in chart form listing test dates, locations, slab depth, ambient conditions, relative-humidity values, pH /

alkalinity results where required, and the maximum limits permitted by the proposed flooring and adhesive system.

6. Show test locations on a floor plan submitted with the test report.

Maintain reference markers, holes, and openings that are in place or plainly marked for future cutting by repeating on the finish surface as marked in the sub-floor. Use chalk or other nonpermanent marking device. Installation of floor covering will indicate acceptance of that surface by the installing subcontractor.

2. Installing resilient vinyl planks:
Place units with adhesive in strict compliance with the manufacturer's recommendations as approved by the Architect. Install flooring in strict accordance with the current flooring and adhesive manufacturer's written installation instructions.
   a. Butt units tightly to vertical surfaces, nosings, edgings, and thresholds.
   b. Scribe as necessary around obstructions and to produce neat joints.
   c. Place tiles tightly laid, even, and in straight parallel lines.

Lay units from center marks established with principal walls, discounting minor offsets, so that units at opposite edges of the room are of equal width.
   a. Adjust as necessary to avoid use of cut widths less than 3" wide at room perimeters.
   b. Lay units square to axis of the room or space. Match units for color and pattern by using materials from cartons in the same sequence as manufactured and packaged.

Lay with grain in all units running the same direction, unless otherwise directed by the Architect.
Place resilient edge strips tightly butted to units and secure with adhesive, providing at all unprotected edges unless otherwise shown.

3. Contractor shall, after the project is complete, furnish the Owner with 2% of the total amount of tiles of each type used on the project. All of these tiles shall be in unbroken packages for the use by the Owner. No broken tiles will be accepted.

3.2 CLEANING AND PROTECTING

A. Remove excess adhesive and other blemishes from exposed surfaces using neutral cleaner recommended by the flooring manufacturer. Do not apply wax or field-applied polish unless specifically required by the flooring manufacturer and approved by the Architect.

3.3 EXPOSED EDGE

A. Exposed edge of all flooring where terminated under doors or at locations not provided by base, and all other edges of LVT that abut floors of different materials shall be fitted with transition strips of design approved by the Architect. Acceptable manufacturers shall be Burke Mercer Flooring Products, Tarkett Johnsonite, Roppe, or prior approved equal.

END OF SECTION 09 65 19.23

SECTION 09 91 00 - PAINTING

PART 1 - GENERAL

1.1 SCOPE

A. This section covers furnishing of all labor, materials, tools, equipment, and performing all work and services necessary or incidental to furnish and apply, complete, all paints and finishes as shown on drawings and as specified, in accordance with provisions of the contract documents, and completely coordinated with that of all other trades.

B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.

C. For additional related information, refer to sections:
- 03 30 00 - Cast-In-Place Concrete
- 05 21 12 - Structural Steel and Steel Joists
- 05 30 00 - Metal Deck
- 05 50 00 - Metal Fabrications
- 06 10 00 - Rough Carpentry
- 06 20 00 - Finish Carpentry
- 07 60 00 - Flashing and Sheet Metal
- 08 11 13 - Hollow Metal Doors and Frames
- All HVAC Sections
- All Electrical Sections

D. The terms "paint" and "painting" refer to all applied coatings except special wall coatings. Paint includes fillers, primers, scalers, emulsions, enamels, thinners, stains, and all other applied coatings whether used as primer intermediate or finish coats.

E. Work Included
1. Paint and finish all interior surfaces in finished work except as follows:
2. No field prime coat is required on items furnished with shop applied prime coat except that items so furnished shall have all abraded, damaged or marred areas touched-up by field painting before subsequent coats are applied. (Exception: Hollow metal frames shall be back-primed at the jobsite as indicated in Section 08 11 13.)
3. Pre-finished items: Unless otherwise indicated, do not include painting when factory-finishing is specified for such items as (but not limited to) laminate plastic toilet enclosures, acoustic materials, architectural casework, finished mechanical and electrical equipment including light fixtures, switchgear and distribution cabinets, elevator frames, doors, and equipment, etc. However, paint prefinished items as directed by the architect if necessary to match color scheme.
4. Concealed surfaces: Unless otherwise indicated, painting is not required on wall or ceiling surfaces in inaccessible areas, such as furred areas, pipe spaces, and duct shafts.
5. Finished metal surfaces: metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished material will not require finish painting, except as otherwise specified.
6. Operating part and labels: Do not paint any moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, signages, sensing devices, motor and fan shafts, unless otherwise indicated.
7. Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating or name plates, etc.
8. Do not paint new acoustic ceilings, glass, plastic laminate finishes, and special wall coatings.
9. Finishes on items of mechanical equipment, pipes, and ducts: located within mechanical equipment rooms shall be as described under painting provision of the Mechanical Specifications.

10. All ducts, pipe, and items of equipment exposed in finished work outside mechanical equipment rooms shall be painted as described herein, except factory-finished items where painting is not indicated.

1.2 COLORS

A. Architect will furnish a schedule showing where various colors shall be used. PNT-1 is the typical paint finish indicated in the Room Finish Schedule. PNT-2 and PNT-3, where subsequently indicated, shall be additional color selections unless a different coating system is specifically identified. Contractor shall prepare 12" x 12" samples of paint colors on cardboard as requested, and 12" x 12" samples of wood finishes on selected woods or plywood.

B. Before proceeding with painting, Contractor shall finish one complete room, space, or item of each color scheme required using selected colors, finished texture, materials, and workmanship. After approval, these selected rooms or items shall serve as a standard for similar throughout the project.

C. For sprayed-on finish, contractor shall finish a 100 s.f. sprayed-on sample using selected color, finished texture, materials, and workmanship. Samples shall be free of streaking, lapping, pile-up of paint, and spray-gun pass marks.

1.3 DELIVER AND STORAGE

A. Deliver all materials to job site in original, new and unopened containers bearing manufacturer's name and label, and application instruction thereon.

B. Provide labels on each container with following information:
Name or title of material
Manufacturer's stock number
Manufacturer's name
Contents by volume, for major pigment and vehicle constituents
Thinning instructions
Application instructions

1.4 PROTECTION AND CLEANUP

A. Protect work of other trades, whether to be painted or not, against damaged by painting and finishing work. Leave all such work undamaged, with any damage corrected by cleaning, repairing, or replacing, and repainting, as directed by the Architect.

B. Provide "wet paint" signs as required to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.

C. Upon completion of work, clean all windows, glass, and other paint-spattered surfaces. Remover spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

1.5 SITE CONDITIONS

A. Contractor and his painting subcontractor shall examine all surfaces and parts of structure to which painting is to be applied and Contractor shall correct conditions detrimental to performance of work. Do not proceed with painting until satisfactory conditions have been corrected.

B. Starting of painting in any area will be construed as acceptance of surfaces within that area.

C. Painting over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film is not acceptable work.

PART 2 - PRODUCTS

2.1 MATERIALS - GENERAL

A. Contractor shall submit for approval a complete list of, and complete manufacturer's data for, each type of material he proposed to use.

B. Provide finish coats which are compatible in all respects with prime paints used. Review other sections of specifications in which prime paints are to be provided to ensure compatibility of total coating system for various substrates. Provide barrier coats over incompatible primers or remove and reprime as required.

C. Materials shall be of types specified under "Schedule of Painting". Painting materials not specifically described such as thinners, solvents, shellac, turpentine, etc., shall be of highest quality and shall have identifying labels on containers.

D. Materials which have not been approved for use shall not be used and shall be removed from site.

E. Paint shall have well ground pigment, shall not readily cake or thicken in container, shall be readily and easily stirred with paddle to smooth, uniform consistency, and shall have easy brushing qualities.

F. All paint materials and equipment shall be stored in accordance with manufacturer’s instructions. Storage space shall be kept clean and shall be left in condition required for equivalent spaces in project.

G. Contractor shall take all precautions to keep fire hazard to a minimum.

H. Cleaner for bare metal shall be T.S.P. (TRI Sodium Phosphate) in solution as recommended by the manufacturer.

I. Colors for tinting shall be as recommended and furnished by manufacturer of paint or finish.

J. Shellac shall be pure white gum cut in pure denatured alcohol.
Thinners:
1. Use only thinners, reducers, and solvents specifically recommended by the coating manufacturer for the product, substrate, application method, and environmental conditions.
2. Do not use substitute or unauthorized thinners.

<u>Preparation of Surfaces</u>

<u>General</u>

a. Surfaces shall be clean, dry and adequately protected from dampness.
b. Surface shall be free of any foreign material which will adversely affect adhesion or appearance of applied coating.
c. Mildew shall be removed and surface neutralized.
d. Efflorescence on any area shall be corrected before painting.
e. Galvanized Metals - Prepare in accordance with ASTM D6386 and the coating manufacturer's written recommendations.
    1. Remove oil, grease, dirt, salts, oxidation products, and other contaminants that could interfere with coating adhesion.
        a. Use SSPC-SP1 solvent cleaning or manufacturer-approved cleaning methods as required.
        b. Where profiling is required for coating adhesion, brush-off blast clean in accordance with SSPC-SP16 or use another preparation method specifically approved by the coating manufacturer.
    2. Exterior and Interior (Wet)

a. Prepare galvanized surfaces as specified above and as required by the selected coating system.
b. Do not apply coatings until the surface is clean, dry, properly profiled where required, and accepted by the coating manufacturer.

Wood to be Painted

a. Sandpaper to smooth and even surface, then dust off.
b. After priming coat has dried, putty all nail holes, cracks, open joints and other defects. Putty shall be colored to paint.

Plaster, Gypsum Wallboard

a. Rake small cracks, scratches and abrasions deeply.
b. Undercut large crack edges, coat cracks with shellac and fill with prepared patching plaster. Spot coat patches with prime coat when dry, prior to applying specified prime coat.
c. Do not use sandpaper on plaster surfaces to be painted.
d. Before painting any plaster, surfaces shall be tested with moisture testing device. No paint or scaler shall be applied on plaster when moisture content exceeds 12%, except as may be required by manufacturer of the paint materials used. Test sufficient areas in each space, and as often as necessary to determine proper moisture content for painting.

Drywall

a. Fill all minor irregularities with approved patching material and sand to smooth level surface. Exercise care to avoid raising nap of paper.

Concrete and Concrete Unit Masonry (Allow new concrete and masonry to cure a minimum of 30 days prior to coating.)

a. Patch large openings and holes, finish flush with adjacent surface. Before priming, fill any small holes with a patching compound that is compatible with the finish coats. (The Contractor shall verify compatibility of patching compound.)
b. Remove form oil from poured-in-place concrete by washing concrete with xylol, or as required for complete removal.
c. Surfaces shall be dry. No painting shall be done until surfaces are tested by moisture meter and shown to be within the acceptable limits of specified manufacturer and safe to paint, or below 12%. Allow new concrete and masonry to cure a minimum of 30 days prior to coating.

Ferrous Metal Surfaces

a. Remove oil, grease, dirt, and other contaminants in accordance with SSPC-SP1.
b. Interior Steel: Remove rust, loose mill scale, damaged shop primer, and other detrimental material by SSPC-SP2 or SSPC-SP3 as appropriate. Feather sound shop primer at repair areas.
c. Exterior Steel: Prepare bare, rusted, welded, and damaged shop-primed areas in accordance with SSPC-SP3 minimum, or more stringent preparation required by the specified coating manufacturer.
d. Clean and prepare transitions between intact shop primer and repair areas to provide a smooth, sound substrate for finish coats.
e. Touch up or reprime damaged and unprimed ferrous metal with a primer compatible with the shop primer and specified finish coating.

Wood to Receive Natural Finish

a. Sandpaper to smooth and even surface, then dust off.
b. After wood is filled, stained, and has received one coat of varnish, prepare a mixture of putty and colors in oil to exact shade or color, and fill all nail holes, etc. Sand lightly after dry and touch-up puttied spots with varnish.
c. Sand varnish between coats.
d. Filled or puttied spots shall not show in finished work.

Mechanical Units - Not Used unless specifically indicated to be field painted.

PART 3 - EXECUTION

3.1 WORKMANSHIP - General

A. Only skilled mechanics shall be employed. Equipment shall be kept clean and in proper conditions to provide a job commensurate with intent of specifications.

B. Do not use same tools for application of paint on smooth surfaces that were originally used to paint concrete block.

C. All materials shall be mixed, thinned, modified and applied only as specified by manufacturer's directions.

D. All priming coats and undercoats shall be tinted to approximate shade of final coat, except slightly lighter.

E. If Architect so directs, succeeding coats shall not be applied until he has inspected previous coat.

F. Contractor shall protect his work at all times and protect all adjacent work and materials by suitable covering or other method during progress of his work. Upon completion of work, he shall remove all paint and varnish spots from floors, glass and other surfaces. He shall remove from premises all rubbish and accumulated materials of whatever nature not caused by others and shall leave work in clean, orderly and acceptable condition.

G. Remove and protect hardware accessories, device plates, lighting fixtures, factory finished work, and similar items; or provide ample-in-place protection. Upon completion of each space, carefully replace all removed items.

H. Remove electrical panel box covers and doors before painting wall. Paint separately and reinstall after all paint is dry.

I. All materials shall be applied under adequate illumination, evenly spread and smoothly flowed onto avoid runs, sags, holidays, brush marks, air bubbles and excessive roller stipple.

J. Coverage and hide shall be complete. When color, stain, dirt, or undercoats show through final coat of paint, surface shall be covered by additional coats until paint film is of uniform finish, color, appearance and coverage, at no additional cost to the Owner.

K. All coats shall be thoroughly dry before applying succeeding coats.

L. All suction spots or "hot spots" in plaster and/or cement after application of first coat shall be touched up before applying second coat.

3.2 WORKMANSHIP FOR INTERIOR PAINTING

A. All interior wood trim shall be back-primed before installation with undercoat or penetrating sealer, as required.

B. Enamel or varnish finish applied to wood or metal shall be sanded with fine sandpaper and then cleaned between coats to produce an even smooth surface.

C. Interior doors to be painted shall be sealed on tops and bottoms with prime coat only. Side edges of interior doors shall be finished same as faces of doors.

D. All closets and storage space shall be finished same as adjoining rooms, unless otherwise specified. All other surfaces shall be finished same as nearest adjoining surfaces, unless otherwise specified or directed by Architect.

E. Paste wood filler applied on open grained wood, after commencing to flatten shall be wiped across grain of the wood, then with a circular motion to secure a smooth, filled,

clean surface with filler remaining in open grain only. After overnight drying, sand surface until smooth before applying specified coat.

F. General Note: Prior to installation, all interior and exterior steel door frames shall be back primed with a rust inhibitive primer equal to and compatible with the primer used on frames from factory.

3.3 SCHEDULE OF PAINTING

A. INTERIOR

1. High Abuse Gypsum Wallboard - Standard PNT Finish
1st Coat: Sherwin-Williams ProMar® 200 Zero VOC Interior Latex Primer, B28W12600 (approximately 1.0 mil DFT, or manufacturer's current recommendation)
2nd Coat: Sherwin-Williams SuperPaint® Interior Acrylic Latex, Satin (apply at manufacturer's recommended DFT)
3rd Coat: Sherwin-Williams SuperPaint® Interior Acrylic Latex, Satin (apply at manufacturer's recommended DFT)

2. High Abuse Gypsum Wallboard - Epoxy, where specifically indicated
1st Coat: Sherwin-Williams ProMar® 200 Zero VOC Interior Latex Primer, B28W12600 (approximately 1.0 mil DFT, or manufacturer's current recommendation)
2nd Coat: Sherwin-Williams Pro Industrial™ Waterbased Catalyzed Epoxy, Eg-Shel, B73-360 Series (2.0-4.0 mils DFT)
3rd Coat: Sherwin-Williams Pro Industrial™ Waterbased Catalyzed Epoxy, Eg-Shel, B73-360 Series (2.0-4.0 mils DFT)

3. Wood - Clear Finish, where field finishing is indicated
1st Coat: Sherwin-Williams / Minwax® Performance Series Fast-Dry Sanding Sealer, or current approved equal
2nd Coat: Sherwin-Williams / Minwax® Performance Series Fast-Dry Varnish, Clear Satin
3rd Coat: Sherwin-Williams / Minwax® Performance Series Fast-Dry Varnish, Clear Satin

4. Wood - Stained, where field finishing is indicated
1st Coat: Sherwin-Williams Wood Classics® Interior Oil Stain, color as selected by Architect
2nd Coat: Sherwin-Williams / Minwax® Performance Series Fast-Dry Varnish, Clear Satin
3rd Coat: Sherwin-Williams / Minwax® Performance Series Fast-Dry Varnish, Clear Satin

5. Wood - Painted, where field finishing is indicated
1st Coat: Sherwin-Williams PrepRite® ProBlock® Interior/Exterior Latex Primer/Sealer, or current equivalent recommended for the substrate
2nd Coat: Sherwin-Williams Pro Industrial™ DTM Acrylic, Gloss, B66W01051 (2.5-4.0 mils DFT)
3rd Coat: Sherwin-Williams Pro Industrial™ DTM Acrylic, Gloss, B66W01051 (2.5-4.0 mils DFT)

6. Insulated Pipe and Ductwork
1st Coat: Sherwin-Williams Pro Industrial™ Multi-Surface Acrylic, Eg-Shel (1.5-2.0 mils DFT or manufacturer's current recommendation)
2nd Coat: Sherwin-Williams Pro Industrial™ Multi-Surface Acrylic, Eg-Shel (1.5-2.0 mils DFT or manufacturer's current recommendation)

7. Metal Doors, Frames and Exposed Metals

1st Coat: Spot prime bare, welded, abraded, or damaged areas with Sherwin-Williams Pro Industrial™ Pro-Cryl® Universal Acrylic Primer or another primer compatible with the shop primer and finish system (2.0-4.0 mils DFT)
2nd Coat: Sherwin-Williams Pro Industrial™ DTM Acrylic, Gloss, B66W01051 (2.5-4.0 mils DFT)
3rd Coat: Sherwin-Williams Pro Industrial™ DTM Acrylic, Gloss, B66W01051 (2.5-4.0 mils DFT)

8. Galvanized Metal
1st Coat: Sherwin-Williams Pro Industrial™ Pro-Cryl® Universal Acrylic Primer, B66-310 Series (2.0-4.0 mils DFT)
2nd Coat: Sherwin-Williams Pro Industrial™ DTM Acrylic, Gloss, B66W01051 (2.5-4.0 mils DFT)
3rd Coat: Sherwin-Williams Pro Industrial™ DTM Acrylic, Gloss, B66W01051 (2.5-4.0 mils DFT)

9. Mechanical Units - Not Used unless specifically indicated to be field painted.
10. Exposed Structural Steel and Steel Joists, where indicated to be painted
Spot Primer: Sherwin-Williams Corothane® I GalvaPac One-Pack Zinc Primer, B65G00011 (3.0-4.0 mils DFT)
1st Coat: Sherwin-Williams Pro Industrial™ High Performance Epoxy, B67W00201/B67V00200 (4.0-8.0 mils DFT)
2nd Coat: Sherwin-Williams Pro Industrial™ High Performance Epoxy, B67W00201/B67V00200 (4.0-8.0 mils DFT)

11. Metal Deck, where exposed and indicated to be painted
1st Coat: Sherwin-Williams Pro Industrial™ Multi-Surface Acrylic, Eg-Shel, B66W01561 (3.0-4.0 mils DFT)
Note 1: Color of exposed overhead structural steel and metal deck shall be selected by Architect.

B. EXTERIOR

1. Galvanized Metal
1st Coat: Sherwin-Williams Pro Industrial™ Pro-Cryl® Universal Acrylic Primer, B66-310 Series (2.0-4.0 mils DFT)
2nd Coat: Sherwin-Williams Pro Industrial™ DTM Acrylic, Gloss, B66W01051 (2.5-4.0 mils DFT)
3rd Coat: Sherwin-Williams Pro Industrial™ DTM Acrylic, Gloss, B66W01051 (2.5-4.0 mils DFT)

2. Ferrous Metals and Miscellaneous Metals
1st Coat: Sherwin-Williams Steel Spec® 3013 Universal Primer, or compatible approved equal (apply at manufacturer's recommended DFT)
2nd Coat: Sherwin-Williams Pro Industrial™ DTM Acrylic, Gloss, B66W01051 (2.5-4.0 mils DFT)
3rd Coat: Sherwin-Williams Pro Industrial™ DTM Acrylic, Gloss, B66W01051 (2.5-4.0 mils DFT)

3. Wood - Painted, where indicated
1st Coat: Sherwin-Williams Exterior Latex Wood Primer, or current manufacturer-recommended exterior wood primer
2nd Coat: Sherwin-Williams SuperPaint® Exterior Acrylic Latex, Satin (apply at manufacturer's recommended DFT)
3rd Coat: Sherwin-Williams SuperPaint® Exterior Acrylic Latex, Satin (apply at manufacturer's recommended DFT)

4. Exposed Concrete, where indicated
1st Coat: Sherwin-Williams Loxon® Concrete & Masonry Primer, or current approved equal

2nd Coat: Sherwin-Williams ConFlex™ XL High Build Coating (apply at manufacturer's recommended DFT)
3rd Coat: Sherwin-Williams ConFlex™ XL High Build Coating (apply at manufacturer's recommended DFT)

5. Exposed Masonry (Brick) - Not Used under this Section.
6. Metal Deck - Not Used.
7. Corrugated Steel Gym Wall Panels - Not Used.

IMPORTANT NOTE: IN THE ABOVE SCHEDULE OF PAINTING, THE AMOUNT OF COATS AND DRY FILM THICKNESS MILLAGE IS INDICATED. THE DRY FILM THICKNESS SHALL OVERRIDE THE AMOUNT OF COATS INDICATED. IF IT TAKES MORE COATS THAN INDICATED, TO ACHIEVE THE DRY FILM THICKNESS SHOWN, THEN ADDITIONAL COATS OF PAINT SHALL BE APPLIED IN ORDER TO RECEIVE THE SPECIFIED DRY FILM THICKNESS.

IMPORTANT NOTE: RECOMMENDED MANUFACTURER'S MAXIMUM DRY FILM THICKNESS (DFT) SHALL NOT BE EXCEEDED IN ANY ONE COAT OF PAINT TO ACHIEVE THE SPECIFIED MILLAGE.

NOTE: FOR BRUSH AND ROLL APPLICATION MULTIPLE COATS MAY BE REQUIRED TO ACHIEVE SPECIFIED FILM THICKNESSES. SEE NOTE M. 15.

NOTE: Intumescent fireproofing compatibility requirement - Not Used.

3.4 TINTING AND PRODUCT NUMBERS

A. All paint coats shall be in the same color family but at different degrees of same color. Contact Architect after each coat for inspection.

B. Painting contractor shall submit to the Architect prior to purchase of products the product name and numbers of the paints to be used on this project. NOTE! ALL PRODUCTS SHALL BE EQUAL TO THAT WHICH HAS BEEN SPECIFIED HEREIN AND APPROVED BY THE ARCHITECT. ALL PRODUCTS SHALL HAVE IDENTIFYING LABELS ON CONTAINERS AT JOBSITE.

3.5 MANUFACTURERS AND TRADE NAMES

A. Given herein are intended to establish minimum standards of materials and finishes. Subject to compliance with specifications, products of manufacturers listed below are approved for use:

Sherwin-Williams - Basis of Design
Minwax / Sherwin-Williams (for stains and clear wood finishes)
Prior approved equals.

B. Contractor shall submit, if required, necessary information to accurately show that quality of materials and finishes proposed for use are equal to standards specified.

C. Bidders desiring to use coatings other than those specified shall submit their proposal in writing to the Architect at least ten (10) working days prior to the bid opening. Requests for substitution shall include manufacturer's literature for each product giving the name, generic type, descriptive information, solids by volume, recommended dry film thicknesses and a list of five (5) projects where each product has been used and rendered satisfactory service. No request for substitution shall be considered that would decrease film thickness, the number of coats applied or offer a change in the generic type of coating specified. The coating contractor shall submit manufacturer's certified test reports for the following test methods showing that the substitute product(s) equal or exceed the performance of the specified products outlined in the painting schedule.

1. American Society for Testing and Materials (ASTM)
    a. ASTM D 4585, Condensing Humidity
    b. ASTM B 117, Salt Spray
    c. ASTM D 3359B, Adhesion
    d. ASTM D 3273 Fungal Resistance

e. ASTM D 1653 Moisture Vapor Transmission
f. ASTM G154, Fluorescent UV Exposure
g. ASTM D 4213 Scrubbability
h. ASTM D 1308 Stain Resistance
i. ASTM D 4060 Abrasion Resistance
j. ASTM D2243, Freeze-Thaw Resistance of Water-Borne Coatings
k. ASTM D 3363 Hardness
l. ASTM D 2794 Impact Resistance
m. ASTM D 522 Elongation
n. ASTM D 2805 Contrast Ratio
o. ASTM D 2486 Scrubbability
p. ASTM D 4541 Adhesion
q. ASTM D 4141 C EMMAQUA-NTW
r. ASTM D 1014 Exterior Exposure 45° South
s. ASTM E 308 Light Reflectance

2. Federal Test Methods: Not Used.
3. Exterior Exposure - Exterior exposure testing as applicable to the proposed substitute coating.

D. Minimum Performance Requirements. No material will be considered that fails to meet the following performance requirements.
1. Epoxy Wall Coating
a. Scrubbability ASTM D 2486
Requirement: Passes 8,000 scrub cycles.
b. Adhesion ASTM D 4541
Requirement: Minimum 1000 psi
2. Acrylic Wall Coating
a. Scrubbability ASTM D 2486
Requirement: No less than 2500 scrub cycles
b. Adhesion ASTM D 4541
Requirement: Minimum 1500 psi

3.6 COLOR SELECTION

A. Colors shall be selected by Architect and shall be matched by successful contractor.

3.7 APPLICATION

A. Apply coatings by brush, roller, spray, squeegee, or other applications in accordance with manufacturer's directions. Use brushes best suited for type of material being applied. Use rollers of carpet, velvet back, or high pile sheep wool as recommended by manufacturer for material being applied. Spray coatings uniformly with suitable and properly maintained equipment.

B. Wherever spray application is used, apply each coat to provide the equivalent hiding power of brush-applied coats. Do not double-back for the purpose of building up film thickness of 2 coats in one pass, unless recommended in writing by coating manufacturer.

C. The minimum number of coats and minimum coating film thickness required shall be the same regardless of the application method used. Do not apply succeeding coats until the previous coat has cured as recommended by the coating manufacturer. Sand between coats where required to produce an even, smooth surface.

D. Apply additional coats when undercoats or other conditions show through the finish coat until the coating film is of uniform finish, color and appearance.

E. Coat the back sides of access panels, removable or hinged covers to match exposed surfaces.

F. Coat surfaces behind moveable equipment and furniture the same as similar exposed surfaces.

G. Apply each material at not less than manufacturer's recommended spreading rate. Provide a total dry film thickness of the entire coating system as specified or, when not specified, as recommended by manufacturer.

H. Before application of finish coats, apply a prime coat to material which is required to be coated or finished.

I. Recoat primed and sealed substrates.

J. Do not apply coatings when temperature of surfaces to be coated or the surrounding air temperature is 50 degrees F., or below, unless specifically permitted by manufacturer's printed instructions.

K. Do not apply coatings in snow, rain, mist, or fog; or when relative humidity exceeds 85% and do not apply coatings to damp or wet surfaces, unless otherwise permitted by manufacturer's printed instructions. Coatings work may be continued during inclement weather only if the areas and surfaces to be coated are enclosed and heated within temperature limits specified by manufacturer.

L. Completed work shall match approved samples for color, texture and coverage. Remove, refinish and recoat work not in compliance with specified requirements.

M. Important: The manufacturer of the paint product used (or his authorized representative) must inspect the surface prior to the initial installation or for mock-up sections applied on the project and give the painting contractor approval to apply the product as approved on the initial mock-up sections. The manufacturer (or his authorized representative) shall also approve the painting contractor’s methods of applications of his product according to printed instructions of the manufacturer. Payment of this work will be delayed to the Contractor until these written approvals are received by the Architect.

N. All paint product names and numbers shall be provided at the end of the job for the Owner’s future reference.

O. Important Note: The specified number of coats for each system are the minimum number required to achieve the specified film thicknesses. If roller or brush applied, additional coats may be required to achieve the specified film thickness.

P. All coating shall be applied during environmental conditions that meet the requirements of the coating manufacturer.

Q. Mock-Up
1. A full system mock-up shall be installed for shop-primed metal and for other systems as required by the Architect to verify adhesion, appearance, and compatibility between primers, finish coats, and substrates.

R. Figure a maximum of 35% of surfaces to be painted to receive deep colors. This does not include clear sealers and stains.

END OF SECTION 09 91 00

SECTION 10 14 16 - PLAQUES

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor shall furnish all labor, materials, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of Cast Plaques as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.

B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.

C. The Contractor shall coordinate with all trades and provide all in wall blocking as necessary for a complete and secure installation as recommended by the manufacturer.

1.2 SUMMARY

A. Related Documents: Provisions established within the General and Supplementary Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.

B. Section Includes:
1. Cast bronze plaque

1.3 QUALITY ASSURANCE

A. Supplier: Obtain all signage products in this and other signage specifications through a single supplier from a single manufacturer.

B. Regulatory Requirements: Products shall meet requirements of the Americans With Disabilities Act Accessibility Guidelines (ADAAG) and local amendments and modifications.

C. Installer: Installation shall be performed by installer specialized and experienced in work similar to that required for this project.

1.4 SUBMITTALS

A. Submit in accordance with requirements of Division 1.

B. Product Data: Submit product data for specified products. Include material details for each sign specified.

C. Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including dimensions, anchorage, and accessories.

D. Samples for initial selection: Submit supplier’s standard color chart for selection purposes and selected colors for verification purposes.

E. Samples for Verification: For each type of sign, include the following samples to verify color and finish selected:
1. Actual sample of casting in metal specified to show finish, texture & lettering style.

F. Installation: Submit supplier’s installation instructions.

1.5 Closeout Submittals:

A. Submit operation and maintenance data for installed products, including precautions against harmful cleaning materials and methods.

B. Submit warranty documents specified herein.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Division 1.
   1. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
   2. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
   3. Store products protected from weather, temperature, and other harmful conditions as recommended by supplier.
   4. Handle products in accordance with manufacturer's instructions.

1.7 WARRANTY

A. Project Warranty: Comply with requirements of Division 1.

B. Manufacturer's Warranty: Submit manufacturer's standard warranty document executed by authorized company official.
   1. Warranty Period: One year from date of substantial completion.

PART 2 - PRODUCTS

2.1 SIGNAGE SYSTEMS

A. The following manufacturers and products are used as a basis of design and are Prior Approved:
   1. A.R.K. Ramos Signage Systems, 1321 South Walker, Oklahoma City, OK 73109; Telephone: 1-800-725-7266; Fax 1-405-232-8516.
      Acceptable Product: Cast Aluminum Logo Plaque and Cast Bronze Plaque
   2. Or Prior Approved Equals - Manufacturers shall submit an equivalent style signage system for review by the Architect a minimum of 10 days prior to bid.

2.2 FABRICATION

A. General: Cast free from pits, gas holes, and warped surfaces.

B. Cast Bronze Plaque:
   1. Quantity: 1
   2. Material: Bronze
   3. Size: 24” W x 30” H with a single border
   4. Plaque to be cast in one piece. No visible seams allowed.
   5. Plaque Information: Project name, date, all of the names listed in the Ascension Parish School Board box at the front title sheet plus for 25% more names, Architects, Contractor and four (4) Consultants names shall appear on the plaque as furnished by the Architect.
   6. Fastening method shall be concealed.
   7. Finish: Sealed finish.
   8. Location: Verify location with Architect on the jobsite.
   9. If more than one rubbing is required for changes, there shall be no extra charge.

C. Verify location of all Cast Plaques with Architect on the jobsite.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions: Verify installation conditions previously established under other sections are acceptable for product installation in accordance with manufacturer's instructions.

B. Scheduling of installation shall be the responsibility of the General Contractor and the installer. Proceeding with installation implies installer’s acceptance of substrate and conditions.

C. Contractor and installer shall coordinate and verify that all required blocking is installed to properly support Cast Metal Plaques according to manufacturer’s recommendations.

3.2 INSTALLATION

A. Install product in accordance with supplier’s instructions.

B. Install product in locations indicated using mounting methods recommended by sign manufacturer and free from distortion, warp, or defect adversely affecting appearance.

C. Install product level, plumb, and at heights indicated.

D. Install product at heights to conform to Americans with Disabilities Act Accessibility Guidelines (ADAAG) and applicable local amendments and regulations.

E. Install signs within the following tolerances and in accordance with manufacturer's recommendations:
   1. Exterior Signs: Within 1/4 inch vertically and horizontally of intended location.

3.3 CLEANING, PROTECTION AND REPAIR

A. Repair scratches and other damage which might have occurred during installation. Replace components where repairs were made but are still visible to the unaided eye from a distance of 3 feet.

B. Remove temporary coverings and protection to adjacent work areas. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from project in accordance with provisions in Division 1.

END OF SECTION 10 14 16

SECTION 10 14 19 - DIMENSIONAL LETTER SIGNAGE

PART 1 – GENERAL

1.1 SUMMARY

A. Related Documents: Provisions established within the General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.

B. Section Includes:
1. Exterior dimensional aluminum letters.
2. Exterior custom dimensional aluminum logo / graphic elements.

1.2 QUALITY ASSURANCE

A. Supplier: Obtain all signage products in this and other signage specifications through a single supplier from a single manufacturer.

B. Structural Performance: Design exterior dimensional letters, logos, mounting hardware, anchors, and attachments in accordance with ASCE/SEI 7-16 for Risk Category III and ultimate design wind speed Vult = 164 mph. Determine applicable positive and negative Components and Cladding pressures for the actual sign location, effective wind area, building height, exposure, and wall zone. Provide signed and sealed delegated-design calculations by a professional engineer licensed in the State of Louisiana where required to demonstrate adequacy of the sign assembly and anchorage.

C. Installer: Installation shall be performed by installer specialized and experienced in work similar to that required for this project.

1.3 SUBMITTALS

A. Submit in accordance with requirements of Division 1.

B. Product Data: Submit product data for specified products. Include material details for each sign specified.

C. Shop Drawings: Submit shop drawings showing each sign layout, profiles, dimensions, letter heights, stroke widths, spacing, logo proportions, material thicknesses / depths, finishes, mounting templates, studs, anchors, stand-offs, blocking / backing requirements, and accessories. Show exact relationship to brick coursing and adjacent architectural features. Include structural calculations required by Paragraph 1.2.B.

D. Samples: Submit supplier's standard and custom exterior finish color samples for selection and verification. Submit representative aluminum material / finish sample when requested by Architect.

E. Installation: Submit supplier's installation instructions and mounting / anchorage requirements.

F. Closeout Submittals:
1. Submit operation and maintenance data for installed products, including precautions against harmful cleaning materials and methods.
2. Submit warranty documents specified herein.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Division 1.

1. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
2. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
3. Store products protected from weather, temperature, and other harmful conditions as recommended by supplier.
4. Handle products in accordance with manufacturer's instructions.
5. Sign vendor shall provide Owner with reorder / replacement information at completion, including final approved sign drawings, finish information, and vendor contact / ordering information.

1.5 WARRANTY

A. Project Warranty: Comply with requirements of Division 1.

B. Manufacturer's Warranty: Submit manufacturer's standard warranty document executed by authorized company official.
1. Warranty Period: One year from date of Substantial Completion. Warranty shall cover defects in sign materials, fabrication, finishes, and mounting components furnished under this Section. Contractor remains responsible for installation and anchorage in accordance with the Contract Documents.

PART 2 - PRODUCTS

2.1 SIGNAGE SYSTEMS

A. The following manufacturer and products are used as a basis of design and are Prior Approved:
1. ASI Signage Innovations / ASI Louisiana.

B. Acceptable Product: ASI exterior dimensional aluminum letters and custom fabricated / cut aluminum logo elements, or prior approved equal meeting the requirements of this Section.

C. Exterior Dimensional Signage: Provide non-illuminated dimensional aluminum letters and logo elements at locations shown on the Drawings.
1. South Elevation - Main Building Identification: Dimensional letters reading "Lady of the Sea Medical Clinic," arranged and proportioned as indicated on the Drawings and matching Owner branding.
2. South Elevation - Pharmacy Identification: Dimensional letters reading "PHARMACY," sized and located as indicated on the Drawings.
3. East Elevation - Owner Logo / Identification: Dimensional letters reading "Lady of the Sea" together with the Owner's sailboat logo / graphic, arranged and proportioned as indicated on the Drawings.
4. Materials: Exterior-grade aluminum. Flat-cut letters and graphic elements shall be minimum 1/4 inch thick unless a greater thickness or fabricated depth is required to achieve the appearance shown, maintain rigidity, or satisfy structural requirements. Fabricated dimensional components shall have welded or mechanically joined aluminum faces and returns appropriate to the approved design.
5. Finish: Manufacturer's exterior-grade painted finish suitable for long-term exposure. Colors shall be selected by Architect and Owner to match the Lady of the Sea branding and approved shop drawings.
6. Artwork and Typography: Fabricate letters, logo, spacing, proportions, and graphic elements from Owner- or Architect-approved electronic artwork. Do not substitute typefaces, alter logo proportions, or revise spacing without written approval.

7. Mounting: Provide concealed threaded studs, spacers / stand-offs where required, anchors, templates, and reinforcing necessary for a complete installation on the brick-veneer exterior walls. Anchor to structural backup, blocking, or another substrate demonstrated adequate by the delegated design. Do not rely solely on face brick to resist project wind loads unless specifically demonstrated by the engineered anchorage design and accepted by Architect.
8. Weatherproofing: Coordinate all penetrations through brick veneer, sheathing, air barrier, and other exterior-envelope components. Provide compatible sleeves, sealants, and flashing / sealing required to maintain continuity of the water-resistive and air-barrier systems. Coordinate with Sections 07 27 26 and 07 92 00.

2.2 FABRICATION - GENERAL

A. General: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.

B. Design, fabricate, and install sign assemblies to prevent buckling, opening up of joints, and over-stressing of welds and fasteners.

C. Mill joints to a tight, hairline fit. Form joints exposed to the weather to exclude water penetration and to permit drainage of fabricated hollow components where required.

D. Conceal fasteners where possible. Exposed fasteners, where unavoidable, shall be corrosion resistant and finished or located to be inconspicuous.

E. Create signage to required sizes and layout. Comply with requirements indicated for design, dimensions, finish, color, and details of construction.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions: Verify installation conditions previously established under other sections are acceptable for product installation in accordance with manufacturer's instructions.

B. Verify exterior wall construction, brick veneer, concealed backing / support, air barrier, and other conditions affecting sign anchorage are complete and suitable for installation. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install product in accordance with supplier’s instructions.

B. Install dimensional letters and logo elements at locations indicated using approved mounting and anchorage methods. Use approved templates to maintain exact alignment, spacing, and graphic proportions. Install free from distortion, warp, visible fasteners, or other defects adversely affecting appearance.

C. Install signs level, plumb, accurately aligned, and at heights and locations indicated on the exterior elevations.

D. Field verify brick coursing, control joints, architectural reveals, and adjacent features before fabrication. Coordinate minor mounting adjustments required to avoid conflicts; do not relocate or alter the approved sign composition without Architect approval.

E. Install dimensional signs within the following tolerances and in accordance with manufacturer's recommendations:

1. Letter and Logo Layout: Within 1/4 inch vertically and horizontally of the approved shop drawing location and template.
2. Maintain uniform baselines, letter spacing, stand-off depth, and alignment throughout each sign assembly.

3.3 CLEANING, PROTECTION, AND REPAIR

A. Repair scratches and other damage which might have occurred during installation. Replace components where repairs were made but are still visible to the unaided eye from a distance of 10 feet.

B. Remove temporary coverings and protection to adjacent work areas. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from project in accordance with provisions in Division 1.

3.4 SIGN SCHEDULE

A. Schedule: Provide exterior dimensional signage shown on Sheet A201, including the south-elevation "Lady of the Sea Medical Clinic" identification, south-elevation "PHARMACY" identification, and east-elevation "Lady of the Sea" identification with sailboat logo / graphic. Final sizes, typography, colors, spacing, and mounting configuration shall be as shown on approved shop drawings and Owner / Architect-approved branding artwork.

END OF SECTION 10 14 19

SECTION 10 21 13.19 - PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SCOPE

A. Requirements of the general conditions and special conditions apply to the work in this section.

B. Provide all labor, materials, etc., necessary for the completion of the work of this section as specified or shown on the drawings.

C. Work of this section consists of, but is not limited to, the following:
1. Toilet stalls, stall doors, screens and entry partitions, urinal screens
2. Hardware, etc., for stalls
3. Shop drawings

D. Work not included in this section:
1. Toilet room accessories. (RE: Section 10 28 00 - Toilet, Bath & Laundry Accessories)

E. Submit six (6) sets of shop drawings, including details and a sample of each item of hardware for Architect's approval.

F. Provide drawings showing locations for adequate steel reinforcements or wood blocking in walls to be provided by others for proper securement of the finished work.

G. Furnish color cards for use of the Architect. (With no less than 10 standard colors.)

H. Furnish Static load testing on door hinges to meet or exceed 800 lbs.

I. Furnish certificate of compliance that only virgin materials are used for fabrication and no regrind or reprocessed scrap allowed.

J. Comply with all standards as required by state and local laws and codes. State Statutes RS40-1561, Chapter 7, Part 3 and the American National Standards Institute (ANSI) A 117.1-1986 and ADAAG 2010 apply.

K. Provide and install all items as described in the Contract Documents as required to constitute a complete project, in full compliance with state and local laws and codes.

L. Information shown on the plans show the general information as to layout, sizes and dimensions. Examples shown in this section of the specifications gives specific requirements as required by ANSI 117.1-1986 and ADAAG 2010 and shall be used for dimensions and locations of handicapped access specialty items and standard items adapted for use by the handicapped. Sizes and dimensions given are minimum standards. Other examples from the same source are not excluded and shall apply. Copies of ANSI 117.1-1986 and ADAAG 2010 are available at the office of the Architect.

M. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

N. Deliver, store, and handle compartments as recommended by manufacturer to protect from damage.

O. Provide manufacturer’s written two (3) part warranty: The entire toilet partition shall be warranted for ten (10) years, against breakage, corrosion delamination, to include hardware; replaced without charge, excluding labor. Panels, pilasters and doors shall be warranted for fifteen (15) years against breakage, corrosion and delamination; replaced without charge, excluding labor.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Columbia Partitions Series 19825, by PSISC, P.O. Box 181, Columbia, S.C. 29202, 803-252-3020, Fax: 866-337-7286.

B. Sentinel Floor Mounted Overhead Braced Toilet Partitions and Modesty Style Partitions in Bradmar (HDPE) Solid Plastic Series 400, as manufactured by The Mills Company a subsidiary of Bradley Corp., P.O. Box 309, Menomonee Falls, Wi 53052-0309 (800) 272-3539. Contact Person: Sean Hebert with Superior Products, (225) 644- 9773.

C. Solid Plastic Polyethylene Overhead Braced Toilet Partitions, Shower and Dressing Compartments as manufactured by Ampco Products LLC, 11400 N 36th Ave, Miami, FL 33167. Tel: (305)821-5700

D. Solid Plastic Overhead Braced Toilet Partitions (Hiney Hiders), as manufactured by Scranton Products: 801 E. Corey St. Scranton PA 18507 (800) 445-5148

E. Or Prior Approved Equal. All submittals for approval shall be presented in accordance with the submittals clause of this document and must be presented at least ten (10) working days prior to the bid date. All submittals shall be reviewed based on the standard of quality established herein.

2.2 MATERIALS

A. General: Provide material which has been selected for surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are not acceptable. Solid Plastic HDPE shall meet or exceed all requirements for Class “B” Flame Spread Rating calculated according to ASTM E-84 and shall carry a UL Class “B” Fire Rating Certification.

B. Material shall be Solid HDPE, overhead braced floor supported
1. Doors - Minimum 1.00" Finished Thickness, 55" high
2. Divider Panels - Minimum 1.00" Finished Thickness, 55" high
3. Pilasters - Minimum 1.00" Finished Thickness, 82" high

C. Pilasters, Doors and Panels shall have edges machined to a .250" radius. Pilasters, Doors and Panels shall be provided with a self-adhesive peel coat to protect the finish during installation.

D. Colors: To be selected by Project Architect from Manufacturer’s Standard Colors.

E. Pilaster Shoes: ASTM A 167, Type 304 18 gauge Stainless Steel, minimum 3" high, 18 gauge, finished with #4 Polish, attached with Stainless Steel Through Bolts.

F. Continuous Brackets: Full High (54") Type 304 stainless steel. Inside of opening of bracket shall be 1.00" for panels and pilasters. All holes for mounting to wall and panel/pilaster shall be pre-drilled. Holes are to be spaced at 12" o.c. (Max.) along the full length of the bracket for a total of ten (10) holes for mounting to the wall and five (5) holes for mounting to the panel/pilaster. Each bracket is to have a minimum wall thickness of .125". Brackets shall be pre-drilled for mounting to door using theft proof stainless steel Torx Head with Pin Through Bolts. (Attachment using screws to core material is unacceptable)

G. Continuous Hinge: Continuous 14 gauge Type 3stainless steel hinge (54"). Hinge shall be 3" wide and shall have cam knuckles for gravity type self-closing action. Pivot pin shall be .250" in diameter and shall be made of Type 304 stainless steel. Hinges shall provide emergency access by lifting the door. Hinges shall be pre-drilled for mounting to door using theft proof stainless steel Torx Head with Pin Through Bolts. Mounting holes shall

be at 12" o.c. (Max.) for through-bolting with stainless steel fasteners. In-swinging hinges shall be preset to hold doors in the closed position when unlatched. Out-swinging hinges shall be preset to hold doors in the closed position when unlatched.

H. Strike and Keeper: Heavy duty Type 304 14 gauge stainless steel with a satin finish. The strike and keeper shall have an integral rubber bumper door stop. Furnish one per door.

I. Slide Latch: Heavy duty cast stainless steel with a satin finish. The slide latch shall be surface mounted. Latch shall have an internal stainless steel buffering spring to prevent damage when door is inadvertently slammed against the latch. Latch knob is to be riveted to the slide bar and then welded to ensure that the knob will not come off. Furnish one per door.

J. Coat Hook: Heavy duty Type 304 cast stainless steel with a satin finish. Furnish one per door.

K. Door Stop: Heavy duty cast stainless steel with a satin finish. Furnish one for each disabled accessible door.

L. Pull Handle: Heavy duty cast Type 304 stainless steel with a satin finish. The pull handle shall have mounting holes drilled and tapped for 10/24 threads at 3.50" o.c. The pull handle shall be .655" wide and shall be mounted back to back with the slide latch. Furnish one for each disabled accessible door.

M. Overhead Bracing (Headrail): Continuous heavy duty extruded 6063-T5 aluminum headrail with Anti-Grip profile. Headrail shall have integral reinforcing channel and curtain track. Headrail shall have a satin anodized finish. Provide headrail corner brackets, wall brackets, and headrail end caps as required. The headrail and thickness of the headrail and headrail brackets shall be .125". Each headrail bracket is to be packaged in a separate poly bag and is to be labeled by stock number and manufacturer.

N. Anchorage and Fasteners: All fasteners shall be stainless steel with theft proof heads, through-bolts unless noted otherwise. Chrome plated steel or brass are not acceptable.

2.3 FABRICATION

A. General: Provide standard doors, panels, screens and pilasters fabricated for partition system, complete with all accessories and hardware listed above and as required for installation of fully functional system, unless otherwise noted. Provide units with cutouts and drilled holes to receive partition-mounted hardware, accessories, and grab bars as indicated.

B. Overhead-Braced and Floor-Anchored Partitions:
1. Furnish heavy duty cast stainless steel “Z” bars, complete with stainless steel threaded rods, lock washers and leveling-adjusting nuts at pilaster, to permit structural connection at floor.
2. Make provision for setting and securing continuous extruded aluminum anti-grip handrail at top of each pilaster.
3. Furnish stainless steel shoe at each pilaster to conceal supports and leveling mechanism.

C. Doors: Unless otherwise indicated, provide 24" wide in-swinging doors for standard toilet partitions and 36" wide out-swinging doors with a minimum 32" wide clear opening for partitions indicated to be handicapped accessible.

D. Floor Anchored Privacy Screens: Furnish privacy screens consisting of a pilaster and a panel of the same construction and finish as the toilet partitions. Furnish in accordance with the drawings.

PART 3 - EXECUTION

3.1 EXECUTION

A. Installation

1. General: Comply with manufacturer’s written installation instructions. Install partitions rigid, straight, plumb and level. Provide clearance of not more than .50" between pilasters and panels, and not more than 1.0" between panels and walls. No evidence or drilling, cutting and patching shall be visible in finished work.

2. Attach continuous wall brackets to the wall with the following:
   a. At solid masonry: #14 x 1.50" long stainless steel phillips pan head screws and plastic #14/16 anchors at 9" o.c. vertical spacing.
   b. At cavity masonry: .25" diameter x required length stainless steel toggle bolts at 9" o.c. vertical spacing.

3. Overhead-Braced and Floor-Anchored Partitions: Secure pilasters to floor and level, plumb, and tighten. Secure continuous headrail to each pilaster with not less than two (2) through-bolt stainless steel fasteners. Hang doors and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

4. Screens: Attach with anchoring devices according to manufacturer’s written instructions and to suit supporting structure. Set units level and plumb and to resist lateral impact.

B. Accessories

1. Mount accessories to partition units in accordance with manufacturer’s instructions.

C. Adjusting and Cleaning

1. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer’s written instructions for proper operation.

2. Provide final protection and maintain conditions that ensure toilet partitions and screens are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 10 21 13.19

SECTION 10 26 13 - CORNER GUARDS

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor shall furnish all labor, materials, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, surface mount corner guards as shown on drawing and as specified in accordance with provisions of the Contact Documents and completely coordinated with that of all other trades.

B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.

C. The drawings do not purport to show all locations and requirements for wall protection. The Contractor shall provide wall protection at all 90 degree angle and 135 degree angle outside corners of drywalls in Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Inpro IPC Door and Wall Protection Systems.

2.2 MATERIALS

1. Corner Guards:
    a. Type : Surface-mounted, direct glue applied.
    b. Material: PVC-free high-impact copolymer plastic (PETG).
    c. Size: 1-1/2 inch wings, 90 degree.
    d. Height: Full height.
    e. Length: One piece.
    f. Accessories: Matching prefabricated top caps and manufacturer-recommended adhesive.
    g. Color: White Sand (Inpro Color 0103).

PART 3 - EXECUTION

3.1 WORKMANSHIP

A. Install one 96" high wall guard trim at every outside corner of gypsum board walls throughout the new addition. Corner guards shall be installed with bottom edge set just above rubber base trim.

B. Inspect all surfaces to receive wall protection systems for proper condition before installation.

C. Install wall protection systems to walls securely in accordance with manufacturer’s written instructions.

D. Install wall protection systems accurately in location, alignment, and elevation.

E. Mechanically fasten securely to existing studs at recommended spacing.

F. Do not install cut lengths of corner guards with surface checking, end checking or other damage.

G. Corner guards shall be installed at all outside corners or as indicated in the construction drawings.

3.2 ADJUSTING AND CLEANING

A. Touch up minor damages or blemishes as approved by the Architect.

B. Clean surfaces in accordance with manufacturer’s instructions.

END OF SECTION 10 26 13

SECTION 10 28 00 - TOILET, BATH AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete of toilet accessories as shown on drawings and as specified in accordance with provisions of the contract documents and completely coordinated with that of all other trades.

B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, and complete installation shall be furnished and installed as part of this work.

C. Comply with applicable state and local laws and codes, the 2021 International Building Code, ICC A117.1-2017, and the 2010 ADA Standards for Accessible Design.

D. Provide and install all items as described in the contract documents as required to constitute a complete project, in full compliance with state and local laws and codes.

E. Information shown on the Drawings indicates general layout, sizes, dimensions, and accessory locations. Install accessible accessories in strict accordance with the 2010 ADA Standards for Accessible Design, ICC A117.1-2017, and dimensions indicated on the Drawings. Where requirements differ, comply with the more stringent applicable requirement unless directed otherwise by the Authority Having Jurisdiction.

F. NOTE: Verify all quantities, mounting locations, and furnishing responsibilities of toilet accessories by reviewing the Drawings. Unless an accessory is specifically identified as Owner Furnished Contractor Installed (OFCI), accessories specified in this Section shall be Contractor Furnished Contractor Installed (CFCI).

PART 2 - PRODUCTS

2.1 MATERIALS

A. Grab Bars - 1-1/2" diameter, Type 304 stainless steel, satin-finish slip-resistant surface, with concealed fasteners. Provide sizes indicated on the Drawings, including GB1 - 36 inch rear grab bars and GB2 - 42 inch side grab bars. Provide wall reinforcing / blocking required for secure installation and accessible loading requirements.

BOBRICK: B-6806 Series Straight Grab Bars
BRADLEY: 8120 Series Grab Bars
AMERICAN SPECIALTIES: 3800 Series Grab Bars
Or prior approved equals

B. Toilet Paper Dispenser (TPD) - Surface-mounted, multi-roll toilet tissue dispenser; Type 304 stainless steel with satin finish, vandal-resistant / theft-resistant spindle arrangement, and concealed or tamper-resistant fastening. Locate as indicated on the Drawings and comply with accessible reach and clearance requirements.

BOBRICK: ConturaSeries B-4288
BRADLEY: Approved equivalent
AMERICAN SPECIALTIES: Approved equivalent
Or prior approved equals

C. Mirror (FM-1) - 24" wide x 36" high welded-frame mirror with Type 304 stainless steel satin-finish frame, minimum 1/4" first-quality float glass, galvanized steel back, and

concealed theft-resistant mounting. Mount with bottom edge of reflecting surface at the accessible height indicated on the Drawings.

BOBRICK: B-290 2436
BRADLEY: 781-2436
AMERICAN SPECIALTIES: 0600 Series, 24 x 36 inch
Or prior approved equals

D. Mirror (Type #2) - Not Used.

E. Liquid Soap Dispenser (SD) - Surface-mounted vertical manual liquid-soap dispenser, Type 304 stainless steel with satin finish, approximately 40 fl oz capacity, concealed fastening, refill indicator, and vandal-resistant top. Basis of Design: Bobrick B-2111. Provide at locations indicated on the Drawings. Bradley, American Specialties, or prior approved equal.

F. Sanitary Napkin Disposal Unit (SND) - Recessed sanitary napkin disposal unit, Type 304 stainless steel with satin finish, seamless / beveled flange, self-closing disposal panel, removable leak-resistant receptacle, and lockable service door. Basis of Design: Bobrick B-353. Provide at locations indicated on the Drawings. Prior approved equals by Bradley or American Specialties are acceptable.

G. Paper Towel Dispenser (PTD) - Surface-mounted paper towel dispenser, Type 304 stainless steel with all-welded construction and satin finish; full-length stainless steel piano hinge; keyed lock; and capacity for C-fold or multifold towels. Provide at locations indicated on the Drawings.

BRADLEY: Series 250-15 - Surface Mounted
BOBRICK: Series B-262 - Surface Mounted
AMERICAN SPECIALTIES: Series 0210
Or Prior Approved Equal

H. Towel Dispenser/Waste Receptacle - Not Used.

I. Utility Shelves - Not Used.

J. Hand Driers - Not Used.

K. Utility Hooks - Not Used.

2.2 ACCESSORY SCHEDULE - LADY OF THE SEA MEDICAL CLINIC
(Provide accessories in the quantities and locations indicated on the enlarged plans, interior elevations, and accessory schedules. The following schedule identifies the accessory type marks used on the Drawings. Contractor remains responsible for complete quantities.)

A. FM-1:
1. Mirror
a. 24" wide x 36" high; Bobrick B-290 2436 or approved equal.

B. GB1:
1. Grab Bar
a. 36" long; Bobrick B-6806 x 36 or approved equal.

C. GB2:
1. Grab Bar
a. 42" long; Bobrick B-6806 x 42 or approved equal.

D. TPD:
1. Toilet Paper Dispenser
a. Bobrick B-4288 or approved equal.

E. SD / SND / PTD:
1. Accessory Products
a. SD - Soap Dispenser: Bobrick B-2111 or approved equal.
b. SND - Recessed Sanitary Napkin Disposal: Bobrick B-353 or approved equal.
c. PTD - Surface-Mounted Paper Towel Dispenser: Bobrick B-262 or approved equal.

F. NOTE: Accessory type marks, quantities, and exact locations shall be verified from Sheets A401 through A410 and related enlarged plans / elevations. Plumbing fixtures identified in the accessory schedules are specified under Division 22 and are not furnished under this Section.

PART 3 - EXECUTION

3.1 Provide and install all blocking and anchoring in the wall. IMPORTANT: Failure to install adequate means for supporting toilet accessories, especially handicapped items, will require the demolition of finished work, installation of support blocking and anchoring, and reconstruction of work at the Contractors expense. All handicapped accessories shall support at 500# minimum loading.

3.2 Install all items in strict accordance with manufacturer's recommendations.

3.3 All fastener, accessories, etc. shall be stainless steel or other corrosion proof material. Fasteners shall be tamperproof type where exposed.

3.4 NOTE! All fixtures and accessories required to meet accessible and barrier-free conditions shall adhere strictly to the 2010 ADA Standards for Accessible Design and ICC A117.1-2017. Contractor shall maintain required clearances, mounting heights, reach ranges, and operable-part requirements.

END OF SECTION 10 28 00

SECTION 10 44 16 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor shall furnish all labor, materials, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of firefighting devices as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.

B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.

C. Furnish and install semi-recessed fire extinguisher cabinets with 10 lb. minimum capacity fire extinguishers for multi-purpose dry chemical Type “ABC” and 6 liter minimum capacity fire extinguishers for wet chemical Type “WC” as indicated in drawings.

D. For additional information, see drawings Sheets LS-1 and Blow-up Floor Plans.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fire extinguishers shall be: “Architectural Series” 2409 R4 as manufactured by: Larsen’s Manufacturing Co., Phone: 954-486-3325

1. Box specification: All semi-recessed cabinets shall have heavy gauge steel boxes with vertical duo tempered safety glass door 304 stainless steel with #4 finish. (If in fire wall, use clear wire glass.)

2. Fire rating, **if located in fire wall**: Cabinets shall be constructed to have fire rating required to match wall. The manufacturer shall provide detailed installation instructions and factory supplied anchoring devices to insure proper installation. **(Integrity of the fire rated walls shall be maintained throughout the project.)** Fire resistant materials shall be contained inside double wall cabinet construction.

3. Trims specification: 304 Stainless steel trims and doors shall be in #4 finish, one piece construction in “Rolled-Edge Semi-recessed” style.

4. Projection: Cabinets shall not project more then 3-1/2" into the space. (Depth of cabinet no more than 6".)

5. Door specification: Doors shall have vertical duo tempered safety glass manufactured from 304 stainless steel with a #4 finish. They shall have recessed pulls and red diecut lettering vertically reading “Fire Extinguisher”.

6. Fire Extinguisher specification: Multi-purpose dry chemical extinguishers meeting class **A, B, and C** fires requirements. 10 pound minimum capacity.

PART 3 - EXECUTION

3.1 WORKMANSHIP

A. Coordinate installation with all other trades. Anchor firmly all components into position. **Provide shop drawings for approval before ordering.** Mount top of extinguisher at 5'-0" A.F.F. in accordance to N.F.P.A. standards. Protrusions into circulation spaces shall be in accordance to A.D.A. standards, 4" maximum.

END OF SECTION 10 44 16

SECTION 12 30 00 - CASEWORK

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and provisions of the Contract including General Conditions, Supplementary Conditions, and Division 01 – General Requirements apply to this Section as if repeated herein.

1.2 WORK INCLUDED

A. Furnish and install prefabricated, factory-assembled high-pressure laminate casework and accessories as shown on the drawings and specified herein. Casework shall include all fillers, scribes, finished ends, finished backs, countertops, sink cutouts, splashes, supports, shelving, and related components required for a complete installation.

B. Casework Contractor shall verify field dimensions prior to fabrication. Minor dimensional variations shall be accommodated using manufacturer's standard modular fillers and scribes.

C. Provide all labor for unloading, distribution, and installation of casework and related items as specified.

D. Provide prefabricated countertops in high-pressure laminate and/or solid surface (polymer), as indicated on drawings and equipment schedules.

1.3 WORK RELATED, NOT INCLUDED

A. Division 06: Rough Carpentry – blocking, framing, and reinforcements within walls to adequately support casework.

B. Division 07: Joint Sealants – caulking of casework and/or countertops to abutting walls.

C. Division 08: Finish Hardware – master keying of cabinet locks to building systems. Factory-installed cabinet locks may be provided; final keying by others.

D. Division 09: Resilient Tile Flooring and vinyl base molding.

E. Mechanical – furnishing, installation, and hook-up of sinks, fixtures, outlets, strainers, tailpieces, traps, vacuum breakers, stops, etc., shall be performed by the Mechanical Contractor to state and local codes. Sink cutouts shall be by the Casework Contractor.

F. Electrical – furnishing, installation, and final connections of wiring, conduit, and/or electrical items within casework shall be performed by the Electrical Contractor unless specifically furnished as part of factory-assembled units.

G. All in-wall blocking for base, wall, and tall units shall be provided and installed by the General Contractor.

1.4 STANDARD OF QUALITY / BASIS OF DESIGN

A. Basis of Design: Stevens Industries, Inc., Teutopolis, Illinois – 1200 Tradition Series High Pressure Plastic Laminate Casework. Casework of other nationally recognized manufacturers may be considered for prior approval, provided products are equal in configuration, materials, construction, and performance.

B. Manufacturers requesting approval shall submit written requests identifying deviations, along with product literature, certifications, and representative cut-away samples. Full-size cabinet mockups shall not be required unless specifically requested by the Architect.

C. The Owner or its designated representative reserves the right to reject any proposal that does not meet the criteria established by this specification.

D. Manufacturer shall provide a standard written warranty covering defects in materials and workmanship in accordance with published warranty terms. Buy-out items shall be covered under their respective manufacturers' warranties.

E. Casework shall be fully factory assembled and independently tested to applicable industry standards, including SEFA 8 structural performance requirements. Project-specific destructive testing shall not be required.

F. Prior Approved Modular Laminate Casework Manufacturers:

- Stevens Industries, Inc.
- TMI Systems Design Corporation
- Case Systems, Inc.
- LSI Corporation of America

Other manufacturers seeking approval shall submit substitution requests in accordance with Division 01.

1.5 SUBMITTALS

A. Comply with Division 01.

B. Product Data: Submit Casework Manufacturer's catalog and technical data showing standard modular casework construction, materials, finishes, and hardware used.

C. Submit colors as noted in 2.02.2 for exterior high-pressure decorative laminate color selections.

D. Submit interior laminate samples or manufacturer's standard color chips in three colors:

- Frosty White: Wilsonart 1573
- Natural Almond: Wilsonart D30
- Fog: Formica 961
  or approved equal.

E. Submit electronic PDF files (minimum one set) of laser-quality, 11" x 17" shop drawings consisting of:

1. Color and hardware options selection sheet
2. Small-scale floor plan showing casework in relation to the building
3. Large-scale elevations and plan views

4. Cross-sections, service runs, blocking locations, and sink centerlines as applicable to modular casework systems

F. Shop drawings shall be submitted within forty-five (45) days of casework contract award, unless otherwise agreed to in writing.

G. Shop drawings are intended to illustrate general arrangement, standard modular configurations, utility coordination, and finish selections. Field verification and installation tolerances shall be in accordance with manufacturer’s standard practices.

PART 2 – PRODUCTS

2.1 GENERAL

A. Decorative laminate casework shall be Stevens Industries, Inc., 1200 Tradition Series, as specified or approved equal, with the following minimum features. Basis of Design is established to define quality, configuration, materials, and performance.

1. Core material shall be engineered board meeting ANSI A208.1 Industrial Grade M-2 or M-3, manufactured with No Added Formaldehyde (NAF) or ULEF resins, and meeting applicable CARB requirements.
2. Cabinet components shall meet or exceed applicable ANSI physical and mechanical performance standards.
3. Edges shall be PVC, machine applied using automated hot-melt adhesive application and trimming.
4. Drawer slides shall be heavy-duty, self-closing, epoxy or powder-coated steel slides with minimum 100 lb static load rating, tested in accordance with SEFA 8 and/or ANSI/BHMA A156.9.
5. Drawer boxes shall be non-racking, rigid construction with minimum 1/2" thick bottoms.
6. Cabinet backs shall be minimum 1/2" thick where required for mounting and rigidity.
7. High-pressure laminates shall be thermoset to core using catalyzed PVA adhesive under heat and pressure, resulting in balanced panel construction. Contact adhesives shall not be used.
8. Cabinet interiors shall be Thermally Fused Laminate (TFL) meeting or exceeding NEMA LD3 GP-28 performance requirements.
9. Cabinets shall be factory assembled and provided with integral toe base construction where applicable.
10. Casework systems shall be independently tested to meet or exceed SEFA 8 structural performance standards. Project-specific destructive testing shall not be required.
11. Rail-mounted casework, where provided, shall be vertically and horizontally adjustable using manufacturer’s standard systems.

B. Color and finish selections:

1. Up to five (5) color schemes may be selected at no additional cost from manufacturer’s standard offerings. Construction, hardware, and finish options shall remain consistent across color schemes.

2.2 MATERIALS

A. Exterior Vertical Surfaces:

1. Door and drawer fronts, finished ends, and exposed backs shall be surfaced with PF-28 (.028") High Pressure Laminate conforming to NEMA LD3.
2. Laminate selections shall be from manufacturer’s standard offerings or Wilsonart, Formica, Nevamar, or Pionite standard, non-premium lines.
3. Wood grain direction shall follow manufacturer’s standard production practices.
4. Exterior HPL panels shall be balanced with cabinet liner surface (.020") or TFL backer.
5. Lamination shall utilize catalyzed PVA adhesive set under pressure. Contact adhesives shall not be used.

B. Interior Surfaces:

1. Semi-exposed and concealed interior surfaces shall be Thermally Fused Laminate (TFL) meeting NEMA LD3 GP-28 performance requirements. Interior color selections shall be from manufacturer’s standard offerings. Non-conforming surface types shall not be used.

C. PVC Edging:

1. Door and drawer fronts shall receive 3mm PVC edging, machine applied.
2. Cabinet components and shelving shall receive nominal 1mm (.020") PVC edging, machine applied.

D. Core Materials:

1. Particleboard and MDF cores shall conform to ANSI A208.1 and A208.2 standards and applicable CARB regulations.
2. Moisture resistant and No Added Formaldehyde formulations shall be provided where required.
3. Equivalent approved industrial grade core materials acceptable.
4. Sink cabinets and tops at wet areas shall utilize moisture resistant plywood Core.

E. Hardware:

1. Hinges shall be heavy-duty institutional grade, available as 5-knuckle 270° pivot overlay or concealed commercial-grade hinges, with finishes and quantities per manufacturer’s standard.
2. Drawer slides shall be as specified in 2.1.A.4.

3. Shelf supports shall be injection molded polycarbonate with anti-tip locking feature and 32mm system compatibility.
4. Pulls, hanger rods, hooks, locks, and accessories shall be selected from manufacturer's standard collections and comply with project requirements.
5. Locks, where required, shall be high-security commercial-grade, master-keyed as specified, with removable cores.

Proprietary part numbers and brand-specific hardware designations are intended to establish a standard of quality and shall not preclude approved equivalent systems meeting the performance and functional requirements of this specification.

2.3 CONSTRUCTION (PARTS SHALL BE FIELD REPLACEABLE)

A. Cabinet body components shall be secured utilizing concealed mechanical fasteners and/or dowel construction consistent with AWI Premium Grade Quality Standards (latest edition) and manufacturer's standard production methods. Fasteners shall be designed for use in engineered wood panels.

B. Joints shall be tight fitting and designed to resist loosening due to:

1. Dimensional changes in core materials
2. Racking during shipment and installation
3. Normal use
4. Applicable seismic and performance loading consistent with SEFA 8 testing standards
5. Fasteners and screws shall be corrosion resistant

C. Construction Features – All Cabinets:

1. Structural components shall be minimum 3/4" thick with balanced surfaces
2. Back panels shall be:
   a. Minimum 1/4" to 1/2" thick, factory finished where exposed, and incorporated into a captured groove or integrated mounting frame system
   b. Backs shall contribute to cabinet rigidity and wall mounting capacity
3. Drawer components shall be engineered board or MDF core with balanced surfaces, thickness per manufacturer's standard
4. Mounting frames, stretchers, or rails shall be structural components mechanically fastened and concealed behind cabinet backs
5. Where cabinet backs are exposed, a separate finished decorative back panel shall be provided
6. Base and tall cabinets shall utilize integral base or toe-kick construction designed to transfer loads through cabinet ends directly to the floor. Separate applied bases are not required unless manufacturer standard
7. Horizontal rails between drawers shall be structural members reinforcing cabinet ends. Full-depth rails shall be provided where required for locking or security

8. Cabinet ends shall include a 32mm system hole pattern for adjustable shelving, hardware mounting, and future component relocation
9. Door and drawer fronts and finished ends shall be balanced construction with high-pressure laminate bonded to core material
10. Adjustable shelves shall be engineered board or MDF core with balanced surfaces and PVC front edge
    a. Shelf thickness shall be 3/4" minimum, increased to 1" where required by span or loading
11. Fixed interior components such as shelves and dividers shall be mechanically fastened using concealed fasteners or dowels
12. Door widths shall comply with manufacturer’s standard limitations for material, hinge type, and performance

D. Wall Cabinets:

1. Wall cabinet ends shall be mechanically fastened to provide required tensile and racking strength in accordance with SEFA 8 performance testing
2. Wall cabinet tops and bottoms shall be minimum 3/4" thick members integrated into cabinet ends using dowels and/or mechanical fasteners
3. Cabinets shall include integral upper and lower mounting frames or stretchers designed to support wall attachment and load distribution

E. Base Cabinets:

1. Base cabinet ends shall be mechanically fastened to provide structural stability in accordance with SEFA 8 performance criteria
2. Base cabinets shall include a structural subtop or rail system supporting countertops and resisting racking
3. Sink cabinets shall include provisions for plumbing access, removable backs where required, and countertop support per manufacturer’s standard
4. Moisture resistant core or plywood shall be used at sink and wet area cabinets
5. EXTERIOR PLYWOOD BASES TO BE USED THROUGHOUT. PLYWOOD CORE AT WET AREAS.

F. Tall Cabinets:

1. Tall cabinet ends shall be mechanically fastened to provide structural stability in accordance with SEFA 8 performance testing
2. Tall cabinets shall include intermediate fixed shelves or structural members as required to maintain dimensional stability
3. Tall cabinets shall include integrated mounting frames or stretchers contributing to cabinet rigidity and wall attachment

4. Drawer construction shall comply with manufacturer’s standard details; drawers requiring non-standard glue-only or unsupported thin bottoms shall not be permitted

G. Drawers:

1. Drawer boxes shall be rigid, non-racking construction with captured bottoms and sides designed to work in conjunction with specified drawer slides
2. Drawer box materials shall be engineered board or MDF with TFL surfaces per manufacturer’s standard interior finish offerings
3. Drawer corners shall be joined using dowels, mechanical fasteners, or equivalent proven joinery methods
4. Drawer fronts shall be removable and attached from the inside for serviceability

H. Adjustable Shelving (Wall Hung):

1. Shelving systems shall be manufacturer’s standard heavy-duty adjustable shelving compatible with cabinet system

I. Countertop Grommets:

1. Grommet locations shall be coordinated with Architect/Owner. Contractor shall furnish and install grommets as specified

2.4 PERFORMANCE

A. Laminates:

1. “High Pressure Laminates” shall meet the definition and performance requirements of NEMA LD3-1995. Vertical grade laminate shall be GP-28 balanced with a minimum grade of CL-20. Countertops shall be GP-50 or PF-42 as specified
2. Thermally fused melamine shall meet the performance requirements of NEMA LD3-1995 for GP-28. Cabinet manufacturer shall submit panel manufacturer’s current published specification stating ANSI core properties and NEMA finish properties

B. Hinges:

1. ANSI 156.9.4.1,2,3,4: Two hinges mounted 23" on center on a 23-7/16" wide x 19-11/16" high cabinet door shall be capable of supporting a 100 pound test load located 1" from the outside edge of the door
   a. Cycle, open and close, from 5 degrees open through 95 degrees open with no failure to hinges, door, or cabinet end panel
   b. The maximum horizontal permanent hinge set shall not exceed .030"

C. Drawers:

1. ANSI A156.4.11: a production drawer box 21-5/16" wide x 20-3/4" deep x 3-7/8" high with an applied finished front 6-7/16" high x 23-1/8" wide with a 20" drawer slides shall be tested as follows:
   a. When uniformly loaded with 100 pounds and tested through 100,000 opening and closing

cycles, the drawer shall operate freely
b. When the drawer is fully extended, a 100 pound load shall be supplied to the drawer front at a point on the centerline of the drawer for one minute. No permanent damage or distortion shall occur

D. Adjustable Cabinet Shelving:

1. Shelving shall not deflect in excess of 1/4" when loaded as follows:
a. Standard Shelving – 25 pounds / s.f.
b. Library Shelving – 40 pounds / s.f.

E. Wall Hung Cabinet Load Test:

1. Earthquake test procedure developed by the “Woodwork Institute of California” for casework used in California schools and hospitals
a. A 48" h x 12" d x 48" w wall hung cabinet using interlocking mechanical fastening devices shall support a 2,000 pound dead load concurrently with a 982 pound lateral pull out load. Test complies with loads specified in Title 17 with a safety factor of two

2.5 COUNTERTOPS

A. High-Pressure Decorative Laminate Countertops:

1. Countertops shall be nominal 1" to 1-1/8" thick fabricated high-pressure decorative laminate (HPL) assemblies
2. Decorative laminate shall be General Purpose or Horizontal Grade (HGS) conforming to NEMA LD 3 (latest edition)
3. Laminate patterns, wood grains, and solid colors shall be selected from manufacturer’s standard, non-specialty offerings from Wilsonart, Formica, Nevamar, Pionite, or equal. Finish shall be matte, textured, or suede
4. Core material shall be manufacturer’s standard engineered board or composite core suitable for countertop fabrication. Moisture-resistant or plywood core shall be used at sinks and wet areas
5. Laminate shall be bonded to the core using manufacturer’s standard thermoset or PVA adhesive systems with balanced backer sheet
6. Countertop joints shall be secured with adhesive and concealed joint fasteners per manufacturer’s standard
7. Provide backsplashes and endsplashes where shown on drawings and where countertops abut walls or adjacent cabinets
8. Countertops shall conform to ANSI A161.2 Performance Standards for Fabricated High-Pressure Decorative Laminate Countertops
9. Exposed edges shall be postformed laminate or minimum 3mm radius PVC edge, machine applied using hot-melt adhesive

10. Moisture-resistant or plywood core shall be provided at all wet areas and adjacent sink locations

11. Where countertops are seamed and require supplemental support brackets, brackets shall be provided in accordance with manufacturer's installation requirements to ensure structural continuity

B. Solid Surface Countertops:

1. Solid surface countertops shall be fabricated from acrylic or polymer-based solid surface material from Wilsonart or approved equal

2. Material shall be homogeneous, through-body color acrylic or polymer composite suitable for sanding and refinishing of minor surface damage

3. Sheet thickness shall be manufacturer's standard, typically 1/2" nominal, with built-up edges to achieve indicated profiles and overall thickness

4. Edge profiles, backsplashes, and end splashes shall be as indicated on the drawings or manufacturer's standard profiles

5. Color selection shall be made by the Architect from manufacturer's standard color offerings during submittals

6. Solid surface material shall meet applicable industry standards for performance, durability, stain resistance, impact resistance, and fire performance, including ANSI Z124.3 and NEMA LD 3, where applicable

7. Solid surface countertops shall include manufacturer's standard understructure and support requirements. Unsupported spans shall not exceed manufacturer recommendations

8. Integral or undermount sinks, where specified, shall be factory fabricated and seamlessly integrated with the countertop material

9. Finish shall be manufacturer's standard matte or suede finish unless otherwise noted

PART 3 – EXECUTION

3.1 SHIPPING

A. All casework shall be protected for shipment in accordance with the Casework Manufacturer's standard packaging and delivery methods suitable to prevent damage during normal transit and handling

3.2 CASEWORK INSTALLATION

A. Casework shall not be delivered or stored at the jobsite until building has become adequately dry and secure. Building conditions shall be maintained in accordance with manufacturer's published site condition requirements and industry standards prior to delivery and during installation

B. Installation shall be by an installer authorized and/or factory trained by the Casework Manufacturer

C. Casework is to be installed plumb and true, and is to be securely anchored in place in accordance with manufacturer's installation instructions and applicable codes. Scribe casework fillers as necessary for a tight fit

D. Wall cabinets shall be securely fastened to horizontal blocking, not to plaster, lath, or wallboard. Appropriate trade shall provide reinforcement of stud walls during erection of walls. Blocking locations and requirements shall be coordinated with the Casework Manufacturer's standard installation requirements

E. Install countertops on base cabinets in accordance with countertop manufacturer's recommended fastening methods

3.3 CLEANING AND PROTECTION BY CASEWORK CONTRACTOR

A. Empty drawers of dirt and dust. Wipe out cabinet interiors to remove dirt and dust. Remove pencil or other marks, excess adhesive, etc. from cabinets and countertops. Remove all packaging, scraps, and debris resulting from casework installation activities

B. Make final adjustments to doors and drawers. Doors shall swing freely, catches shall hold securely, and all other doors shall be aligned both vertically and horizontally. Drawers shall open and close smoothly, without binding and without excessive slide play

C. Provide keys and related hardware as specified and coordinate turnover with the Owner or Owner's representative

D. Advise the General Contractor or site superintendent of required protection measures for casework and countertops following installation. Protection by other trades after installation is the responsibility of the General Contractor unless otherwise noted

UNACCEPTABLE PRODUCTS / METHODS

A. Concealed hinges (only five knuckle hinges)

B. Low pressure laminate modular cabinets

C. The use of self-edged doors and drawers (only machine applied PVC edges acceptable)

D. The use of particleboard where sinks are located (only treated plywood is acceptable)

END OF SECTION 12 30 00

SECTION 12 49 20 - MANUAL ROLLER SHADES

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishings and installation, complete, of manual roller shades as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.

B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.

1.2 SUMMARY

A. Section Includes:
   1. Manual roller shades with single rollers.

B. Related Requirements:
   1. Section 05 50 00 - Metal Fabrications
   2. Section 06 10 00 - Rough Carpentry
   3. Section 08 41 00 - Entrances and Storefront

1.3 REFERENCES:

A. Flame-Resistant Materials Shall Pass or Exceed One or More of the Following Test:
   1. National Fire Protection Association (NFPA) 701
   2. Department of Transportation Motor Vehicle Safety Standard 302 Flammability of Interior Materials
   3. California Administrative Code Title 19
   4. Federal Standard 191 Method 5903 (used by Port Authority of New York and New Jersey for drapery, curtain, and upholstery material)
   5. Boston Fire Department Teat BFD IX-1
   6. New York State Uniform Fire Prevention and Building Code

1.4 SUBMITTALS:

A. Provide in accordance with Section 01 33 23 - Shop Drawings, Product Data, and Samples.
   1. Product data for roller shades and accessories. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.
   2. Shop drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.
   3. Samples for Initial Selection: For each type and color of shadeband material. Include Samples of accessories involving color selection.
   4. Samples for Verification: For each type of roller shade.
      a. Shadeband Material: Not less than 10 inches (250mm) square. Mark inside face of material if applicable.
      b. Installation Accessories: Full-size unit, not less than 10 inches (250mm) long.

B. Closeout submittals
   1. Maintenance Data: For roller shades to include in maintenance manuals.

1.5 COORDINATION:

A. Coordinate layout and installation of the roller shades with adjacent construction, including ceiling suspension systems, light fixtures, HVAC equipment, fire-suppression system, and partitions.

1.6 QUALITY ASSURANCE

A. SUPPLIER: Manufacturer, subsidiary or licensed agent shall be approved to supply the products specified, and to honor any claims against product presented in accordance with warranty.

B. INSTALLER: Installer or agent shall be qualified to install specified products by prior experience, demonstrated performance and acceptance of requirements of manufacturer, subsidiary, or licensed agent. Installer shall be responsible for an acceptable installation.

C. UNIFORMITY: Provide Manual Roller Shades of only one manufacturer for entire project.

D. MOCKUPS: Build mockups to verify selections made under sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
   1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless the Architect specifically approves such deviations in writing.
   2. Subject to compliance with requirements, approved mockups may become part of the completed work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.9 WARRANTY

A. Lifetime Limited Warranty. Fabrics warranted for a period of 5 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Source Limitations for Roller Window Shades: Obtain roller window shades from single manufacturer. Obtain accessories, including necessary mounting hardware, from roller window shade manufacturer.

B. Acceptable Manufacturers:
   1. Hunter Douglas Contract / 12250 Parkway Centre Dr. / Poway, CA 92064/ Phone: 800-727-8953 Fax: 800-205-9819
   2. MechoShade Systems, Inc. / 42-03 35th Street / Long Island City, NY 11101/ Phone: 718-729-2020 Fax: 718-729-2941
   3. or prior approved equals

2.2 MATERIALS:

A. PRODUCT: Manual Roller Shades

1. FABRICS: Inherently anti-static, flame retardant, fade and stain resistant, light filtering, and room darkening fabrics providing 1% openness factor. Fabric shall be PVC-coated fiberglass E Screen 7501. (Fabrics shall not be rail loaded. Rollers to be coupled where windows have a clear opening over 10 feet.) Finish selected by Architect from manufacturer's available colors.

2. CONTROL SYSTEM: Adjustment-free continuous qualified #10 stainless steel ball chain ((90-lb. test)) and pulley clutch operating system allows precise control and ensures a uniform look. Clutch will develop no more than ½ pound drag for ease of lifting. Glass reinforced polyester thermopolymer (PBT) plastic components conform to military specification MIL M-24519 and designed for smooth, trouble-free operation.

3. ROLLER: Circular-shaped painted extruded aluminum tubes with thicker wall & ribs provide additional strength while locking into place the clutch & end plug. 3" outside diameter extruded tube to have a .090 wall thickness. 2" outside diameter extruded tube to have a .072" wall thickness (1 ½" & 1 1/8" tubes have .055" wall thickness) providing strength & durability.

4. END PLUG: Heat stabilized fiber reinforced plastic outside sleeve and center shaft provide bearing surfaces on which the roller rides ensuring smooth, wear resistant operation.

5. BOTTOM ROD: Extruded aluminum weight in a Sealed Pocket Hem Bar, or Flat Bottom Bar for fabrics that are not seamable. Bottom rod is for tracking adjustments and provides uniform look.

6. MOUNTING HARDWARE: Manufacturer's standard .07" nickel-plated, C1008/1010 cold rolled steel universal brackets including end plug bracket with lock down retainer device.

7. ADDITIONAL AVAILABLE OPTIONS: Fascia, Top & Bottom Covers

B. ROLLER-SHADE FABRICATION

1. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

2. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):
   a. Shade measurements shall be accurate to within + 1/8" or as recommended in writing by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER-SHADE INSTALLATION

A. INSTALLATION shall comply with manufacturer’s specifications, standards and procedures as detailed on contract drawings.

B. ADEQUATE CLEARANCE shall be provided to permit unencumbered operation of shade and hardware.

C. CLEAN finish installation of dirt and finger marks. Leave work area clean and free of debris.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

END OF SECTION 12 49 20

SECTION 13 34 00 - FABRICATED ENGINEERED STRUCTURES

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor shall furnish labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of the Metal Building System as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.

B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, and complete installation shall be furnished and installed as part of this work.

C. For additional information refer to:
Architectural site plan, building plans, elevations, and door schedule
Structural, Mechanical, Plumbing, and Electrical Drawings

D. The materials to be furnished shall include all items specified herein as outlined in the contract per the “Common Industry Practices” section of the MBMA “Metal Building Systems Manual,” subject to the requirements of the Contract Documents.

E. The material includes all structural framing, metal roof and wall panels, insulation, trims, closures and seals, ventilators and louvers where shown, hardware, bolts, and sealants.

F. All materials shall be fabricated in a workmanlike manner from materials meeting or exceeding the specifications included herein.

G. BUILDING DESCRIPTION

1. Provide a complete pre-engineered metal building system for the approximately 600 square foot detached storage building indicated on the Drawings. Provide clear-span framing with columns, rafters, purlins, girts, and roof slope, eave height, dimensions, and framed openings as indicated on the Drawings. Building shall include factory-finished metal roof and wall panels, basic roof and wall insulation, and all accessories required for a complete installation.

2. Acceptable manufacturers include Ludwig Buildings Enterprises, LLC, Nucor Building Systems, Ceco Building Systems, or approved equal. Manufacturer shall provide a complete engineered metal building system complying with the requirements of this Section.

H. NOMENCLATURE

1. Roof Slope

a. Roof slope shall be as indicated on the Drawings.

2. Width and Length

a. The building width and length shall be measured from outside to outside face of sidewall girts and end wall girts, respectively.

3. Eave Height

a. The building eave height shall be measured along the outside face of the sidewall girts from the top of the finished floor to the top of the eave strut.

4. Bay Spacing

a. The interior bay spacing between centers of frames shall be as indicated in the contract documents.

b. The end bay spacing shall be measured from the outside face of end wall girts to centerline of first interior frame.

5. Exterior Framed

a. Purlins shall be mounted on the outside of the rafters.

6. Flush Framed

a. Girts shall be mounted so the outside face of the girts and columns are flush. Refer to D.3. Secondary Framing for additional information.

7. End Frames

a. End frames shall be non-expandable, bearing type on end wall columns spaced as per contract documents.

1.2 DESIGN

A. Built-up sections, other welded members and structural shapes shall be designed in accordance with AISC 360, “Specification for Structural Steel Buildings,” edition referenced by the applicable Building Code.

B. Light gauge cold-formed steel members shall be designed in accordance with AISI S100, “North American Specification for the Design of Cold-Formed Steel Structural Members,” edition referenced by the applicable Building Code.

C. All welding shall conform to the requirements of the applicable American Welding Society (AWS) Structural Welding Code. All welders shall be qualified for the type of weld performed.

D. DESIGN LOADS

1. Live Load

a. Buildings shall be designed for roof live loads required by the applicable Building Code and Structural Drawings.

b. Any permitted roof live-load reduction shall be established by the building system engineer in accordance with the applicable Building Code. Include rain loads and other applicable loads in the design.

2. Wind Load

a. Primary framing, secondary framing, roof and wall panels, connections, doors, and anchorage shall be designed for wind loads in accordance with the Louisiana State Uniform Construction Code, adopted 2021 International Building Code, referenced ASCE 7, and the project-specific wind design criteria indicated in the Structural Drawings. Submit building- and component-and-cladding-pressure calculations for the actual site and building geometry.

3. Design Load Combinations

a. The building shall be designed for all applicable strength and serviceability load combinations required by the adopted Building Code and referenced standards, including dead, live, wind, and rain loads.

1. Design combinations shall include dead and roof live loads as applicable.

2. Design combinations shall include wind and rain loads as applicable.

4. Collateral Loads

a. Building shall carry additional loads as follows:

1. Metal roof and wall panel systems, insulation, accessories, and other permanent loads included in the storage building.

2. Electrical fixtures, conduits, supports, and other suspended items shown on the Drawings. Coordinate actual concentrated loads with the Electrical Engineer. No mechanical piping allowance is required unless indicated by the Mechanical Drawings.

5. Certification

a. The building manufacturer shall furnish a letter of design certification bearing the seal of a Professional Engineer registered in the State of Louisiana.

6. Calculations

a. The building manufacturer shall furnish design calculations bearing the seal of a Professional Engineer registered in the State of Louisiana.

b. Design calculations shall be manually and/or computer generated at the discretion of the building manufacturer.

c. The design calculations shall include the magnitude and location of design loads, support condition, material properties and the type and size of major structural members.

7. Drawings

a. Building manufacturer shall furnish an anchor bolt setting plan with horizontal and vertical column reactions, including uplift and shear reactions for each design load combination.

b. Building manufacturer shall furnish steel framing drawings and details indicating location and proper erection requirements of all building components furnished.

8. Foundation

a. The storage building shall be supported on a reinforced slab-on-grade with conventional shallow perimeter or isolated foundations as indicated on the Structural Drawings. Piles are not anticipated. Final slab thickness, reinforcement, foundation dimensions, and foundation design shall be provided by the Structural Engineer of Record.

b. Foundations and anchor bolts shall be coordinated with the metal building manufacturer’s anchor bolt setting plan and final column reactions. Do not fabricate or install anchor bolts until the Structural Engineer of Record has reviewed the reactions and anchorage requirements.

1.3 COORDINATION AND SUBMITTALS

A. Submit complete pre-engineered metal building shop drawings, roof and wall panel profiles, finish samples, roof and wall insulation product data, anchor bolt plans, and Louisiana-sealed engineering calculations for manufacturer-designed components.

B. Coordinate building penetrations, sleeves, lighting, power distribution, door opening support, and other appurtenances with Electrical and Plumbing Drawings. Electrical service to the detached storage building is required.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Hot rolled bars, plates, sheets or strip for primary frames and other welded members shall have a minimum yield stress of 55,000 pounds per square inch.

B. Hot rolled plates, sheets, or strip for secondary and other cold-formed members shall have a minimum yield stress of 55,000 pounds per square inch.

C. Pipe for interior columns and other structural shapes shall have a minimum yield stress of 36,000 pounds per square inch.

D. Galvalume or approved equal aluminum-zinc alloy-coated steel sheet shall conform to ASTM A792/A792M, with coating and yield strength as required by the panel manufacturer and engineered design. Prepainted panels shall have an appropriate coating for the project coastal exposure and manufacturer warranty requirements.

E. Pre-painted material shall be color finished as specified herein over a substrate as specified in paragraph 2.1 Materials.

1. The material shall be cleaned and pretreated chemically in accordance with the manufacturer’s specifications and requirements to provide corrosion resistance and primer adherence.

2. The cleaned and pretreated material shall be primed with a pigmented epoxy primer to ensure finish coat adhesion and to provide additional corrosion resistance.

3. The exterior surface shall be factory finished with silicone-modified polyester coating as the manufacturer’s standard for the specified panel system, subject to a minimum twenty-year exterior finish warranty applicable to the project location. Colors shall be selected by the Architect from the manufacturer’s standard color selection.

4. The interior surface shall be color coated with a polyester enamel having a normal minimum thickness of 0.50 mil, color off-white.

5. The exterior finish shall be smooth and free of any major defects such as skips, streaks, blisters, flow lines or other surface film imperfections. Minute defects that do not affect the performance of the panels shall be acceptable.

   Minute cracks which appear in the paint film due to cracking of the base material during forming are normal and are not considered to be a defect.

6. All panels, upon erection, shall be uniform in color and shall be a satisfactory commercial color match to the adjoining panels of the same color, erected at the same time.

7. Building manufacturer shall furnish compatible touch-up materials for minor finish scratches. Panels with significant coating damage, corrosion, deformation, or punctures shall be replaced. Repairs shall comply with manufacturer’s written instructions without impairing finish warranties.

F. High-strength structural bolts, nuts, and washers shall conform to ASTM F3125/F3125M, Grade A325, or the applicable standard for the connection design.

G. Machine bolts and nuts shall conform to ASTM A307, or the applicable standard for the connection design.

H. Cable bracing shall be fabricated from 1 x 7 galvanized wire rope, extra high strength Class A, conforming to ASTM A-475.

I. Aluminum unless specified otherwise shall conform to the requirements of the Aluminum Association Series 3000 Alloy.

J. Shop-applied primer for exposed or concealed structural steel shall be the manufacturer's standard rust-inhibitive primer compatible with the finish and anticipated exposure. Lead- and chromate-based primers are not permitted.

2.2 STRUCTURAL FRAMING

A. GENERAL

1. All primary and secondary framing shall be designed and fabricated for field assembly by means of bolting with the minimum amount of cutting or welding.

2. All framing members or bundle of parts shall be identified by an easily, visible mark that is stamped, stenciled, tagged or painted.

B. PRIMARY FRAMING

1. Primary framing shall consist of building and end frames.

2. Rigid frame columns and rafters shall be built-up or hot-rolled structural steel sections, as required by the engineered metal building system and approved Drawings.

3. End frames shall be cold-formed "C" sections or built-up I sections, as determined by design requirements.

4. Primary framing shall be furnished with factory punched and welded base and splice plates.

5. Primary framing shall be pre-punched for purlin, girt, bracing and other secondary members.

C. SECONDARY FRAMING

1. Secondary framing shall consist of purlins, girts, eave struts, base angles, "C" sections, clips and other required components.

2. Purlins and girts shall be cold-formed "Z" sections with stiffened flanges, pre-punched for attachment to primary members. Purlins and girts shall be of the simple or continuous span design, as determined by design requirements.

a. Girts shall be spaced and sized as required by the metal building system design and to provide secure attachment of the wall panel system.

b. Purlins shall be sized and spaced to carry roof system assembly including system dead load.

3. Eave struts shall be cold-formed “C” sections with unequal stiffened flanges, pre-punched for attachment to primary members. Eave struts shall be of the simple span design.

4. Base angles, if required, shall be cold-formed angles attached to the concrete with suitable fasteners.

5. “C” sections, clips and other required components shall be of the size and type required by design.

D. BRACING

1. Wind bracing for roofs and walls shall be diagonal bracing consisting of cables, rods, or angles. Portal frames may be used in sidewalls in lieu of diagonal bracing where building openings do not allow. Bracing shall be designed for the project wind loads.

2. If diaphragm action of the roof and/or wall panels provide the required wind bracing, diagonal bracing shall not be required.

3. The compression flange of all primary members shall be braced laterally with the steel angle flange braces connecting to the webs of purlins or girts.

E. BOLTS

1. All structural connections shall be bolted.

2. Bolts shall be installed and tightened in accordance with the manufacturer’s erection drawings and the applicable provisions of AISC and RCSC.

F. PAINT

1. All primary and secondary steel members shall be cleaned of foreign matter and loose scale and given one shop coat of the manufacturer’s standard rust-inhibitive primer.

2. All damaged primer areas shall be cleaned and touched up by the erector with compatible rust-inhibitive primer after erection.

2.3 ROOF AND WALL PANELS

A. GENERAL

1. Walls shall be covered with factory-finished, standard pre-engineered metal building “R” panels as described below.

2. Roof panels shall be part of the pre-engineered metal building system. Provide factory-finished exposed-fastener “R” roof panels compatible with the manufacturer’s framing, trim, closures, and weatherproofing details. Roof purlins shall be sized and spaced to support the roof assembly and project wind-uplift requirements. Standing-seam roofing on the main clinic building is specified separately and is not required on this storage building.

a. Roof and wall panels shall be Galvalume or factory pre-painted sheet steel complying with Paragraph 2.1.

b. Panel thickness shall be minimum 26 gauge for roof and walls, or heavier as required by engineering, tested system performance, or manufacturer’s warranty.

3. Colors for exterior surfaces of pre-painted roof and wall panels shall be selected from manufacturer's standard color selection. Coordinate selections with Architect.

B. PANEL DESCRIPTION

1. "R" wall and roof panels shall be precision roll-formed for approximately 3-foot-wide coverage with trapezoidal ribs, nominal 1-1/4-inch rib height and 12-inch major-rib spacing, or manufacturer's standard comparable engineered profile approved by Architect.

2. Soffit and liner panels, where indicated on the Drawings, shall be 26-gauge prefinished flush (concealed fastener) panels, 12 inches wide, in color selected by Architect from manufacturer's standard colors.

3. "R" panels shall have side laps of at least one major rib. Roof and wall panel end laps shall be sized, sealed, and located at supports as required by the manufacturer's weather-tight installation details and applicable uplift design.

4. Panel length: Roof and wall panels shall be in continuous lengths where practical, with laps only where required by available lengths and manufacturer's installation instructions.

C. "R" PANEL FASTENERS

1. Galvalume Panels

a. Panels shall be fastened to structural members with manufacturer-approved corrosion-resistant self-drilling fasteners and bonded sealing washers. Fastener length, type, and spacing shall comply with engineered wind-uplift requirements for roof field, perimeter, and corner zones and walls.

b. All panel side laps shall be fastened with manufacturer-approved corrosion-resistant fasteners and sealing washers at spacings established by manufacturer's installation requirements and engineered design. Exposed fastener heads shall match panel color.

D. CLOSURES

1. Closure strips shall match configuration of roof and wall panels and shall be fabricated from non-shrinking laminated, cross-linked polyethylene (closed-cell structure) material, or manufacturer's approved equivalent.

2. Closure strips shall be installed at eaves, ridges, rakes, wall bases, penetrations, and other locations as required by manufacturer's weather-tight installation details.

E. INSULATION

1. Provide basic faced fiberglass blanket insulation at metal roof and wall panels, furnished as part of the pre-engineered metal building system. Insulation shall be continuous and installed with manufacturer-approved facing, supports, taped joints, and closures to reduce gaps and condensation. Insulation R-values shall be as indicated on the Drawings and as required by applicable energy code for the actual building use.

2. Coordinate insulation thickness, facing, attachments, and clearances with metal building purlins, girts, roof and wall panels, and the hollow metal door frames.

Provide manufacturer-approved vapor-retarder transitions at edges and penetrations where required.

2.4 TRIM

A. RAKE TRIM

1. As provided by metal building manufacturer and coordinated with the roof panel system specified herein.

B. DRIP EDGE / EAVE TRIM

1. As provided by metal building manufacturer and coordinated with the roof panel system specified herein.

C. CORNER TRIM

1. The corner trims shall be ninety degree cold-formed trim of 26 gauge thickness with finish and color to match end wall panels.

D. DOOR AND MISCELLANEOUS TRIM

1. All door and miscellaneous trim shall be fabricated from 26 gauge material, color to be selected by the architect from manufacturer’s standard colors.

E. EAVE, GABLE, AND OVERHANG FASCIA TRIM

1. Shall be provided by metal building manufacturer. All fascia, eave, gable, and overhang trims indicated on the Drawings shall be fabricated from 26 gauge minimum material or heavier material required by engineering.

2.5 FRAMED OPENINGS

A. Provide framed and reinforced openings for one pair of 3-foot-0-inch by 7-foot-0-inch hollow metal doors at locations indicated on the Drawings. Coordinate jambs, headers, reinforcement, thresholds, anchors, and flashings with Section 08 11 13 - Hollow Metal Doors and Frames and with the architectural door and hardware schedules.

2.6 BUILDING ANCHORAGE AND FOUNDATIONS

A. ANCHORAGE

1. The building anchor bolts shall be designed to resist maximum column reactions, including wind uplift and shear, resulting from applicable load combinations. Anchor bolt sizes and locations shall be indicated on the manufacturer’s anchor bolt setting plan and coordinated with Structural Drawings.

B. FOUNDATIONS

1. Foundations shall be designed and detailed by the Structural Engineer of Record for the site soils and verified building reactions. The metal building manufacturer shall furnish design reactions and anchor bolt requirements. Refer to the Structural Drawings and Section 03 30 00 - Cast-in-Place Concrete.

2.7 BUILDING ERECTIONS

A. THE ERECTION of the metal buildings and installation of accessories shall be performed in accordance with building manufacturer’s erection drawings by a qualified erector using proper tools and equipment. The erector shall be responsible for all temporary supports, bracing, and guys required to secure, align, and plumb the structure.

B. ERECTION PRACTICES shall, in addition, conform to the common industry practices of the MBMA “Metal Building Systems Manual,” and the AISC “Code of Standard Practice for Steel Buildings and Bridges.” There shall be no field modifications to primary structural members, except as authorized by the building manufacturer in writing.

C. QUALITY ASSURANCE

1. Erector Qualifications: An experienced erector who has specialized in erecting and installing work similar in material, design. and extent to that indicated for this Project.

2. Manufacturer Qualifications: A qualified manufacturer experienced in pre-engineered metal buildings and accredited under IAS AC472.

   a. IAS AC472 Accreditation: Metal building system manufacturer shall maintain current accreditation in accordance with International Accreditation Service AC472, “Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems.”

   b. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

   c. Source Limitations: Obtain primary metal building system components, including structural framing and metal pane assemblies, through one source from a single manufacturer.

D. DELIVERY, STORAGE & HANDLING

1. Deliver components, sheets, panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

2. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

3. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness and with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

E. PROJECT CONDITIONS

1. Weather Limitations: Proceed with installation only when weather conditions permit metal panels to be installed according to manufacturers’ written instructions and warranty requirements.

2. Field Measurements:

   a. Establish Dimension for Foundations: Comply with established dimensions on approved anchor-bolt plans, establishing foundation dimensions and proceeding with fabricating structural framing without field measurements. Coordinate anchor-bolt installation to ensure that actual anchorage dimensions correspond to established dimensions.

   b. Established Dimensions for Metal Panels: Where field measurements cannot be made without delaying the Work, either establish framing and opening dimensions and proceed with fabricating metal panels without field measurements or allow for field trimming metal panels. Coordinate construction to ensure that actual building dimensions, locations of

structural members, and openings correspond to established dimensions.

F. COORDINATION

1. Coordinate size and location of concrete foundations and casting of anchor-bolt inserts into foundation walls and footings. Concrete, reinforcement, and formwork requirements are specified in Division 3, Section “Cast-in-Place Concrete”.

2.8 WARRANTIES

A. MANUFACTURER’S ONE YEAR WARRANTY

1. The manufacturer warrants its products against defects in material and workmanship for one year from the date of Substantial Completion. Provide written terms of the manufacturer’s warranty. This warranty shall not reduce Contractor obligations under the Contract Documents.

B. PANEL COLOR WARRANTY

1. The building manufacturer shall warrant the factory-applied color coating on roof and wall panels for a period of twenty years from date of Substantial Completion, including coverage appropriate to the project’s coastal exposure. Submit warranty conditions and any exclusions for salt-air exposure for Architect’s review.

PART 3 - EXECUTION (not used)

END OF SECTION 13 34 00

SECTION 20 0100 - GENERAL PROVISIONS

PART 1 GENERAL

1.01 GENERAL

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements apply to the work specified in this section.

B. The division of the specification into divisions 20, 21, 22 and 23 is for contractor convenience only and is not intended to establish limits of work. This contractor is responsible for any and all references to their work that may be located within a different section of the specifications.

C. The architectural features shown on these drawings upon which the contract documents are based may be inaccurate or incomplete. The contractor shall coordinate all installation requirements with the most current to date sealed architectural contract documents and modify as required.

D. The contractor is responsible for including in bid a complete and working system in accordance with the most current to date sealed architectural contract documents.

E. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 DESCRIPTION

A. Perform all work under this heading, including the furnishing of labor, materials, equipment, and service necessary for and reasonably incidental to the proper completion of all mechanical work as shown on the drawings and herein specified.

B. Visit and examine the job and confer with all authorities concerned in order to become familiar with all existing conditions pertinent to the work to be performed. No additional compensation will be allowed for failure to be so informed.

C. Materials and equipment shall be new, except where otherwise indicated, of the best quality, with same brand or manufacturer for all similar material.

D. Perform all work in a neat and workmanship manner.

E. In general, provide the installation of plumbing systems, and heating, air conditioning and ventilating systems complete with piping, fittings, fixtures, equipment, etc.

F. Regardless of titles and subdivisions herein employed, consider these specifications as an complete document with General Sections applying to all other sections. All bidders are cautioned to read entire specifications and to thoroughly familiarize themselves with all requirements thereto.

G. Check all specifications and all drawings and bring to attention any conflicts or variations as soon as noted.

H. Specifications and accompanying drawings apply to all contracts or sub-contracts entered into for supplying material or labor for construction of work specified herein and shown on the drawings.

I. The drawings and specifications are complementary and what is shown and/or called for on one shall be furnished and installed the same as if shown and/or called for in the other.

J. In case of discrepancies and/or ambiguities in the drawings and/or in the specifications, consult Architect prior to submission of a proposal. Failure to do so on the part of the successful bidder shall be construed as explicit agreement on his part to abide by the Architect's decision in such matters.

K. The word "Provide" as used in these specifications and on the drawings shall be termed to mean "furnish and install".

1.03 QUALITY ASSURANCE

A. The Contractor bidding on this portion of the work must be fully experienced in the installation of equal size, complexity, and quality, and must be licensed to perform such work as required by the Rules and Regulations Promulgated by the State Licensing Board for Contractors.

B. In bidding he acknowledges that he fully understands the scope of the work and design, and has the ability for the contract price to assemble and install the equipment, piping, ductwork, etc., as shown and specified, so as to mold same into a satisfactory workable system and arrangement.

C. Contractor shall recognize that a fault or error in his work remains his responsibility regardless of whether such difficulty was discovered after the work had progressed, and shall make corrections at no cost to Owner.

D. Provide adequate and competent constant supervision to assure that work is done in accordance with good standard practice and workmanship and with intent of drawings and specifications.

E. Install all work in strict accordance, with all local and state codes and ordinances, with National Board of Fire Underwriters, and in accordance with all O.S.H.A. Standards.

F. Secure all permits and inspections and pay all legal fees and taxes and provide Owner with a certificate of approval from agencies having jurisdiction over various phases of the work.

1.04 SUBMITTALS

A. Shop Drawings and Submittal Data Required

1. Submit to the Architect for review, immediately after award of contract, six (6) copies of complete descriptive information and dimensional data on all items of equipment, materials and accessories. Submit all shop drawings at one time. Piece meal submission shall not be acceptable.

2. Shop drawings and submittal data shall be considered to be instruments to service only and submitted for the sole purpose of convenience to the Contractor to assist him in the performance of the contract. The Architect's review of the shop drawings and submittal data shall not supersede these specifications, the accompanying drawings or the contract terms, unless specifically covered by a properly executed change order, and then only to the extent specifically and explicitly stipulated therein.

3. Coordination with electrical: Contractor to submit copy of any & all shop drawings that indicate electrical requirements to the project electrical engineer for electrical service & electrical load verification. Applicable to all mechanical items.

4. Any and all changes within to the contract documents in submittals shall be highlighted in yellow on the submittals (dimension, size, electrical requirements, material, color, etc.).

5. The contractor shall provide a copy of the respective Mechanical Equipment Schedule of the equipment that is being submitted with the information/data of the submitted equipment within the schedule. This is required to be able to compare the specified equipment with the submitted equipment on an exact format basis. Failure to submit custom mechanical equipment schedule with submittal may result in a rejected submittal.

6. The contractor shall submit to the mechanical engineer, as soon as feasible after award of the contract, equipment room layouts at a scale not less than 1/4" = 1'-0" showing the layout of the actual equipment to be used and all necessary clearances. This drawing is to comprehensive of all trades as to eliminate conflicts. The contractor will be responsible to verify all access for maintenance as required by the manufacturer.

7. *Well in advance of preparing the project shop drawings and well in advance of ordering any project equipment, and as part of the requirements and work of this project division:*

1. Employ, coordinate directly with, and pay (if such payment is required) the respective suppliers/vendors of all project equipment and/or the respective project subcontractors who are providing all project equipment, as respectively applicable:

a. To review all respective equipment performance, electrical characteristics and requirements which are indicated and/or given on any of the project drawings and/or in any of the project specifications; and

b. To determine whether or not each bit of the information that is relevant to such indicated equipment performance, electrical characteristics and requirements is accurate for the exact respective equipment which is being furnished for the project;

2. Have such suppliers/vendors and/or subcontractors, as respectively applicable:

a. Verify, in no uncertain terms, with proper documentation, which bits of the information that is relevant to such indicated equipment performance, electrical characteristics and requirements are indeed so accurate; and

b. Furnish the respective, properly-corrected, equipment performance, electrical characteristics and requirements for all indicated equipment electrical characteristics and requirements which are not so accurate;

3. Submit all such verifying and/or correcting documentation to the architect, in a timely manner, in the same formats in which the respective equipment performance, electrical characteristics and requirements were originally indicated and/or given. For example:

a. For all equipment performance, electrical characteristics and requirements which were originally indicated and/or given in the form of equipment schedules, submit the respective, properly-corrected, equipment performance, electrical characteristics and requirements in the form of corrected, similar, equipment schedules;

b. For all equipment performance, electrical characteristics and requirements which were originally indicated and/or given in the form of equipment notes (plan keynotes), submit the respective, properly-corrected, equipment performance electrical characteristics and requirements in the form of corrected, similar, equipment notes;

c. For all equipment performance, electrical characteristics and requirements which were originally indicated and/or given in the form of specification verbiage, submit the respective, properly-corrected, equipment performance, electrical characteristics and requirements in the form of corrected, similar, specification verbiage; and so on."

B. Record Drawings

1. The contractor shall be furnished with one (1) set of blue line prints, on which Contractor shall show any changes in the work caused by unforeseen circumstances and these drawings shall be turned over to the Architect in good order prior to final acceptance of the building. Architect in turn shall prepare record drawings from information furnished by contractor.

C. Parts Catalogs and Operating Instructions

1. Furnish to the Architect for the Owner, three (3) complete sets of parts catalogs and operating instructions bound in large binders for his use. Each set shall contain:
   a. Complete wiring and control diagrams
   b. Routine maintenance operations
   c. Detailed operating instructions and instructions for making minor adjustments
   d. Manufacturer's catalog data, pump curves, service instructions, and part list of each piece of operating equipment

2. One additional copy of the first item above shall be framed under glass and installed in each equipment room where applicable.

3. Instruct Owner's operator in the proper care, operation, lubrication, and maintenance of mechanical equipment installed.

D. Substitution

1. All material, equipment, methods and accessories entering into the work under this section of contract are subject to approval or disapproval of the Architect. Approval of any manufacture or vender, any material, or product, shall not constitute a waiver of Architect's right to demand full compliance with contract requirements, including shape, size, quality and performance.

2. Equality of materials is that established by opinion of Architect. Decision of Architect is final.

3. Whenever a material or article of equipment is specified by use of a proprietary name, or by naming the manufacturer or vendor, any material or article which will perform adequately the duties imposed by the design will be considered for substitution, providing it is of equal substance, and function, meets specifications, and is aesthetically acceptable to the Architect, and that requests for approval along with all literature and technical data on proposed substitution is submitted in writing so as to be received in Office of Architect not less than seven (7) calendar days prior to opening of bids.

4. Literature, technical data, etc., includes complete data (including catalog names and model numbers) and samples if necessary, with submissions for substitutions. Burden of proof that material offered for substitution is equal, or superior, in construction and efficiency to that named, rests on Contractor, and unless proof is satisfactory to Architect, substitutions will not be approved.

1.05 PRODUCT, DELIVERY, STORAGE AND HANDLING

A. Take necessary precautions to protect all material, equipment, apparatus and work from damage. Failure to do so to the satisfaction of the Architect will be sufficient cause for the rejection of the material, equipment or work in question. Contractor is responsible for the safety and the good condition of the materials installed until final acceptance by the Owner.

1.06 JOB CONDITIONS

A. Accompanying drawings, including plans, details, diagrams, notes, etc., are shown to limit and explain structural conditions, construction requirements, sizes, capacities, and method of installation and erection. Structural and other conditions may require certain modifications and adjustments from conditions shown. Such deviations are permissible; however specific sizes, capacities, and requirements affecting the satisfactory performance and operation of the installation shall remain unchanged. Make allowances for normal job conditions and interferences.

B. Whenever it becomes necessary to shift ducts or pipes or to change shape of ducts, such changes shall be referred to the Architect for approval.

C. Ask for details whenever uncertain about method of installation. Lack of details not requested shall not excuse improper installation and correction shall be responsibility of Contractor.

D. Furnish detailed ductwork shop drawings and large scale equipment room layouts base on field measurements, actual job conditions, and actual equipment to be installed on project.

E. Schedule and perform all mechanical work to avoid delays.

F. All piping, cleanouts and covers, and other mechanical items in way of construction or remodeling, shall be rerouted, relocated or otherwise adjusted to work out with such construction or changes shown or specified in any or all of various sections of specifications.

G. Refer unknown site or job conditions that are encountered immediately to Architect for method of disposition before continuation of work.

1.07 GUARANTEE AND SERVICE

A. Guarantee all equipment, materials and workmanship for a period of one (1) year following date of acceptance.

B. Guarantee all equipment compressors & air cooled chillers shall come with a full ten (10) years (material, labor, refrigerant).

C. During the period of guarantee and defects in equipment, materials or workmanship shall be promptly corrected without cost to Owner.

D. Guarantee includes equipment capacity and performance ratings specified with excessive noise levels. Any deficiencies in equipment capacity specified shall be promptly corrected.

E. Guarantee does not include normal maintenance items.

F. Refer to water heater specifications for warranty.

G. Warranty period begins at date of substantial completion, not when contractor starts equipment. Figure in bid extending warranty to accomplish this.

1.08 COORDINATION DRAWINGS

A. The contractor shall coordinate work of all various sections having interdependent responsibilities for installing, connection to, and placing such equipment. At the contractor's expense, all (including but not limited to, mechanical, plumbing, electrical system) necessary offsets, bends, duct size/configurations, crossing/cross-overs shall be provided and installed as necessary to integrate within the structural system and the architectural features (ceilings and walls, etc.).

B. Coordination Drawings: the purpose of the coordination drawings is to assure proper forethought and coordination of integrating all systems of the building within the structural framework, architectural ceilings, floors, and walls of the building. The contractor shall provide coordination drawings prior to the submittal of all system shop drawings. The coordination drawings shall include ductwork and all mechanical HVAC piping and associated items, plumbing verticals and sprinkler piping, chases, electrical conduit, and shall indicate sizes of these items and the structural members.

C. The contractor shall submit the coordination drawings (four (4) complete sets) to the architect for the architect's approval no later than one month after the work has commenced on the project site. The contractor shall revise and re-submit the drawings as the architect may require. Provide a DVD/CD with each hard copy with PDF's of coordination drawings.

D. The coordination drawings shall include, but is not limited to, the following:

1. Plan drawings for each floor indicating structural member sizes, HVAC components/sizes/routes/locations, major electrical conduit grouping/routes, vertical chases/openings, and all other items as necessary to comply with the requirements of 1.8.A and 1.8.B of this section.
2. Section drawings through major pathways for systems (such as corridors, if appropriate), and exemplary rooms.
3. Prior to the commencement of preparing the drawings, the contractor shall confirm the proposed listing of drawings to be submitted.
4. Any and all other drawings, schedules, and information necessary to illustrate the contractor's understanding of the architectural design intent of the critical ceiling heights, wall locations, and all other design parameters and how they are accommodated upon the contractor's proposed integration of the systems noted in the contract documents.

E. During the course of construction, the contractor shall update the coordination drawings in a clean, clear, and legible manner and have the drawings readily available on-site for the architect's access. Upon substantial completion, the contractor shall submit the updated coordination drawings to the architect for the owner's future use and shall be the property of the owner.

F. The General Contractor is to coordinate with all sub-contractors as to provide the coordination drawings. All contractors are to be responsible for coordinating their applicable work. The

General Contractor and all sub-contractors shall work cohesively in a timely manner as to provide the coordination drawings.

1.09 ELECTRICAL COORDINATION WITH BUILDING AND AUTOMATIC TEMPERATURE CONTROLS PRIOR TO BID COORDINATION DRAWINGS

A. The contractor shall Given the nature of the evolving technology in the field of Building & Automatic Temperature Controls (and the differences between various manufacturers), various Temperature Control Devices have been specified at various voltages (120-1-60, 24V, etc., Refer to Specification 230900). It is the responsibility of the General Contractor, Electrical Contractor, Mechanical Contractor, & Temperature Controls contractor to coordinate prior to bid as to ensure all electrical provisions for all Temperature Control Devices are accounted for (material, equipment, conduit, breakers, wiring, devices, installation, labor, etc.) as to provide a complete and working Temperature Controls System. Should the Contractor (and subcontractors) fail to coordinate all electrical provisions prior to bid, then the cost to provide such electrical provisions shall be solely borne by the Contractor (and subcontractors). No additional cost to be provided by the owner to the Contractor for failure to coordinate prior to bid. Refer to specification 230900 for Building and Automatic Temperature Controls sequences of operation, EMS point list, product data, etc.

1.10 FEES AND DEPOSITS

A. Arrange for and pay regulatory inspection and service connection fees (sewer, drainage, water and gas) including the cost of any main extensions. Pay meter deposits for utility services. After substantial completion of the project, the meter registration shall be transferred to the User/Owner.

1.11 VISITING SITE

A. The Bidder shall visit the site of proposed work so that he may understand the facilities, difficulties and restrictions attending the execution of the contract. No additional compensation will be allowed for failure to be so informed.

1.12 UTILITY CONNECTIONS

A. Coordination of utilities which are work of this contract to utilities installed as work of other divisions prior to starting any work. Verify connection points, inverts, valving, etc., prior to commencing any work. No additional compensation will be allowed for conflicts that occur due to lack of coordination.

1.13 NEW EQUIPMENT INSTALLATION

A. New equipment installed under this project specified by other sections of these specifications which requires discipline specific connections shall be coordinated & installed by the contractor. These connection points are based on the manufacturer specified and laid out by the contractor. Should the contractor utilize another manufacturer, it is the contractor's responsibility to verify all new connections (mechanical, plumbing, electrical, etc.) and modify required services as necessary to place new piece of equipment into operation.

1.14 SPECIAL CONDITIONS

A. No piping, ducts or other mechanical equipment foreign to the electrical equipment shall pass through or above the spaces dedicated to electrical panel boards, electrical distribution panels, electrical switchboards and motor control centers. Work shall conform with NFPA 70. Working clearances and dedicated spaces at electrical equipment shall be maintained per NFPA 70. Coordinate with each trade.

1.15 WORK IN OTHER DIVISIONS

A. Prior to bidding, the Contractor shall coordinate items of work referred to as “work of other Divisions” to insure items are not omitted or duplicated.

1. Utility Connections - sewer, natural gas, storm drainage and water unless otherwise noted on the drawings.

2. Electrical work (wiring, raceways and disconnect switches), fire alarm work (wiring, raceways, equipment and devices) associated with work of this division and not specified as work of Division 26 - Electrical, shall be work of this division.

3. Supports for work of this Division, except supports specifically indicated to be provided under other Divisions, shall be provided as work of this Division. Supports provided under other Divisions shall be checked and coordinated under this Division to ensure that they suit the work to be installed.

4. Painting, including painting of exposed insulation, exposed piping and exposed ductwork not specified as work of DIVISION 9 - FINISHES, shall be work of this Division. Damaged surfaces of factory finished items shall be repaired to the satisfaction of the Architect/Engineer as the work of this Division. Nameplates shall be protected until painting has been accomplished. Protection shall be removed and nameplates cleaned prior to acceptance of equipment.

1.16 MANUFACTURER’S RECOMMENDATIONS

A. Equipment and materials provided under this Division of the specifications shall be installed according to manufacturer’s recommendations. Each manufacturer’ application and installation instructions shall be reviewed prior to ordering equipment or commencing with the work. If the drawings or specifications show or describe any deviations from the manufacturer’s recommendations the Contractor shall request clarification, from the Architect/Engineer and provide as directed at no additional cost to the User Agency. Where the respective manufacturer’s recommended installation required equipment/material not shown within the contract documents, the contractor shall provide & figure the cost of these additional equipment/material in their bid. The contractor shall provide a complete and working system.

PART 2 PRODUCTS

2.01 TOOLS AND SCAFFOLDING

A. Furnish all tools, equipment, scaffolding and other facilities required to properly and expeditiously perform the work.

2.02 BUCKS, GROUNDS AND CHASES

A. All bucks, grounds, lintels, blockouts, chases and grouting for work under this Division shall be done by the General Contractor.

B. This Division shall be responsible for proper location and sizes or for any errors of omission in placing same.

2.03 FOUNDATIONS AND SUPPORTS

A. Provide foundation and supports of concrete or steel shapes for equipment requiring same.

B. Mount all floor mounted mechanical equipment on nominal four (4) inch high concrete housekeeping pads.

2.04 ACCESS PANELS

A. Factory made access doors and frames, prime coat finish, screwdriver latch(s) of suitable size as required.

B. Access panels in rated ceiling to have same rating as ceiling. Where access panels are required in fire rated ceiling then the access panel shall be fire rated.

C. Access panels in lined ductwork to be double wall type with insulation sandwiched in between, same insulation value as adjacent ductwork.

D. Where valves (domestic water valves, etc.), dampers, controls, fire dampers, smoke dampers and detectors, reheat coils, VAV Boxes, etc., are concealed in walls or non-accessible ceilings, install factory made access doors and frames. Contractor shall refer to drawings for locations of items in need of access panels. Panels to be sized as to properly access equipment. Minimum access panel size to be 24x24.

E. Paint all exposed access panels to match finish of respective wall and/or ceiling.

F. Not used.

2.05 FLOOR AND CEILING PLATES (ESCUTCHEONS)

A. Where any pipe or risers pass exposed through walls, partitions, floors or ceiling, use chrome-plated floor and ceiling plates.

B. Plates shall be large enough to completely close the hole around the pipes and shall be round with the least dimension not less than 1-1/2" larger than the diameter of the pipe. Plates shall be secured in an approved manner.

2.06 SIPHON PREVENTORS

A. Furnish and install approved type siphon preventers on all equipment and fixtures in such a manner as to prevent water being siphoned back into the water supply in the event the water supply is shut off.

2.07 FLAME SPREAD PROPERTIES OF MATERIALS

A. All materials and adhesives used for acoustical linings, jackets and insulation shall comply with requirements of NFPA 90A and 90B and UL guide no. 40 V.8.15. Products exceeding a flame spread rating of 25, or a smoke developed rating of 50, as determined by ASTM Test Method E-84 are prohibited. Adhesives and sealers shall be fire retardant and fire resistant when dry. Flame proofing treatments which are subject to decomposition, deterioration, or the effects of moisture are prohibited.

2.08 SCAFFOLDING, RIGGING AND HOISTING

A. Each contractor shall furnish all scaffolding as required for the installation of his work. He shall either arrange with the General Contractor for servicing in connection with any rigging and hoisting required or provide his own equipment to hoist apparatus to be installed by him into place. Each contractor shall see that any equipment too large to permit passage through normal doorways and access ways is brought to the job and set in place before the mechanical spaces are enclosed. All apparatus not delivered in this manner shall be disassembled and reassembled in the proper location. Equipment specified to be factory assembled and tested prior to shipment shall not be disassembled for shipment to an installation into the building.

2.09 VIBRATION ISOLATION

A. Transmission of vibration or structural borne noise to occupied areas by equipment installed under this contractor will not be permitted. Contractor shall furnish for approval, data showing disturbing frequency, supported weight, static deflection, efficiency and calculations supporting same for each isolator he proposes to use.

B. All isolators shall be selected and certified, using published data, to limit vibration transmission to 10% for equipment located on floors in direct contact with grade and 5% for equipment located other than the above. Should any noise or vibrations be objectionable to the Architect and/or Owner, field instrumentation tests and measurements shall be made by the isolator manufacturer or his representative to determine the source and cause of such disturbance. Any non-compliance with these specifications shall be corrected by the contractor in a manner satisfactory to the Architect at no additional cost to the Owner.

2.10 UNDERGROUND PIPING WARNING TAPE

A. All underground piping shall have warning tape installed directly above underground piping (beyond building slab). Tape shall be installed 12 to 18 inches below finished grade. Warning tape shall be metallic detectable type consisting of 0.35 mils thick solid core encased in a protective plastic jacket that is resistant to alkalis, acids and other destructive elements found in the soil. The lamination bond shall be strong enough that the layers cannot be separated by hand. Total composite thickness to be 5.0 mils. Foil core to be visible from unprinted side to ensure continuity. Warning tape for metallic piping may be 0.4 mils polyethylene film without metallic laminate.

B. Warning tape shall have a continuous warning message repeated every 18 to 36 inches shall be imprinted on the tape surface. The tape shall contain an opaque color concentrate designating the color code appropriate to the line being buried. Tape shall be minimum 3" wide.

C. All PE piping shall be traced with copper wire when bored (single solid conductor insulated, not stranded, wire, 12-gauge for 2” and smaller, 8-gauge for lines larger than 2”, any connection to T-splice shall be made using multi-cable connector block (Polaris block) with silicone for underground/wet locations). Provide underground warning tape installed above underground piping. Underground warning tape shall read “Caution Gas Line Buried Below”.

D. An additional #10 copper wire shall be adhered to all underground nonconductive piping and fastened with plastic zip ties every 4'-0" on center. Provide a long tail tracer wire at valve with ring and cover.

2.11 MATERIALS IN AIR DUCTS AND PLENUMS

A. No plastic or other non-metallic materials as defined by NFPA 90A shall be used in air ducts or plenums unless specifically rated for such service.

2.12 FLASHING

A. Metal flashing: 26 gauge galvanized steel.

B. Lead flashing: 5 lb/sq ft sheet lead for waterproofing.

C. Flexible flashing: 47 ml thick sheet butyl; compatible with roofing.

D. Caps: Steel, 22 gauge minimum; 16 gauge at fire resistant elements.

2.13 EQUIPMENT IDENTIFICATION

A. Provide labels for each starter, control switch, and all equipment. Labels to be engraved black laminated bakelite nameplates with 1/4" high which cut letters, secure to starters, switches or equipment.

2.14 FIRE RATED WOOD

A. All wood as specified within these construction documents (mechanical, plumbing, sprinkler plans and specifications) shall be of the fire rated type. PYRO-GUARD treated wood as manufactured by HOOVER treated wood products.

2.15 CONCRETE FASTENERS

A. Fastenings set into concrete to support pipe, air handlers and other mechanical equipment shall be steel or malleable iron expansion shields set in proper size drilled holes. Do not exceed the manufacturer's rated pull out load. The manufacturer's rated load must be based on a factor of safety of 5 or else the allowable load must be reduced to give a factor of safety of 5. Self drilling Rawl Saber Tooth or Phillip Red Heads may be used. Anchors using lead, plastic or shields of any material other than steel or malleable iron shall not be used.

B. Powder actuated fasteners, Hilti or Ramset, may be used for loads applied with a factor of safety of 5 but not more than 300 pounds for the largest size. The powder charge shall be found by trial and shall be the smallest charge that gives full insertion into the concrete. These fasteners may be used for ductwork and small pipe.

C. Not used.

D. Follow manufacturer's instructions and use setting tools procured from the manufacturer of the drilled-in anchors to expand the shields.

E. Fasteners of the type set into concrete by drilling shall be self drilling Rawl Saber Tooth or Phillips Red Heads.

F. Powder actuated fasteners shall be Hilti or Ramset.

2.16 PROTECTIVE COATING FOR UNDERGROUND PIPING

A. Underground pipe and fittings including the portion through the floor shall be protected against corrosion by application of protective coatings.

B. Prior to coating, pipe and fittings shall be cleaned of all rust, scale, dirt, and oil.

C. Pipes and fittings shall be given a wash coat of epoxy primer having a dry film thickness of 1.5 - 2.0 mils. Over the primer apply two coats of coal-tar base epoxy coating, each having a dry film thickness of 6 mils.

D. Coatings shall have a holiday test using a ½" spark. Recoat any areas not passing test.

E. Provide for all underground metal piping up from grade.

F. 2-Part coal-tar epoxy to be Carboline 300M or prior approved equal.

2.17 EMS CONDUIT AND BOXES

A. UNDERGROUND EMS CONDUIT: Rigid Nonmetallic Conduit (RNMC): Schedule 40, rigid polyvinylchloride, rated for 90 degrees C conductors, with pull string, solvent cement connectors and couplings. Nonmetallic strap hangers allowing thermal expansion movement. Conduit to meet NEMA TC-2; fittings to meet NEMA TC-3. Expansion Coupling: Nonmetallic to compensate for thermal expansion.

B. EMS CONDUIT WITHIN BUILDING: Shall be hot dipped galvanized rigid steel conduit. All conduits shall be new and shall bear the inspection label of the Underwriter's Laboratories, Inc. Metallic conduit shall be hot-dipped galvanized. Fittings for conduit shall be an approved type specially designed and manufactured for their purpose. Rigid metal conduit fittings, bushings, and other components shall be galvanized. Setscrew connector fittings shall not be permitted. All fittings for rigid steel or aluminum conduit shall be threaded and coupled unless specifically approved otherwise by the Engineer.

C. Pull Boxes: Communication/EMS ground mounted pull boxes shall be polymer concrete, ANSI/SCTE 77 2002 – Tier 22 rated, provide dimensions indicated on the drawing. Open bottom. Cover to be labeled “Communications”. Secure cover with stainless steel standard hex head bolts. Covers shall be traffic rated. ALL PULL BOXES TO BE SIZED IN ACCORDANCE TO NEC (NATIONAL ELECTRIC CODE).

D. Stainless Steel EMS Enclosure: NEMA 3R enclosure (UL 508A Listed). Manufactured from Type 304 16 gauge stainless steel; 16 gauge doors and 14 gauge bodies, Minimum-width body flange provides maximum body opening, Pre-cut gland plate openings in the bottom of the enclosure with a seal to ensure protection, External formed 90 degree body flange, Door opens 210 degrees, Mounting holes in back of body for direct mounting or for optional external mounting brackets, Type 316 stainless steel hinge pins, Corner-formed doors are easily removed by pulling clip-style hinge pins, Quarter-turn latches furnished with 3mm double-bit insert, Seamless foam-in-place gasket, Self-grounding latch system with double seal, Grounding stud on the body, Full-sized galvanized steel back panel included, Bonding provision on the door, Furnished hardware kit includes: gasketed gland plates and hardware, grounding hardware and sealing washers for wall-mounting holes, Three-point latching, Finish: Door and body have smooth #3 brushed finish. Hoffman medium GL66 series stainless steel wall mount enclosure.

2.18 PREPARED OPENINGS

A. Piping and tubing installed through masonry or concrete walls, floor/ceiling assemblies and floors above grade shall be installed through pipe sleeves.

B. Duct installed through masonry or concrete walls and non-rated concrete floors above grade shall pass through 20-guage galvanized sheet metal sleeves. Duct sleeve shall have a ½" maximum annular clearance around duct. Allowances shall be made for external duct wrap (if specified). Ducts, tubing and piping installed through floors of mechanical rooms shall have a 4" high concrete curb on each side to prevent water from leaking through openings. Exposed piping installed through walls shall be fitted with chromium plated escutcheons on each side of the wall. Exposed ductwork passing through non-rated masonry or concrete walls shall be fitted with a 2" wide sheet metal flange around each side of duct on each side of the wall.

C. Ducts installed through partitions, walls or floors which are smoke rated or have a fire rating of one hour or greater shall be installed in accordance with SMACNA standards. Piping and tubing installed through partitions, walls or floors which are smoke rated or have a fire rating of one hour or greater shall be installed through pipe sleeves.

2.19 ROOF MOUNTED EQUIPMENT, DUCTS AND PIPING

A. Not used.

2.20 SAFING MATERIAL

A. Safing material shall be installed in annular spaces between sleeve and pipe or tubing where sleeve and pipe or tubing penetrate partitions that are designated as smoke separations. Material shall be mineral wood designed for hand packing. Material shall have an ASTM E 84 rating of flame spread -10, fuel contributed -0, smoke developed -0 and shall be rated non-combustible per ASTM E 136.

2.21 TAMPER PROOF FASTENERS

A. Where equipment is specified to have tamper proof or vandal proof fasteners, the Contractor shall coordinate and use the same type of fastener on each item. Provide User Agency with two wrenches, screw drivers, etc., for each type of fastener used on the project.

2.22 ENCLOSURES

A. Control equipment enclosures provided by the Contractor or provided as part of a packaged piece of equipment shall meet the following minimum standards unless specifically indicated otherwise. Where indicated on the drawings or specifications, flush mounted enclosures shall be provided.

B. Control equipment enclosure provided within the building shall be equivalent to or greater than NEMA 12 type construction. Control equipment enclosures provided outside of the building, a non-enclosed area of the building or in an accessible crawl space under a building shall be equivalent to or greater than NEMA 3R type construction with drain and breather. Control equipment enclosures provided within hazardous areas, controlling explosion-proof equipment shall be NEMA 7 or 9 type construction. Control equipment enclosures provided for cooling towers and associated equipment within 20'-0" of towers shall be NEMA 4X noncorrosive type construction.

2.23 SAFETY PANS

A. Safety pans shall be fabricated from 12-guage (min.) galvanized steel. Sides of pans shall be a minimum of 4" high with top edges hemmed. Sides longer than 6'-0" shall have additional flat bar or angle top edge bracing to prevent sagging. Joints and seams shall be watertight. Pans shall be extended at least 6" beyond the sides of the equipment it is serving. Provide a 1" galvanized steel female pipe coupling in side of pan near the bottom of overflow piping connection. All joints and seems to be seamless construction. This is applicable for all auxiliary drain pans under air handling units, hot water heaters, etc.

1. Provide float switch in auxiliary drain line, unit to de-energize when float switch is tripped.

2. Pipe safety pans to nearest floor drain. Provide ball valve in safety pan condensate drain line (normally closed).

PART 3 EXECUTION

3.01 CUTTING AND PATCHING

A. Cut all openings as required for the work under this section. Patching shall be done by the craft whose work is involved. Furnish and install all necessary sleeves, thimbles, hangers, inserts, etc., at such time and in such a manner so as not to delay or interfere with the work of other trades. No beams or joists shall be cut. After resurfacing has been done, any further cutting, patching and painting shall be done at the expense of the Contractor.

3.02 COORDINATION

A. Coordinate all mechanical work with other phases of the work, including ceilings systems and tiles, electrical work, other mechanical work, etc.

3.03 PAINTING

A. Factory painted equipment that has been scratched or marred shall be repainted to match original color.

B. Steel equipment hangers and supports, un-insulated black steel pipe, and black steel pipe supports exposed to sight outside the building which are not provided with factory prime coat shall be cleaned of rust, grease, and scale. After cleaning hangars, supports and pipe, a field-applied prime coat and two coats of a bituminous aluminum paint shall be provided. Insulated pipe outside the building shall be cleansed of rust, grease and scale. Paint all exposed piping, insulation, grilles, fans, etc., in building or on roof, if not factory finished. Paint piping equipment, hangers, and accessories in all mechanical equipment rooms, including covering and foundations with two (2) coats of approved paint after thoroughly cleaning. Size insulation covering before painting. Equipment having factory finish, if damaged or scratched, shall be touched up and given one additional coat of machinery enamel.

C. All painting shall conform to the requirement of the PAINTING & COATINGS Section.

3.04 CLEANING AND ADJUSTING

A. All equipment, pipe, valves, and fittings shall be cleaned of grease, oil, paint spots, metal cuttings, sludge, and construction debris.

B. Ducts, plenums and casings shall be cleaned of all debris and blown free of all particles of rubbish and dust before installing outlet faces.

C. Bearings shall be lubricated as recommended by the equipment manufacturer.

D. Temporary filters shall be provided for fans that are used during construction. At the time of starting the balancing of the air distribution system, new filters shall be installed.

3.05 PENETRATION THROUGH FIRE SEPARATIONS

A. Pack annular space between sleeve and pipe (insulation) and / or conduit in rated construction with fire resistant putty, sealant and / or caulk. Material shall be non asbestos based and installed in accordance with manufacturers instruction for fire rating required.

B. Penetrations of multiple items and penetrations with annular space greater than ½" shall be provided with approved backing material in accordance with manufacturer's instructions.

C. Fire retardant sealer and system shall meet ASTM E-84, ASTM E-814, and UL-1479.

3.06 EXCAVATION, TRENCHING AND BACKFILLING

A. General: The Contractor shall perform all excavation to install piping herein specified. During excavation, material for backfilling shall be piled back from the banks of the trench to avid over-loading and to prevent slides and cave-ins. All excavated materials not to be used for back filling shall be removed and disposed of by the Contractor. Grading shall be done to prevent surface water from flowing into trenches and excavations, and any water accumulating therein shall be removed by pumping. All excavation shall be made by open cut. No tunneling shall be done. Trenches shall not be cut below a plane extending at a 45 degree angle down and away from any footing.

B. Trench Excavation. The bottom of the trenches shall be graded to provide uniform bearing and support for each section of the pipe on undisturbed soil at every point along its entire length, except for the portions of the pipe sections excavated for sealing joints. Depressions for joints shall be dug after the trench bottom has been graded. Over depths shall be backfilled with loose, granular, moist earth, tamped. Remove unstable soil that is not capable of supporting the pipe and replace with specified material for a minimum depth of 12" below invert of pipe.

C. Backfilling. The trenches shall not be backfilled until all specified pressure tests are performed. The trenches shall be backfilled with the excavated materials approved for backfilling consisting of earth, loam, sandy clay, sand and gravel or soft shale, free from large clods of earth and stones, deposited in 6" layers and rammed until the pipe has a cover of not less than the adjacent existing ground, but not greater than 2" above existing ground. The backfilling shall be carried on simultaneously on both sides of the trench so that injurious side pressures do not occur. All trenches under pavements and all trenches within the building walls and to 5 feet outside the building walls shall be compacted in accordance with requirements specified in the EARTHWORK Section. For all trenches, the compaction of the filled trench shall be at least equal to that of the surrounding undisturbed material, except that trenches occurring in areas to be filled shall be backfilled in 6" maximum layers and each layer compacted to 95% maximum density. Settling the backfill with water will not be permitted. Re-open any trenches not meeting compaction requirements; or where settlement occurs, refill, compact, and / or restore the surface to the grade and compaction specified above, mounded over and smoothed off.

3.07 FLASHING

A. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or water proofed walls, floors, and roofs.

B. Flash vent and soil pipes projecting 3 inches minimum above finished roof surface with lead worked one inch minimum into hub, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counterflash and seal.

C. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36 x 36 sheet size. Fasten flashing to drain clamp device.

D. Seal floor drains watertight to adjacent materials.

E. Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms, installed in accordance with manufacturer's instructions for sound control.

F. Provide curbs for mechanical installations 14 inches minimum high above roofing surface. Flexible sheet flash and counterflash with sheet metal; seal watertight.

3.08 TESTING PIPE AND DUCT SYSTEMS

A. General: Concealed piping and duct work and insulated piping and ductwork shall be tested in place before concealing or covering. Piping and ductwork located underground shall be tested before backfilling. Equipment, materials, and instruments for testing shall be furnished by the contractor without additional cost to the owner. System components not rated for the respective test pressure shall be isolated from the system during the test.

B. Observation: The Contractor shall notify the owner's representative 7 days prior to a scheduled test. The owner's representative, at his option, has the right to witness the test.

C. Sanitary, Waste, and Vent System

1. The hydrostatic test shall be performed before installing fixtures. Water tests shall be applied to each system(s) either in its entirety or in sections. If the test is applied to the entire system, all openings in the piping shall be closed except the highest opening, and the system shall be filled with water and tested with at least a 10ft. head of water. In testing successive sections, at least the upper 10 ft. of the next preceding section shall be tested so that each joint or pipe in the building except the uppermost 10 ft. of the system has been submitted to a test of at east a 10 ft. head of water. The water shall be kept in the system or in the portion under test for at least 2 hours before the inspection starts. The system shall be tight at all joints.

2. Provide notice of test to engineer/architect for witness of test. Provide engineer/architect results of test in writing on contractor letterhead.

3. The final test of the completed drainage and vent system shall be visual and in sufficient detail to insure that the provisions of this section have been complied with, provided, however, that the plumbing undergo a smoke test. The smoke test shall be made by filling all traps with water and then introducing into the entire system a pungent, thick smoke produced by one or more smoke machines. When the smoke appears at stack openings on the roof (at furthest vent), they shall be closed and a pressure equivalent to a one inch water column shall be built and maintained for fifteen minutes before inspection starts.

D. Domestic Water Systems

1. The hydrostatic test shall be made upon completion of the roughing-in and before setting fixtures. The entire domestic cold water and hot water, and hot water circulation piping system shall be tested at a hydrostatic pressure of 1.5 times the working pressure of the system (but not less than 140 psig) and proved tight at this pressure for a period of not less than 2 hours in order to permit inspection of all joints. Where a portion of the water piping system is to be concealed before completion, this portion shall be tested separately in a manner described for the entire system.

*Do not exceed the manufacturer’s permitted test pressure.

2. Provide notice of test to engineer/architect for witness of test. Provide engineer/architect results of test in writing on contractor letterhead.

E. Fire Protection Systems

1. Automatic Sprinkler and Standpipe Piping. The automatic sprinkler and standpipe system(s) shall be hydrostatically tested in their entirety or in zones defined by shut-off valves. The piping shall be tested at a pressure of 200 psig or at component rated pressure measured at the low point in the system or zone, and shall be proved tight at this pressure for a period of not less than 4 hours. Leaks detected shall be repaired by tightening, rewelding joints, or replacing pipe fittings. Caulking of joints will not be permitted.

2. Fire Service Piping. Underground fire service piping shall be hydrostatically tested in its entirety or in zones defined by shut-off valves. The piping shall be tested at a pressure of

200 psig or at component rated pressure for 4 hours. The amount of leakage shall not exceed 1 oz. liquid measure per hour per inch of pipe diameter per joint. The leakage amount shall be measure by pumping from a calibrated container.

3. Provide notice of test to engineer/architect for witness of test. Provide engineer/architect results of test in writing on contractor letterhead.

F. Heating and Air Conditioning Piping System

1. All HVAC water piping shall be tested hydrostatically and proved tight at a pressure of not less than 1.5 times the normal operating pressure (100 psi minimum) for a period of not less than 4 hours. Isolate equipment that may be damaged due to pressure test. Project pumps shall not be used to produce test pressure.
2. Field erected refrigerant piping shall be tested with a halide leak detector.
3. No loss in pressure will be permitted. Leaks detected shall be repaired by tightening, re-welding joints, or replacing pipe and fittings. Caulking of joints will not be permitted.
4. Provide notice of test to engineer/architect for witness of test. Provide engineer/architect results of test in writing on contractor letterhead.

G. Air Distribution Systems

1. Ductwork classified and constructed as pressure class 3" W.G. and above shall be tested for leakage. Leakage test shall be as outlined in AABC for Total System Balance. Test pressure and allowable leakage rate shall be as indicated in the table below. Pressure class and test pressure shall be positive (+) on fan system discharge side and negative (-) on fan system suction side.

TABLE 1 - DUCT LEAKAGE

Pressure Class	*Test Pressure*	*Maximum Leakage*
(3)"	3"	1.0%
(4)"	4"	1.0%
(6)"	6"	1.0%
(10)"	10"	1.0%

2. Ductwork in pressure classes less than +3" W.G. shall be tested for leakage. Leakage test shall be as outlined in AABC for Total System Balance. Test pressure and allowable leakage rate shall be not greater than 2.0%. Pressure class and test pressure shall be positive (+) on fan system discharge side and negative (-) on fan system suction side.
3. Provide notice of test to engineer/architect for witness of test. Provide engineer/architect results of test in writing on contractor letterhead.

H. Sanitary Sewer Systems Outside the Building

1. The sanitary sewer system shall be tested for leakage by either infiltration tests or exfiltration tests, as appropriate. Prior to testing for leakage, the trench shall be backfilled up to at least the lower half of the pipe. Backfill shall be placed to prevent pipe movement during testing, leaving the joints uncovered to permit inspection. Visible leaks encountered shall be corrected regardless of leakage test results. Leakage as measured by either the infiltration test or exfiltration test shall not exceed 0.15 gallons per inch diameter per 100 feet of pipe line per hour. When leakage exceeds the maximum amount specified, satisfactory correction shall be made and retesting accomplished.
2. When the water table is 2 ft. or more above the top of the pipe at the upper end of the pipe line section to be tested, an exfiltration test shall be made by filling the line to be tested with water so that the head of at least 2 ft. is provided above the water table and the top of the pipe at the upper end of the pipe line to be tested. The filled line shall be allowed to stand until the pipe has reached its maximum absorption, but not less than 4 hours. After absorption, the head shall be re-established. The amount of water required to maintain

this water level during a two-hour test period shall be measured and shall not exceed exfiltration rate specified hereinbefore.

3. Provide notice of test to engineer/architect for witness of test. Provide engineer/architect results of test in writing on contractor letterhead.

I. Natural Gas Systems

1. All piping shall be tested pneumatically and proved tight at a pressure of 100 psi for a period of not less than 4 hours. No loss in pressure will be permitted Leaks detected shall be repaired by tightening, rewelding joints, or replacing pipe and fittings. Caulking of joints will not be permitted.
2. Gas piping, installed within conduit under concrete slabs, and the conduit shall be tested prior to pouring of the concrete slab.
3. All gas pressure test are to be witnessed by owner's representative, no exception.

J. Compressed Air

1. Not used.

K. Roof Drainage System

1. Not used.

3.09 FLOOR AND CEILING PLATES (ESCUTCHEONS)

A. Where any pipe or risers pass exposed through walls, partitions, floors or ceiling, use chrome-plated floor and ceiling plates.

B. Plates shall be large enough to completely close the hole around the pipes and shall be round with the least dimension not less than 1-1/2" larger than the diameter of the pipe. Plates shall be secured in an approved manner.

3.10 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:
    a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.

c. Insulated Piping: One-piece, stamped-steel type with spring clips.

d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.

e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece or Split-casting, cast-brass type with polished chrome-plated finish.

f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated finish.

g. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type with concealed or exposed-rivet hinge and set screw or spring clips.

h. Bare Piping in Equipment Rooms: One-piece, cast-brass type.

i. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

2. Existing Piping

a. Not used.

3.11 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.12 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

B. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.

C. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.

D. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.

E. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

F. Install anchor bolts to elevations required for proper attachment to supported equipment.

G. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

H. Use 5000-psi, 28-day compressive-strength concrete and reinforcement

I. Provide #5 rebar 12" on center each way.

J. Refer to detail sheets for typical concrete equipment pad detail.

K. Contractor to install 4" wide reflective acrylic self-adhesive vinyl black/yellow striped caution/warning tape on vertical rise of all concrete housekeeping pads, tape to be incom manufacturing model #rst146, tape to meet ASTM D-4956-99, submit submittal of tape to engineer for review.

3.13 GROUTING

A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Clean surfaces that will come into contact with grout.

B. Provide forms as required for placement of grout.

C. Avoid air entrapment during placement of grout.

D. Place grout, completely filling equipment bases.

E. Place grout on concrete bases and provide smooth bearing surface for equipment.

F. Place grout around anchors.

G. Cure placed grout.

3.14 ADDITIONAL CLOSE-OUT DOCUMENT REQUIREMENTS

A. LEAD CONTENT CERTIFICATE: As part of the close-out documents, the contractor is to include a certificate stating that the lead content in the domestic water system complies with governing code and Health Department criteria. A test shall be made at each faucet, spigot, drinking fountain, and any other fixture drinking water may be obtained.

B. Contractor to provide a set of plans shows valve schedule & valve location on plans (full size set, 24"x36 plans). Plans to have valve type, manufacturer and model #. Also provide replacement part contact information for each valve.

C. Contractor shall provide a minimum of three (3) sets of record documents of fire protection system. Contractor shall instruct designated owner personnel on system.

3.15 TROUBLESHOOTING

A. By Contractor: If, during the start-up or warranty period, mechanical systems operational problems occur for which the root cause is not readily apparent, Contractor shall promptly, through a Subcontractor or other resource designated by Subcontractor, provide diagnostic and investigative services to determine the cause or causes.

B. By Engineer:

1. At Contractor's request, Engineer will provide the services necessary to determine the cause or causes of the operational problems.

2. Under the provisions of the General Conditions, Engineer will also provide these services if Contractor fails to respond satisfactorily to operational problems within a reasonable time after written notice from Engineer.

3. If while working at Contractor's request or under the provisions of the General Conditions, Engineer determines that the problems are due to failure of the Work to comply with the requirements of the Contract Documents, Owner will compensate Engineer for additional services and deduct the amount paid from payment or payments to Contractor.

3.16 DIVISION OF WORK

A. In accordance with the general conditions, contractor is responsible for dividing the work among the subcontractors and suppliers and for delineating the work to be performed by specific trades. Any mention of mechanical and/or plumbing contractor, control and/or electrical contractor are suggestions as to how the work may be divided. This is not a complete list of all the work. It is the contractor’s responsibility that a complete and entire system is to be installed.

3.17 FIRE RATED WOOD

A. All wood as specified within these construction documents (mechanical, plumbing, sprinkler plans and specifications) shall be of the fire rated type. PYRO-GUARD treated wood as manufactured by HOOVER treated wood products.

3.18 ADDITIONAL TRAINING

A. In addition to all training specified herein, the contractor shall provide the additional training services to the owner:

1. An “Owner Training Coordination Meeting” shall be the first training session and it shall be conducted by the Installing Contractor. This training session shall be conducted upon completion of construction and just prior to Owner Occupancy. This session shall be approximately be one hour long and consist of a tour of the facility to show the location, type, and brands of equipment, include a basic high level description of the system. This

session shall conclude with Maintenance Foreman providing a list of equipment where they want additional training. This session has two functions as follows:

a. First, it allows maintenance foreman to become familiar with equipment location. This coupled with their general knowledge of Systems allows them to respond to and investigate potential warranty issues before turning over the issue to the contractor.

b. Secondly and at the conclusion of this session, the Maintenance Foreman, after having seen the equipment installed has the opportunity to determine if they want the specified Owner training for each piece of equipment. The Maintenance Foremen shall make the decision based on staff knowledge. For example, the HVAC Crew may not want to sit through training because their entire staff sat through 5 prior trainings in the last 2 years for a particular piece of equipment. However, they may choose to have training if they have hired new technicians since last training.

2. The traditional “Owner Training” shall be conducted during the second training session. This session shall be conducted as the Final Punch List Item. It shall be not be scheduled until all equipment is completely operational, Testing and Air Balancing Work has been completed, and the HVAC Building Automation System has been completed and commissioned. This training Session shall include the following:

   a. Basis of Design – To be conducted, via telephone, by Designing Engineer for Mechanical Systems including items like hydronic pumping configurations, unique system components, fresh air theory, etc.

   b. Equipment Training – To be conducted by Vendor/Manufacturer’s Rep for each piece of equipment requested during the Owner Training Coordination Meeting.

   c. HVAC Building Automation Training – To be conducted primarily by the Installing Contractor and then EMS System Integrator.

   d. Allow at least 2 hours for each system. Total training to be at least 40 ours due to the owner.

3. The vendors will then supply brief refresher training at approximately 6 months from the date of substantial completion. Allow at least 4 hours for each system.

4. The vendor will then supply in depth training at 10 months from the date of substantial completion. This training will include all maintenance and operation requirements of each piece of equipment and system and in depth training on control systems. Allow at least 8 hours for each system.

5. All training to be videotaped and supplied to owner & architect/engineer on DVD format.

3.19 FILTERS

A. Construction Filters - Provide MERV 13 high efficiency filters, with rolled filter media clipped over return air grilles for course filtration. All filters to be replaced during construction as needed. Replace all filters after construction with an additional set to the owner.

   a. The contractor is responsible for maintaining keeping the equipment, filters and ductwork clean during construction and that the mechanical system shall see minimal run time prior to owner’s acceptance (for startup & testing/balancing purposes only). During construction, the contractor shall provide and maintain for the HVAC a minimum of a MERV 13 high efficiency filters with rolled filter media clipped over return air grilles for course filtration. All filters shall be replaced as needed during construction and with permanent filters upon completion of project. Condenser coils shall also be maintained as needed. If allowed to get dirty, the contractor shall clean all air handling units, condenser coils, ductwork, piping and all associated items at no cost to the Owner.

B. Contractor to provide a complete list of permanent filters with the filter sizes, type, equipment being filtered and location of filter. Submit list to owner prior to substantial completion.

3.20 TRENCHING AND BACKFILLING OUTSIDE BUILDING SLAB

A. Clearing and Grubbing - The Contractor shall clear and grub the surface areas and remove surface materials of whatever nature encountered, over the line of and to either side of the trenches where the piping systems are to be installed. Existing sidewalks, driveways or other cement or asphalt surfaces which are to remain and have been damaged during excavating shall be repaired to match the adjacent work in material and finish.

B. Trenches:

1. Prior to any excavating or trenching, the Contractor shall contact the regional underground utilities notification program (Louisiana One Call) for assistance in securing the location of any underground utilities that may be affected by this work.

2. Trenches shall be dug so that pipe can be laid to the alignment, depth and slope indicated. Excavation shall be only so far in advance of the pipe laying as to reveal any obstructions, but never more than 100' in advance of the pipe installation unless specifically approved by the Architect/Engineer. Trenches shall be graded such that each section of pipe will rest upon the trench bottom for the full length of its barrel. Provide bell holes at each joint as required for this purpose.

C. Dewatering:

1. Remove any water which may be found or may accumulate in the trenches and excavations and shall perform the work necessary to keep them clear of water while the work is in progress, or as may be required for inspections. Use due vigilance and care so that no water originating on his work, or due to his work, which he is obligated to handle and dispose of under his contract, shall discharge or be discharged upon the work or into the trenches of another contract, unless by mutual agreement of parties affected. should any dispute arise from this cause, the matter shall be referred to the Architect/Engineer for final settlement.

D. Bedding and Backfill:

1. Bedding and backfill material shall be river sand. Backfilling shall not begin until the pipe work to be covered has been inspected by the Architect/Engineer. The Architect/Engineer reserves the right to order any trench backfilled at any time after installation of pipe, if, in his opinion, the particular trench remaining open constitutes a public nuisance. Settlement of backfill in trenches excavated for work of this Division shall be the responsibility of this Division. Trenches shall be refilled as often as necessary to bring them back to required or original grades.

2. Bedding under pipe - Trenches shall be bedded by hand. A 6" layer of river sand shall be placed in the trench and compacted and graded prior to installing the pipe. After the pipe is installed, river sand shall be carefully placed in 3" layers on both sides of the pipe and compacted and graded by hand. The sand shall be deposited in the trench for its full width on each side of the pipe, fittings and appurtenances, simultaneously.

a. Backfilling to 1' above pipe - From the centerline of the pipe, fittings and appurtenances to a depth of 1' above the top of the barrel of the pipe, the trench shall be backfilled by hand or approved mechanical means with river sand. Use special care in placing this portion of the backfill so as to avoid injuring or moving the pipe or disturbing the pipe hangers. This part of the backfill shall be compacted by method approved by the Architect/Engineer.

b. Backfilling to grade - From 1' above the barrel of the pipe up to grade, the trench shall be filled with river sand. Backfill shall be compacted by methods specified in DIVISION 2 - SITEWORK or to 95% maximum density per ASTM D1557 (modified proctor). Where sheeting and bracing are removed from the trench or excavation as backfilling progresses, care shall be taken to insure that voids left by the withdrawn timbers are carefully and thoroughly compacted and that pipe hangers are left vertical and plumb.

3.21 DISPOSAL OF EXCESS EXCAVATED MATERIAL

A. Excess fill taken from excavations shall, unless otherwise provided in the Contract Documents, be removed as soon as possible as work of this Division.

3.22 SUB-SURFACE OBSTRUCTIONS

A. Care must be taken not to disturb, injure or remove any pipes, cables, conduits or other underground structures or utilities that are to remain. As work of this Division, shore-up and protect underground piping, conduit structures or utilities which may be endangered during the work and maintain such structures and utilities during construction. Sub-surface obstructions shall be uncovered in advance of construction so that the method of avoiding same may be determined before pipe laying reaches the obstruction.

B. In the event subsurface structures, pipes, cables, conduits or utilities are broken or damaged in the execution of the work, the User Agency and proper authorities shall be notified and proper repairs shall be made, as work of this Division, to the satisfaction of the Architect/Engineer and authorities involved. Damage to persons or property caused by such breaks shall also be the responsibility of this Division. The change or rearrangement of any underground structures which may interfere with the construction of the work of this Division.

3.23 SHEETING AND SHORING

A. Sheeting and shoring shall be placed in excavations and trenches as required to suit the ground conditions and to properly and safely support the excavations and trench walls and any adjacent structures. Placement of the sheeting and shoring in the trench shall not restrict the excavation and trench width specified in other Sections. Sheeting and shoring for excavations and trenches less than five feet in depth may be of treated wood. Wood indicated to remain in excavations and trenches shall be treated type. Sheeting and shoring for excavations and trenches greater than five feet in depth shall be of steel construction.

B. The Contractor shall employ a Civil Engineer registered in the state of this project to design the steel sheet piling system required for excavations of five feet or greater. The Contractor shall submit one copy of the Engineer's sealed calculations and drawings to the Architect/Engineer for record and file purposes only. The Contractor shall be responsible for the design and construction of the sheet piling system.

C. Unless otherwise instructed by the Architect/Engineer wood sheeting, shoring and bracing shall be cut-off at an elevation of 24" below finished grade. The lower portion of the sheeting and bracing below grade shall remain in the ground. If instructed by the Architect/Engineer to remove the wood or steel sheeting and shoring it shall not be removed until backfilling is completed.

3.24 RESTRAINED JOINTS

A. Restrained joints shall be provided for underground water mains 4" and larger and sewer force mains at each change of direction 11 ¼ degrees or greater and at tees. Restrained joints shall be installed per NFPA 24.

3.25 FRICTION LOSSES, ELECTRICAL RATINGS AND SPACE REQUIREMENTS

A. The values of air and water friction losses, electrical current ratings and space requirements for various pieces of equipment, as contained in these specifications or as scheduled, are estimated values and sizes and have been used in obtaining specifications for equipment and for sizing ducts, pipe, electrical wiring and motor controls. Any necessary changes in any of these items resulting from values other than the estimated ones shown shall be the responsibility of the Contractor and shall be subject to the approval of the Architect/Engineer. The Contractor shall pay any costs for additional labor and material required including costs of any other Contractor involved. Should substitute equipment require different requirements from that shown on the drawings, the Contractor shall be responsible for the cost of the changes. Any such changes must be approved by the Architect/Engineer.

3.26 CHANGES TO PIPING OR DUCTS

A. Should the Contractor desire to make changes in the routing or arrangement of piping or ducts, whether for his own convenience, to avoid conflict with the work of other trades, or to conform to local codes, such changes shall not be made without the prior approval of the Architect/Engineer.

3.27 OPERATING INSTRUCTIONS

A. Prior to the time scheduled for occupancy, the Contractor shall provide the services of a competent mechanic to instruct the User Agency in the care and operation of equipment. Before final acceptance, the Contractor shall prepare and deliver to the Architect/Engineer three bound copies of operating instructions, which shall be contained in a hard back loose lease type binders, divided into a suitable number of volumes so as to permit easy reference and shall include:

1. Description of major components of systems, including the function of major items.

2. Detailed operating instructions and instructions for making routine minor adjustments.

3. Routine maintenance operations.

4. Manufacturer's catalog data, service instructions wiring diagrams, fabrication drawings and parts list for each piece of operating equipment.

5. Copies of equipment submittals and shop drawings, including review sheet, reviewed by and acceptable to the Architect/Engineer.

6. Guarantee and Warranty Information.

7. Names and telephone numbers of subcontractors and suppliers.

3.28 WORK RELATED TO EQUIPMENT NOT FURNISHED AS WORK OF THIS DIVISION

A. Unless specifically indicated otherwise, any required mechanical services for and required mechanical connections to items indicated on the drawings or in the specifications or items provided by User Agency shall be mechanically connected as work of this Division. The Contractor shall provide piping, valves, traps, etc., as required for complete operation of each piece of equipment.

3.29 DISSIMILAR METALS

A. Inert NSF/FDA lines dielectric nipples shall be provided between copper, bronze or brass piping material or valves and steel piping material or steel tanks. Dielectric nipples and brass or copper unions or flanges shall be provided at cast iron valves and equipment where hereinbefore specified for equipment maintenance. Dissimilar metals shall be isolated from surface contact with Each other by the use of a non-conductive material, tape, etc.

3.30 OPENINGS, GROUNDS AND CHASES

A. Openings, grounds, chases and lintels will be provided under other Divisions, as directed by this Division, to accommodate the piping, ductwork and equipment. Sleeves and prepared openings shall be accurately located in slabs or walls before pouring of concrete. It shall be the responsibility of this Division to verify that openings and chases are properly located. Openings associated with work of this Division. Coordinate location of grease ducts through roof and arrange for roof framing to be relocated to avoid offsetting of ducts.

B. Holes through existing concrete shall be either core drilled or saw cut. Drilled or cut holes required shall have the approval of the Architect/Engineer prior to cutting or drilling. Sleeves set in openings cut in existing masonry or concrete walls or concrete slabs shall be one pipe size smaller in outside diameter than the cored hole. The sleeve shall be grouted in place with non-shrinking waterproof grout. Where piping is installed through smoke and/or fire separations, fill annular space between sleeve and piping with safing or fire barrier material.

3.31 PROTECTION OF WORK

A. The Contractor shall protect equipment, fixtures and work from damage. Damaged work will be rejected and replaced at the expense of the Contractor. Where possible, rooms containing new plumbing fixtures shall be kept locked until the building is turned over to the User Agency. Immediately after installation of each plumbing fixture, it shall be covered with a fixture protector.

B. Mechanical equipment shall be protected from and from the weather. Provide adequate and proper storage facilities for items during the progress of the work.

3.32 PROJECT CLOSEOUT DOCUMENTS

A. Prior to the final acceptance of the project the Contractor shall deliver to the Architect/Engineer for review, the following in two three-ring binders:

1. Certificates of approval from local regulatory agencies.

2. Extended equipment warranties.

3. Signed receipts showing that keys to access doors, locked equipment, underground valve wrenches and vandal-proof screwdrivers have been delivered to the User Agency.

4. Valve tag list.

5. Operating instruction manuals which shall include copies of reviewed submittals and shop drawings include review sheet.

6. Results of potable water sterilization tests.

7. Performance tests of backflow preventer.

8. NFPA 13 acceptance certificates for the sprinkler systems.

10. Copy of reviewed sprinkler system shop drawings.

11. Signed receipt showing that the hydronic temperature/pressure test kit has been delivered to the User Agency.

12. HVAC test and balance reports.

13. Record drawings.

B. Final payment will be withheld until each applicable item has been provided to and is found satisfactory by the Architect/Engineer.

END OF SECTION

8-21-26

SECTION 20 0111 - ENVIRONMENTAL CONTROL SERVICES

PART 1 GENERAL

1.1 SUMMARY

A. The purpose of the specification is to define the approved methods and equipment or the use of temporary dehumidification/air conditioning system during construction.

B. The dehumidification system shall be part of the General Contract. Any extra hardware, components or accessories, i.e., duct work, temperature control, transformers, inlet/outlet transitions, etc. Shall be considered incidental with no separate payment for any of the above items.

1.2 SUBMITTALS

A. Dehumidification supplier shall provide drawings showing equipment placement and sizes, air distribution and power cable routing.

PART 2 GENERAL

2.1 ENVIRONMENTAL CONTROLS

A. Dehumidification / Air conditioning equipment shall be used to control the environment in the space 24 hours a day while interior finishes are being stored or installed.

2.2 TEMPERATURE CONTROLS

A. Auxiliary heat, cooling and/ or insulation may be necessary to maintain the temperature at a level acceptable to the contractor performing the reconstruction inside the work space. This auxiliary equipment must be approved for use by the dehumidification/ Air conditioning equipment supplier and shall meet the following requirements.

1. Heaters and refrigerant-type systems will be installed in the process air supply between the dehumidifier and the space as close to the space as possible.
2. Only, electric, indirect gas fired and steam coil auxiliary heaters will be used. No direct fired space heaters will be allowed during the construction.
3. Heaters will be equipped with controls that automatically turn the heater off if the airflow is interrupted or the internal temperature of the heater exceeds its designed temperature or that of the supply duct.
4. Seal the area where dehumidification is introduced to allow the air to escape away from the entry point while maintaining a slight positive pressure unless dust from the operation is hazardous. The design of the filter system, if necessary, will be designed so that it does not interfere with the dehumidification equipment's ability to control the relative humidity and temperature parameters in that space. Do not re-circulate the air from the space or from filtration equipment back through the dehumidifier during reconstructions unless authorized by the dehumidification supplier.

2.3 SPECIFIED EQUIPMENT SIZE AND TYPE

A. Style and size of equipment will be determined by the contractor. The style and size may vary depending on volume of air space needing to be controlled, time of year, containment of area, and any other requirement that may diminish the ability to control the environment.

1. Basis of bid to be 250 square foot per ton of HVAC.

2.4 POWER

A. The required electrical power will not be supplied by the owner. The necessary voltage and amperes needed for operation will be coordinated with the general contractor. The contractor is responsible for providing temporary power necessary to energize the dehumidification/ Air conditioner system.

PART 3 EXECUTION

3.1 INSTALLATION

A. The contractor shall install dehumidification/ Air conditioning equipment in accordance

with manufacturer's written instructions and approved submittals.

B. Dehumidification/ Air conditioning supplier will use flexible duct and temporary ducting to distribute the dry air through the controlled space. Distribution of dry air will be decided by the dehumidification supplier and the general contractor.

C. Temporary power cord will be used to energize the dehumidifiers / Air conditioners.

END OF SECTION

8-21-26

SECTION 20 0200 - MISCELLANEOUS MECHANICAL REQUIREMENTS

PART 1 GENERAL

1.01 GENERAL

A. The term Contractor refers collectively to the general contractor and his subcontractors, and does not distinguish between the parties. The General or Prime contractor is solely responsible to the Owner for coordinating all work between different trades. Any required work not included in subcontractor's contract will be performed at the General or Prime Contractor's expense.

B. Contractor shall furnish and install complete operating systems including all equipment, materials and accessories indicated on the drawings, in the specification, or as required for a complete working system.

C. All equipment shall be stored, handled, installed, tested, calibrated and placed in operation in strict accordance with the manufacturer's recommendations.

D. Equipment manufacturer's representative shall be on site at the time of start up for all equipment. Equipment shall not be placed in operation until manufacturer's representative confirms that all system parameters are approved for start-up.

E. Any additional work caused by prior approved equipment substitutions shall be at the Contractor's expense.

F. All work shall be performed in accordance with the International Building Code. Miscellaneous construction materials required to meet code requirements shall be furnished and installed by the Contractor at the Contractor's expense regardless of whether or not such items are specifically detailed on the Contract drawings. The Contract Drawings are schematic in nature and are not intended to show every detail or component required for a complete working system and complete Code conformance.

G. Contractor shall provide any field wiring and auxiliary equipment or component required by equipment manufacturer's installation instructions and detailed wiring and control diagrams for proper interlocking and safe operation of the equipment. Contractor shall provide cooling water piping, control power supply, and any other utilities or auxiliary components required for proper operation.

H. All equipment drain connections, etc. shall be piped full size to nearest floor or hub drain. Minimum drain line size shall be 1-1/4".

I. Provide adequate clearances around all equipment in accordance with manufacturer's recommendations for proper service, maintenance, and operation of the equipment.

J. Provide OSHA approved belt and coupling guards on all rotating equipment.

K. Any modification of construction details shown on the contract drawings which are necessary to suit actual equipment certified dimensional data or field conditions shall be approved by the Architect. The Contractor will not receive any additional compensation for minor changes in construction details required to accommodate job site conditions, equipment dimensions, etc. A complete job and good workmanship are required.

L. All openings through walls, floors and roof provided for equipment, piping or conduit shall be properly framed, caulked, and flashed to insure water tightness and weather protection. Provide fire stop sealant system in accordance with code requirements.

M. All steel materials used for construction shall be stainless steel, painted steel, or galvanized steel. Bare steel will not be acceptable under any circumstances.

N. Contractor shall provide fire dampers, smoke dampers, smoke detectors and firestats as shown on the drawings and as required by Code.

O. Vibration mountings shall be installed under mechanical equipment to protect the finished installation from objectionable noise and vibration. Flexible connections shall be installed in piping and duct work systems where necessary to prevent transmission of vibrations and noise.

P. Where there is a conflict between information shown on contract drawings, specifications Code requirements or industry standards, etc., the strictest and most conservative interpretation shall

govern. In the event of a discrepancy between new and existing materials, Contractor shall assume the material to be new. If any item is indicated to be new any place on the drawings or in the specifications, the item in question shall be include in the Contractor's bid as new equipment or material.

Q. Contractor shall not furnish, install, or utilize any equipment, products, or product components that contain any amount of asbestos material in any form.

R. The Architect will have the authority to order minor changes in the work not involving an adjustment in the Contract Sum or the Contract Time and not inconsistent with the intent of the Contract Documents in accordance with AIA Document A201-1976.

S. All shop drawings and product data submittals shall include a written, signed statement of total compliance with the Contract Documents. All product data shall be manufacturer's published data. Approval of shop drawings does not relieve the Contractor of responsibility to comply with the Contract Documents. NO SUBSTITUTIONS OR VARIATIONS WILL BE ACCEPTED EXCEPT AS CLARIFIED BEFORE THE BID DATE BY ADDENDUM.

T. Coordination with electrical: Contractor to submit copy of any & all shop drawings that indicate electrical requirements to the project electrical engineer for electrical service & electrical load verification. Applicable to all mechanical items.

U. All materials for new work shall be new and not used.

V. All multi-blade dampers used in HVAC systems shall be U.L. listed and certified to meet U.L. Standard 555S, Class 1 leakage.

W. Fire Rated Wood: All wood as specified & mentioned within these construction documents (mechanical, plumbing, sprinkler plans and specifications) shall be of the fire rated type. PYRO-GUARD treated wood as manufactured by HOOVER treated wood products.

X. All exhaust and fresh air penetrations through sidewalls shall be a minimum 10'-0" above adjoining grade.

Y. ADDITIONAL CLOSE DOCUMENTS: Contractor to provide a set of plans shows valve schedule & valve location on plans (full size set, 24"x36 plans). Plans to have valve type, manufacturer and model #. Also provide replacement part contact information for each valve.

Z. The contractor shall submit to the mechanical engineer, as soon as feasible after award of the contract, equipment room layouts at a scale not less than 1/4" = 1'-0" showing the layout of the actual equipment to be used and all necessary clearances. This drawing is to comprehensive of all trades as to eliminate conflicts. The contractor will be responsible to verify all access for maintenance as required by the manufacturer.

AA. All sprinkler heads shall be located in center of ceiling tiles where applicable. Any relocation of heads shall be at contractors expense in order to center heads in tile. Sprinkler head layout, if shown, is a guide only, contractor shall add sprinkler heads as required to meet all requirements of NFPA 13 and 2001.

BB. Maintain a minimum 5'-0" horizontal separation between building drain or building sewer and underground water service piping per section 608.3 of International Plumbing Code (current edition). Should sewer and water pipe cross, the water pipe shall be installed above the sewer a minimum of 12".

CC. STAINLESS STEEL PIPE HANGERS:

A. Provide stainless steel pipe hangers for all piping located under building slab.

1. Piping up to 6" (Outer Diameter) and less shall utilize 1/4" thick stainless steel hanger rods.

2. Piping greater than 6" (Outer Diameter) up to 10" (Outer Diameter) shall utilize 3/8" thick stainless steel hanger rods.

3. Piping greater than 10" (Outer Diameter) shall utilize 1/2" thick stainless steel hanger rods.

B. Hanger rods to span two (2) steel re-bars with 90 degree bend (2" in length) at ends of hanger rods within slab.

C. Twist hanger rods tightly around top of piping two (2) complete 360 degree turns.

D. Provide hanger rods every 4'-0", at all changes in directions, and at all fittings & joints.

DD. This Section shall apply to all work in Division 20, 21, 22 and 23.

1.02 DRILLING FLOOR SLABS AND WALLS

A. Holes through the concrete floor slabs and masonry walls for chilled water and drain piping shall be made with rotary masonry core bits. Diamond tip cutters are recommended, but not required.

B. The use of a jack hammer or any other impact tool for drilling or coring is prohibited.

C. Layout the hole locations, pipe diameters including insulation and furring around pipes before drilling any holes for the pipes. Drill a small pilot hole and check the floor slab from the bottom to be sure that the pipes will miss all beams and joists.

D. Water pipe insulation shall be continuous through the holes. Heating water and drain pipe insulation shall be interrupted at the holes to permit minimum size holes through the floor slabs.

E. The annular space around floor penetrations shall be packed with rated fire proofing material.

1.03 CONCRETE FASTENERS

A. Fastenings set into concrete to support pipe, air handlers and other mechanical equipment shall be steel or malleable iron expansion shields set in proper size drilled holes. Do not exceed the manufacturer's rated pull out load. The manufacturer's rated load must be based on a factor of safety of 5 or else the allowable load must be reduced to give a factor of safety of 5. Self drilling Rawl Saber Tooth or Phillip Red Heads may be used. Anchors using lead, plastic or shields of any material other than steel or malleable iron shall not be used.

B. Powder actuated fasteners, Hilti or Ramset, may be used for loads applied with a factor of safety of 5 but not more than 300 pounds for the largest size. The powder charge shall be found by trial and shall be the smallest charge that gives full insertion into the concrete. These fasteners may be used for ductwork and small pipe.

C. Suitably located existing inserts which were cast into the concrete at the time of construction may be reused.

1.04 PROTECTIVE COATING FOR UNDERGROUND PIPING

A. Underground pipe and fittings including the portion through the floor shall be protected against corrosion by application of protective coatings.

B. Prior to coating, pipe and fittings shall be cleaned of all rust, scale, dirt, and oil.

C. Pipes and fittings shall be given a wash coat of epoxy primer having a dry film thickness of 1.5 - 2.0 mils. Over the primer apply two coats of coal-tar base epoxy coating, each having a dry film thickness of 6 mils.

D. Coatings shall have a holiday test using a ½" spark. Recoat any areas not passing test.

E. Provide for all underground metal piping up from grade.

F. 2-Part coal-tar epoxy to be Carboline 300M or prior approved equal.

1.05 EMS (TEMPRATURE CONTROLS) CONDUIT AND BOXES

A. UNDERGROUND EMS CONDUIT: Rigid Nonmetallic Conduit (RNMC): Schedule 40, rigid polyvinylchloride, rated for 90 degrees C conductors, with pull string, solvent cement connectors and couplings. Nonmetallic strap hangers allowing thermal expansion movement. Conduit to meet NEMA TC-2; fittings to meet NEMA TC-3. Expansion Coupling: Nonmetallic to compensate for thermal expansion.

B. EMS CONDUIT WITHIN BUILDING: Shall be hot dipped galvanized rigid steel conduit. All conduits shall be new and shall bear the inspection label of the Underwriter's Laboratories, Inc. Metallic conduit shall be hot-dipped galvanized. Fittings for conduit shall be an approved type specially designed and manufactured for their purpose. Rigid metal conduit fittings, bushings, and other components shall be galvanized. Setscrew connector fittings shall not be permitted.

All fittings for rigid steel or aluminum conduit shall be threaded and coupled unless specifically approved otherwise by the Engineer.

C. Pull Boxes: Communication/EMS ground mounted pull boxes shall be polymer concrete, ANSI/SCTE 77 2002 – Tier 22 rated, provide dimensions indicated on the drawing. Open bottom. Cover to be labeled “Communications”. Secure cover with stainless steel standard hex head bolts. Covers shall be traffic rated. ALL PULL BOXES TO BE SIZED IN ACCORDANCE TO NEC (NATIONAL ELECTRIC CODE).

D. Stainless Steel EMS Enclosure: NEMA 3R enclosure (UL 508A Listed). Manufactured from Type 304 16 gauge stainless steel; 16 gauge doors and 14 gauge bodies, Minimum-width body flange provides maximum body opening, Pre-cut gland plate openings in the bottom of the enclosure with a seal to ensure protection, External formed 90 degree body flange, Door opens 210 degrees, Mounting holes in back of body for direct mounting or for optional external mounting brackets, Type 316 stainless steel hinge pins, Corner-formed doors are easily removed by pulling clip-style hinge pins, Quarter-turn latches furnished with 3mm double-bit insert, Seamless foam-in-place gasket, Self-grounding latch system with double seal, Grounding stud on the body, Full-sized galvanized steel back panel included, Bonding provision on the door, Furnished hardware kit includes: gasketed gland plates and hardware, grounding hardware and sealing washers for wall-mounting holes, Three-point latching, Finish: Door and body have smooth #3 brushed finish. Hoffman medium GL66 series stainless steel wall mount enclosure.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Fasteners of the type set into concrete by drilling shall be self drilling Rawl Saber Tooth or Phillips Red Heads.

B. Powder actuated fasteners shall be Hilti or Ramset.

PART 3 EXECUTION

3.01 INSTALLATION

A. Follow manufacturer's instructions and use setting tools procured from the manufacturer of the drilled-in anchors to expand the shields.

B. Underground EMS conduit to be installed in strict accordance with National Electric Code with pull boxes at every fourth bend, no more that three (3) turns without installation of pull box. Provide pull boxes at every 200' and at all changes of direction.

END OF SECTION

8-21-26

SECTION 20 0213 - BASIC PIPING

PART 1 GENERAL

1.01 GENERAL

A. Scope
   1. This section covers the minimum basic requirements of above ground piping systems. For details refer to APPLICABLE SECTIONS below.

B. Codes
   1. The work performed shall comply with the applicable codes of ANSI, NFPA and the current edition International Plumbing Code.

PART 2 PRODUCTS

2.01 PIPING, FITTINGS AND VALVES

A. Materials shall be in accordance with the Line Specifications appended to the APPLICABLE SECTIONS of these specifications.

2.02 HANGERS

A. Refer to Section 20 05 29: HANGERS AND SUPPORT DEVICES.

PART 3 EXECUTION

3.01 GENERAL

A. Connections, re-routing, and tie-ins to existing utilities shall be approved by and scheduled with the proper authorities to assure uninterrupted service throughout the facility. The Contractor shall be responsible for locating existing utility lines and will plan the relocation work so that service interruptions shall be of minimum duration.

B. Pipe shall be accurately cut to insure square ends and to measurements established at the site and shall be worked into place without springing or forcing, properly clearing all openings and equipment.

C. High points of the systems, other than refrigerant, shall be vented and low points provided with plugged drains, one-half inch (1/2") in size.

D. Fittings shall be used for all changes of direction or branch take-offs in the piping system except where specifically shown otherwise on the drawings. Mitering pipe to form elbows, cutting into straight runs to form tees, or any similar construction, is not permitted.

E. Dielectric joints shall be installed at all joining of dissimilar metals except valves.

F. Bushings for changes in line size shall not be permitted unless specifically indicated on the drawings.

G. Cutting or other weakening of structural members to facilitate piping installation will not be permitted unless approved by the Architect.

H. Piping shall not be used to support equipment, connected or otherwise, unless the plans and specification require such installation. When necessary, adequate temporary supports shall be installed during erection so as not to over-stress piping, or equipment to which piping is connected. Except as indicated on drawing details or required by other limiting conditions, all piping and equipment within buildings shall be entirely out of the way of equipment, lighting fixtures, doors, windows and other openings. Overhead piping in buildings shall be run in the most inconspicuous positions and parallel to the walls of the structures unless otherwise indicated on the drawing.

I. Adequate clearances shall be provided from walls, ceilings and floors to permit the assembly of joints. All control valves shall have ample clearance for disassembly without disturbing equipment or other piping.

J. Pipe sleeves shall be provided where pipes pass through masonry or concrete walls, roofs and partitions. Sleeves in outside walls in floor and roof slabs, shall be zinc-coated steel pipe

unless otherwise specified. Sleeves in partitions shall be sheet steel of 26 gage minimum. Space between pipe, or insulation and sleeve shall not be less than 1/4 inch. Sleeves shall be held securely in proper position and location. All sleeves shall be of sufficient length to pass through entire thickness of walls, partitions or slabs.

K. Take down joints shall be installed at all connections to equipment and fixtures; at all points where it is necessary to disconnect piping for repairs or maintenance; and on the control side of valves on branches and risers.

L. Start-up strainers shall be installed up stream and adjacent to all items of equipment. They shall be in service and cleaned periodically for ten full days of operation and then permanently removed from the system.

M. Painting and identification of piping, valves, hangers and supports shall be in accordance with SECTION 20 01 00 - GENERAL PROVISIONS. All exposed piping shall be painted and only black steel piping in concealed spaces shall be painted.

3.02 HANDLING AND STORAGE

A. Pipe and fittings shall be handled in such a manner as to prevent damage such as bending of metal pipes or cracking and breaking of plastic pipes. Care shall also be taken to keep both inside and outside free from dirt.

B. Plastic pipe shall be stored on racks with a minimum support spacing of three feet if delivered loose and if delivered in lifts, the lifts shall not be stacked more than three high

C. Fittings shall be kept free from dirt and stored indoors.

D. Solvents cements and primers for plastic pipe shall be handled and stored and the empty containers disposed of in a manner that provides the maximum safety to personnel and property.

3.03 INITIAL CLEANING

A. Minimum requirements for internally cleaning of piping systems shall consist of removing "loose" foreign materials such as scale, sand, weld spatter particles, cuttings, chips, etc. from inside of assembly by any suitable means such as a mechanically driven rotary cleaning tool or wire brush, etc; blowing out all loosened particles with dry compressed air; and inspecting the inside of pipe assembly for cleanliness.

3.04 SOLDERED JOINTS

A. The outside surface of the pipe where engaged in the fitting and the inside surface of the fitting in contact with the pipe shall be cleaned to a bright surface with an abrasive material before soldering. Apply a thin coating of flux to both the pipe and interior of the fitting before telescoping the two parts together.

B. Care shall be taken in the heating of the joints so that the solder will flash and provide a full solid joint.

3.05 THREADED JOINTS

A. Threaded joints shall be the American Standard Taper Pipe Thread (NPT), and shall conform to ANSI B 2.1. Pipe threads shall be cut sharp and smooth, and threading dies and taps shall have a threading stop to prevent overcutting the thread length. Power threading equipment dies shall have a 5 negative front rake when set on plastic pipe. Hand threading dies for plastic pipe shall have a 5 to 10 negative front rake.

B. In threading plastic pipe a tapered plug shall be inserted in the end of the pipe to provide support and prevent distortion to the pipe in the threaded areas. The liberal use of an external lubricant shall be used while threading.

C. After cutting and threading, the pipe shall be end-reamed to full internal pipe diameter. Before applying sealant, thread shall be wiped clean of cuttings and grit.

D. Thread tape sealant shall be used, applied on male threads only, and shall be PTFE type, Caulking of threaded joints to stop or prevent leaks shall not be permitted.

E. Where galvanized pipe has been threaded and connected, the exposed threads at couplings, fittings and appurtenances w\shall have a coat of corrosion resistant paint applied.

3.06 SOLVENT CEMENTED - PLASTIC

A. Apply primer to the pipe and freely in the socket keeping surface wet and applicator wet and in motion 5 to 15 seconds. Avoid puddling in the socket. Apply primer a second time to the fitting socket.

B. For checking penetration, scratch or scrape a few thousandths of the primed surfaces away. Repeated applications to either or both surfaces may be necessary. Weather conditions affect priming action. In cold weather more time is required for proper penetration.

C. Apply a full even layer of cement on the pipe O.D. for a distance slightly greater than the depth of the socket of the fitting. Coat the fitting socket with a medium layer, avoiding puddling. On belled end pipe, do not coat beyond the socket depth or allow cement to run beyond the bell. Put a second full even layer of cement on the pipe O.D. Cement layers must be without void and sufficient to fill any gap in the joints.

D. Immediately upon finishing cement application and before it starts to set, insert the pipe to the full socket depth while rotating the pipe or fitting a 1/4 turn to insure complete and even distribution of the cement. Hold joint together for a minimum of 10 to 15 seconds to make sure that pipe does not move or back out of the socket.

E. For pipe sized 6" and larger, a joining crew consisting of two men is required and the following additional steps necessary:
   1. Rotation of the pipe in the fitting may be omitted.
   2. Hold joint together for 1 to 3 minutes depending on pipe size.
   3. As an aid for joining in these larger sizes, it is recommended that a come-along or pipe joining tool be used.

F. Immediately, after joining and before joint is set, gently place it back onto a level surface, wipe off all excess cement from the circumferences of the pipe and fitting.

G. When the atmospheric temperature is above 90 F to avoid excessive evaporation of the solvent from the cement just prior to joining use one or a combination of the following:
   1. Shade or shelter the joint surfaces from direct exposure to the sun's rays for at least one hour prior to joining and during the joining process.
   2. Make cement joints during early morning hours.
   3. Apply cement quickly. On 6" and larger pipe, it is recommended that two men apply cement to pipe surface while the third applies it to the fitting socket.
   4. Join pipe to fittings as quickly as possible after applying cement.

H. All potable water pipes, pipe related products, and materials that join or seal pipes conform to ANSI/NSF 61.

I. All solvent cements and primers used to join and seal PVC materials shall comply with the requirements of ANSI/NSF 14.

3.07 PIPE SUPPORTS

A. Refer to Section 20 05 29: Hangers and Support Devices

3.08 ORDINARY CLEANING

A. Before cleaning a system such items as safety valves, level controls, orifice plates, strainers, rupture discs, all instruments not tagged or marked with a test pressure and all other items which may be damaged by the cleaning-flushing operation, shall be removed from the line.

B. Prior to testing all piping systems shall be cleaned and purged to the satisfaction of the Architect. The purge point for liquid and gas piping systems shall be lowest and highest points respectively in the system unless otherwise specified. The Contractor shall exercise due care in filling, flushing, purging, venting and draining piping systems. The Contractor shall be responsible for damage resulting from excess vacuums when draining piping systems.

C. All piping systems shall first be purged with compressed air at a pressure not greater than half of the system operating pressure. Purge duration shall continue until there is no visible discharges from openings or 10 minutes, whichever is greater.

D. All piping systems shall secondly be purged with the flow medium of the system. Flushing shall continue for 5 minutes or until the discharge is free of particulate matter, whichever is greater.

3.09 TESTING

E. The contractor shall furnish all test gauges, accurate relief valves to prevent over test-pressuring, the test medium, piping of the test medium, and where required, the necessary pumping device to develop and maintain the proper test pressure. Test gauges shall be supplied by the contractor and shall have dial diameters of a least 6 inches with scale capacity for test pressures. The gauge used on any test shall have a scale capacity of as close as possible to twice the specified test pressure using standard dials. All test gauges shall be checked on a dead-weight tester or shall be compared against a certified master gauge.

F. The Contractor shall be responsible for the removal of water used in testing from all piping systems including attached vessels. Where ditches or temporary lines to ditches are necessary, the Contractor shall provide same, and after use, such ditches or lines shall be removed, leaving the area in its original or equal condition as determined by the Engineer.

G. During hydrostatic testing, provision shall be made for the venting of trapped air at all high points and other places in the system where air pockets may occur.

H. A safety or relief valve may be used at the pressure source to protect systems under test. Pressure applied on any system shall not exceed the specified test pressure by any amount and any damage resulting from neglect of this requirement shall be the responsibility of the Contractor.

I. All the piping of the plumbing system shall be tested with water or air. After the plumbing fixtures have been set and their traps filled with water, the entire drainage system shall be submitted to final tests. The pressure has reached all parts of the system.

J. The water test for the plumbing system shall be applied to the drainage system either in its entirety or in sections. If applied to the entire system, all openings in the piping shall be tightly closed, except the highest openings and the system filled with water to point of overflow. If the system is tested in sections, each opening shall be tightly plugged except the highest openings of the section under test, and each section be filled with water, but no section shall be tested with less than a ten foot head of water. In testing successive sections at least the upper ten feet of the next preceding section shall be tested, so that no joint or pipe in the building (except the uppermost 10 feet of the system) shall have been submitted to a test of less than a ten foot head of water. The water shall be kept in the system, or in the portion under test for at least fifteen minutes before inspection starts; the system shall then be tight at all points.

K. The air test for the plumbing system shall be made by attaching an air compressor or testing apparatus to any suitable opening and after closing all other inlets and outlets to they system, forcing air into the system until there is a uniform gauge pressure of five pounds per square inch or sufficient to balance a column of mercury ten inches in height. This pressure shall be held without introduction of additional air for a period of at least fifteen minutes.

L. The potable water system in its entity or sections shall be tested in strict provisions of the International Plumbing Code, Current Edition.

M. SMOKE TEST - Contractor to smoke test all sewer vent piping prior to wall being closed up. For all CMU block walls smoke test to be performed when walls are 50% formed up.

1. When smoke testing a sanitary sewer system it is helpful to partially block off the section of sewer to be tested from the city main service line. This can be done by using a pneumatic sewer plug or rubber balloon for sealing off the building connections from main lines. Completely blocking the line can cause water to back up and prevent smoke from escaping through defects. Smoke testing may not be done after rain or when ground water is unusually high as this may also prevent detection of defects.
2. Smoke is created using either a smoke bomb or liquid smoke. Smoke bombs are lit and placed on a grate or in a holder on top of each fan, while liquid smoke is injected into the

fan via a heating chamber. The fans create a pressure differential that forces the smoke into the sewer at a pressure just above atmospheric. With properly installed plumbing, the traps will prevent the smoke from entering the building and redirect it out the plumbing vents. Defective plumbing systems or dry traps will allow smoke to enter the inside of the building.

3. The area around the section being tested is searched for smoke plumes. Plumes coming from plumbing vents or the interface between the fan shroud and cleanout rim are normal; however, smoke plumes outside of the cleanout rim are not. Plumes are marked, usually with flags, and defects are noted using measurements from stationary landmarks like the corners of the building. The plumes or markers may also be photographed.
4. Procedure: Equipment Required for building connections and laterals:
    a. Smoke bomb cartridges
    b. Electric blower producing 180 CFM @ 1.3 static pressure is recommended.
    c. Pneumatic sewer plug or rubber balloon for sealing off the building connections from main lines.
    d. Vent cap with open center hole to restrict the flow of air and smoke.
5. Building Connections
    a. It is not absolutely necessary to have the building line blocked off from the main, but doing so will increase test efficiency. In most cases there is a cleanout opening through which a plug or balloon can be inserted between the opening and the main, and then inflated. A length of windshield hose or similar type tubing can be attached to the balloon to facilitate inflation. Vents can be partially blocked allowing the air/smoke mixture to flow through the plumbing system.
    b. Connect the blower to the line at a cleanout and start introducing the smoke through the intake side. NOTE: A properly sized blower is important. Use of a blower with lesser capacity will not generate sufficient pressure to disclose all faults in a line and a blower with too great a capacity may blow water from traps.
    c. Check the interior of the building for smoke. Any smoke should be quickly ventilated by opening doors and windows. Notations should be made of leak locations. Next the yard should be checked for smoke and the location of any smoke marked for later correction of faults.
    d. Smoke will leave no visible residue to damage interior of buildings. It is irritating to breathe, but any irritation will quickly disappear once exposure has ceased. Of course special precautions should be taken with persons having respiratory problems of any kind.
    e. All buildings connected to the lines being tested should be checked for smoke. If a concentration of smoke is present, occupants should be evacuated and the building ventilated. If unvented, smoke will settle out of the air without leaving residue.

END OF SECTION

8-21-26

SECTION 20 0413 - ELECTRICAL PROVISIONS FOR MECHANICAL WORK

PART 1 GENERAL

1.01 SCOPE

A. Extent of electrical provisions to be provided as mechanical work is indicated in other Division-23 sections, on drawings, and as further specified in this section.

B. Types of work normally recognized as electrical but provided as mechanical, specified or partially specified in this section, include but are not necessarily limited to the following:
   1. Motors for mechanical equipment.
   2. Starters for motors of mechanical equipment.

C. Refer to Division 23 sections for specific individual mechanical equipment.

D. Refer to other Division 23 sections for specific individual mechanical equipment electrical requirements.

E. Refer to Division 26 sections for junction boxes and disconnect switches required for motors and other electrical units of mechanical equipment.

1.02 QUALITY ASSURANCE

A. Wherever possible, match elements of electrical provisions of mechanical work with similar elements of electrical work specified in Division 26 sections. Comply with applicable requirements of Division 26 sections for electrical work of this section which is not otherwise specified.

B. For electrical equipment and products, comply with applicable NEMA standards, and refer to NEMA standards for definitions of terminology herein. Comply with National Electrical Code (NFPA 70) for workmanship and installation requirements.

1.03 SUBMITTALS

A. Concurrently, with submittal of mechanical products listing submit separate listing showing rating, power characteristics, application and general location of every motor to be provided with mechanical work. Submit updated information promptly when and if initial data is revised.

B. Coordination with electrical: Contractor to submit copy of any & all shop drawings that indicate electrical requirements to the project electrical engineer for electrical service & electrical load verification. Applicable to all mechanical items.

PART 2 PRODUCTS

2.01 GENERAL - DIVISION OF WORK

A. In accordance with the general conditions, contractor is responsible for dividing the work among the subcontractors and suppliers and for delineating the work to be performed by specific trades. The following are suggestions as to how the work may be divided. It is the responsibility of the contractor to ensure a complete and working system. This is not a complete list of all the work:
   1. GENERAL: The Mechanical Contractor shall furnish to the Electrical Contractor for installation, all the motors, motor starters, start-stop switches, pilot lights, etc., for each piece of motor driven equipment unless shown otherwise.
   2. The Electrical Contractor shall install all motor starters, start-stop switches and pilot lights as furnished by the Mechanical Contractor. The Electrical Contractor shall also do all power wiring, and electrical termination's required for the installation of such mechanical equipment. Control Contractor shall be responsible for providing all control wiring.
   3. The Electrical Contractor shall furnish and install all equipment interlocking power wiring and the control contractor shall be responsible for installing control wiring as described in the control section. The Mechanical & General Contractor shall be responsible for coordinating and checking out all work to provide a complete system in working order, coordination to occur prior to bid.
   4. All electrical equipment shall have the UL label and shall meet the standards of the National Electrical Code and NEMA Rated, I.E.C. is not acceptable.

2.02 MOTOR AND MOTOR CONTROLLERS

A. Motors shall be provided to meet the requirements of the driven equipment. Motors shall be selected to be non-overloading and capable of normal scheduled operation without operating in

the service factor range. Unless required otherwise, three phase motors shall be squirrel-cage induction type, with copper windings, designed for a 40 C rise from 40 C ambient, have minimum Class B insulation and unless required otherwise, have NEMA design B normal starting torque. Motors are to be open drip-proof for indoor applications and totally enclosed fan cooled for outdoor or wet applications.

1. Provide shaft grounding rings for all motors that are to be used with variable frequency drives.

B. All motors shall be high power factor, premium energy efficient type with a minimum 1.15 service factor and minimum 0.85 full load power factor. Motor efficient shall meet or exceed that values listed in the attached table when tested in accordance with NEMA test standards MG112.53a, IEE Test Procedure 112, Method B, using accuracy improved by segregated loss measurements

C. Motors controlled by VFD's shall comply with NEMA MG1, Part 31, Definite Purpose Inverter Fed Motors. (Withstand repeated voltage peaks of 1600V with rise times of 0.1 microseconds and greater).

D. Starters for single phase motors which are not automatically started shall be manual type with melting alloy thermal overload protection and pilot light. Starters for automatically controlled single phase motors shall be magnetic type with NEMA rated AC magnetic contractor, melting alloy thermal overloads and pilot light.

E. Starters for three phase motors 15 horsepower and below shall be combination type starter/disconnect, full voltage non reversing (FVNR), with magnetic NEMA rated contractors rated for horsepower of motor served, adjustable trip magnetic circuit breaker disconnect (motor circuit protector) capable of being padlocked in the open position, 10K AIC minimum fault rating with higher rating when necessary, due to available fault levels. Starters shall have a fused 100VA minimum control transformer (120V, unless required otherwise), HOA switch, push to test operating pilot light, solid state overload relays set for actual motor nameplate full load amps, phase failure and phase reversal protection relay, minimum two N.O. and two N.C. auxiliary contacts and terminal blocks factory prewired for field wiring. Starter shall be horsed in a NEMA 1 enclosure for indoor locations and NEMA 3R enclosure for outdoor or wet locations.

F. Starters for motors 20 horsepower and above shall be soft start type or variable frequency drives.

Motor Efficiency at full load

HP	Nominal	Nominal	Nominal
1	82.5	82.5	80.0
1 ½	84.0	84.0	87.5
2	84.0	84.0	87.5
3	86.5	90.2	89.5
5	89.5	89.5	89.5
7 ½	89.5	91.7	91.7
10	90.2	91.7	91.7
15	91.0	93.0	92.4
20	92.4	93.6	92.4
25	93.0	94.1	93.6
30	93.6	94.1	93.6
40	93.6	94.5	94.1
50	93.0	94.5	94.1
60	93.6	95.4	95.0
75	94.5	95.4	95.9
100	94.5	96.2	95.4
125	95.0	95.4	95.4
150	94.5	96.2	95.8
200	95.0	96.2	95.4

2.03 SOFT START STARTERS

A. Refer to 23 04 14 MOTOR STARTERS Specification.

2.04 VARIABLE FREQUENCY DRIVES

A. Refer to 23 05 14 VARIABLE FREQUENCY DRIVES Specification.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install motors on motor mounting systems in accordance with motor manufacturer's instructions, securely anchored to resist torque, drive thrusts, and other external forces inherent in mechanical work. Secure sheaves and other drive units to motor shafts with keys and Allen set screws, except motors of 1/3 HP and less may be secured with Allen set screws on flat surface of shaft. Unless otherwise indicated, set motor shafts parallel with machine shafts.

B. Deliver starters and wiring devices which have not been factory-in-stalled on equipment unit to electrical Installer for installation.

C. Install power and control connections for motors to comply with NEC and applicable provisions of Division 26 sections. Install grounding where non-grounded isolation of motor is indicated.

END OF SECTION

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SECTION 20 0516 - PIPING EXPANSION COMPENSATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. Perform all Work required to provide and install the following piping expansion compensation equipment as required with supplementary items necessary for their proper installation. Contractor shall provide manufacturers engineering drawings during the submittal phase of project locating the expansion loops/joints along with required sizes and anchor points.

1. Flexible pipe connectors.
2. Expansion joints and compensators.
3. Pipe loops, offsets, and swing joints.

B. Perform all Work required to provide and install the following piping expansion compensation equipment with supplementary items necessary for their proper installation.

1. Flexible pipe connectors.
2. Expansion joints and compensators.
3. Pipe loops, offsets, and swing joints.

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. MIL-E-17814E-Expansion Joints, Pipe, Slip-Type, Packed.

1.04 QUALITY ASSURANCE

A. Provide structural Work and equipment required to control expansion and contraction of piping. Verify that anchors, guides, and expansion joints provided, adequately protect system.

B. Expansion Calculations

1. Domestic Hot Water: Base expansion calculations on 50-degrees F. installation temperature to 140-degrees F., plus 30 percent safety factor.
2. Heating Hot Water: Base expansion calculations on 50-degrees F. installation temperature to 180-degrees F., plus 30 percent safety factor.
3. Chilled Water: Base expansion calculations on 50-degrees F. installation temperature to 65-degrees F., plus 30 percent safety factor.
4. Preinsulated HVAC Piping: In strict conformance with preinsulated piping manufacturer.

1.05 SUBMITTALS

A. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.

B. Expansion Joints: Indicate maximum temperature and pressure rating, and maximum expansion compensation. Indicate alignment, guide locations, quantities, spacing, etc.

C. Operation and Maintenance Data: Include adjustment instructions, warranty.

D. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum three (3) years documented experience.

E. Preinsulated piping manufacturer to provide for expansion, refer Section 232113.

1.06 EXTRA MATERIALS

A. Provide two (2) 12-ounce containers of packing coverage for leak-free performance of expansion joints.

1.07 WARRANTY

A. Provide a five (5) year warranty including coverage for leak-free performance of expansion joints.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.02 MANUFACTURERS

A. Certain items in this Specification are listed by manufacturer and/or manufacturer's model number to establish general style, type, character and quality of the product desired. Similar items manufactured by other than those listed will be considered, providing submittals are made according to Pre-Bid Approval requirements of Instructions to Bidders.

B. Where no manufacturer or model number is given, any product meeting performance or design criteria, or referenced trade association standard may be used and Pre-Bid Approval is not required.

C. Flexible Pipe Connectors:

1. Hyspan Model Series 3505.
2. Pathway Model Xpress FF with anchor foot.

D. Expansion Joints – Steel Piping:

1. Hyspan Model 3501 series.
2. Pathway Model Xpress FF with anchor foot.

E. Expansion Joints – External Ring:

1. Hyspan Model Series 5500.
2. Pathway Model Flexway CT.
3. Flexonics Model TCS-R.

F. Pipe Alignment Guides:

1. Anvil Model Fig. 255.
2. Piping Technology & Products Model Fig. 6.
3. Hyspan Model Series 9500.
4. AAA Technology Model Fig. 295.

2.03 FLEXIBLE PIPE CONNECTORS

A. Copper Piping - Domestic Water:

1. Pathway Model Xpress FF with anchor foot.
2. Exterior Sleeve: Braided bronze or stainless.
3. Pressure Rating: 200 psig WOG and 250 degrees F.
4. Joint: As specified for pipe joints.
5. Size: Use pipe-sized units.
6. Maximum offset: 3/4 inch on each side of installed centerline.

2.04 EXPANSION JOINTS

A. Steel Piping - 150 psig Chilled Water, 150 psig Heating Water, and Steam Condensate:

1. Annular Corrugated Inner Core: Steel laminated bellows meeting ASTM A 240.
2. Exterior Sleeve: Steel housing meeting ASTM A 53 GRB.
3. Pressure Rating: 150 psig and 300 psig at 750 degrees F. Refer to Drawings.
4. Joint: Flanged 150 and 300 raised face as required for piping system.
5. Size: Use pipe-sized units.
6. Axial Compression: 4 inches.

B. External Ring Stainless Steel Bellows Restrained (Chilled and Heating Water Pump Connectors) Type:

1. Pressure Rating: 350 psig at 400 degrees F.
2. Maximum Compression: 0.75 to 1.00 inches.
3. Maximum Extension: 0.25 inches.
4. Maximum Offset: 0.13 inches.
5. Joint: Flanged as required by ANSI class.
6. Size: Use pipe-sized units.
7. Bellows: Type 321 stainless steel.
8. Application: Steel piping over 3 inches.

2.05 ACCESSORIES

A. Pipe Alignment Guides:

1. Two (2) piece welded steel with enamel paint, bolted, with spider to fit standard pipe, frame with four mounting holes, clearance for minimum 1 inch thick insulation, minimum 3 inch travel.

2. Provide and install alignment guides at expansion joints per manufacturer’s requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer’s published recommendations.

1. Accomplish structural Work and provide equipment required to control expansion and contraction of piping, loops, pipe offsets, and swing joints, and provide corrugated bellows type expansion joints where indicated on Drawings or required.

2. Provide pipe anchors as shown on the Drawings and/or as required to facilitate proper operation of pipe guides. Install anchors in compression. Weld anchors to pipe and to building structure

3. Provide pipe guides so that movement takes place along axis of pipe only. Guide sizes shall be the nominal pipe size with insulation. Guides shall not carry dead weight load on pipe and are not intended to take the place of the required pipe supports and rollers.

4. Construct spool pieces to exact size of flexible connection for future insertion.

5. Install flexible pipe connectors on pipes connected to equipment supported by vibration isolation. Provide line size flexible connectors.

6. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor the other end. Install in a horizontal plane unless indicated otherwise.

7. Rigidly anchor pipe to building structure where shown or where necessary. Provide pipe guides so movement is directed along axis of pipe only. Erect piping such that strain and weight is not on cast connections or apparatus.

3.02 TESTING

A. Prepare and Start-up systems under provisions of Section 20 01 00 and Division 21,22,23.

B. Provide inspection services by flexible pipe manufacturer's representative for final installation.

C. Certify that installation is in accordance with manufacturer's recommendations and that connectors are performing satisfactorily. Notify Owner’s Project Manager at least five (5) calendar days prior to the inspection.

END OF SECTION

8-21-26

SECTION 20 0529 - HANGERS AND SUPPORT DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

A. Work Included

1. Hangers and supporting devices for all mechanical piping.

1.3 SUBMITTALS

A. General: All submittals comply with the requirements of Division 23 Section 230001 - GENERAL PROVISIONS

B. Product Data: Data shall be submitted on the following items:

1. Hangers and supporting devices to be used.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide all hangers and rods, turnbuckles, angles, channels and other structural supports to support the piping systems.

B. Pipe hangers, hanger rods, trapeze type hangers, upper attachments and other supports shall be selected based on pipe size (plus insulation of pipes specified to be insulated) and the weight of the medium being transported or the medium used for testing, whichever is heavier. For sprinkler piping, in addition to the pipe and water, allow a minimum of 250 pounds applied at the point of hanging.

C. Rods for pipe hangers shall be carbon steel. Rod size shall be:

Pipe Size	Standard Hanger Rod Diameter	Fire Protection Hanger Rod Diameter
½" - 2"	3/8"	
2 ½" - 3"	½"	
4" - 5"	5/8"	in accordance with NFPA 13
6"	3/4"	
8" - 12"	7/8"	
14" - 16"	1"	
18"	1 1/8"	
20" & larger	1 1/4"	

D. All ferrous metal pipe hangers, except copper plated hangers, and concrete inserts shall be provided with a factory-applied coat of rust inhibiting paint.

E. Pipe hangers for suspending the following horizontal non-insulated piping shall be sized to fit directly around the pipe and protective shield.

1. Sanitary Sewer & Vent Piping.
2. Fire Water Piping.
3. Natural Gas Piping.

F. Pipe hangers for suspending the following horizontal insulated piping shall be sized to fit around the pipe, pipe insulation and pipe insulation protective shields:

1. Chilled water piping.
2. Refrigerant suction piping.

3. Condensate drain piping from air handling units.
4. Waste piping from drinking fountains.
5. Waste piping receiving condensate from air handling units.
6. Domestic cold water piping.
7. Domestic hot water and hot water circulating piping.
8. Makeup Water Piping

G. Pipe hangers for suspending the following horizontal insulated piping shall be sized to fit around the pipe, pipe insulation and pipe insulation protective saddle:

1. Not used.

H. All supporting equipment with the exception of springs in spring isolation hangers shall be designed with a minimum factor of safety of five based on the ultimate tensile strength of the material.

I. Not used.

2.2 PIPE SUPPORTS FOR SUSPENDED HORIZONTAL PIPING

SYSTEM	PIPE MATERIAL	PIPE SIZE	HANGER NUMBER
Chilled Water	Steel	All Sizes	I
Natural Gas	Steel	All Sizes	I
Domestic Cold & Hot Water	Copper	All Sizes	IV
Soil, Waste, & Vent	PVC	All Sizes	V
Soil, Waste, & Vent	Cast Iron	All Sizes	I
Fire Protection	Steel	6" & Larger	I
Fire Protection	Steel	4" & Smaller	VI
Refrigerant (Insulated)	Copper	All Sizes	IV
Refrigerant (Uninstalled)	Copper	All Sizes	IV
Miscellaneous Drains	Steel	All Sizes	I
	Copper	All Sizes	IV
Condensate Drains	Copper	All Sizes	IV
Relief Valve Discharge	Copper	All Sizes	IV
Chemical Feed	Steel	All Sizes	I
	Copper	All Sizes	IV

A. Hanger numbers listed in schedule above shall be the following types:

1. Hanger Number I: Clevis hanger, steel.
2. Hanger Number II: Adjustable split ring hanger, malleable iron.
3. Hanger Number III: Adjustable swivel clevis roller hanger with black cast iron roller and carbon steel yoke and cross bolt.
4. Hanger Number IV: Clevis hanger, copper plated steel.
5. Hanger Number V: Clevis hanger, plastic coated steel.
6. Hanger Number VI: Adjustable band hanger, steel.

B. Hanger numbers listed above shall be:

HANGER NUMBER	ELCEN	CARPENTER & PATERSON	ITT GRINNELL	B-LINE SYSTEMS	MICHIGAN HANGER CO.
I	12	100	260	83100	400
II	- -	240	104	- - - - - - -	111

III	14x	16	- - -	83111	612
IV	312	100CT	CT-65	83104CT	402
V	- - -	100 PVC	- - -	83100C	420
VI	89	800	70	83170	100

C. Upper Attachments:

1. Steel Construction

a. For suspending pipes from steel beams, upper attachments shall be beam clamps and shall be:

- Michigan Hanger Co. No. 364
- B-Line System Fig. 83055
- Carpenter & Patterson Fig. 268

b. For suspending joints from bottom chord of steel bar joists, upper attachments shall be C-clamps with retaining clips and shall be:

- ITT Grinnell Fig. 87
- B-Line Systems Figs. 8351, 83362, and 83363

c. For suspending pipes from the top chord of steel bar joists, upper attachments shall be top-of-beam C-clamps and shall be:

- B-Line Systems Fig. 83034
- ITT Grinnell Fig. 62
- Elcen No. 236L
- Carpenter & Paterson Fig. 192

2. Concrete Construction

a. New Construction

1. For suspending pipe in concrete construction, upper attachments shall be adjustable type concrete inserts. Where weight to be supported by an insert is 300 lbs. or more, install two No. 3 steel reinforcing bars, each 3 ft. long, through the yoke of the insert. Concrete inserts shall be:

- ITT Grinnell Fig. 281
- B-Line Systems Fig. 82500
- Michigan Hanger Co. No. 355
- Elcen No. 86
- Carpenter & Paterson Fig. 75

b. Existing Construction

1. Not used.

2.3 PIPE SUPPORTS FOR FLOOR SUPPORTED HORIZONTAL PIPING

A. General

1. Pipe supports for horizontal piping supported on concrete floors and on concrete bases shall be adjustable pipe saddle support with U-bolt and screwed floor flange. Bolt floor flange to floor and bases utilizing all bolt holes. Adjustable pipe saddle supports shall be steel and shall be:

- B-Line Systems Fig. 83090
- Carpenter & Paterson Fig. 125
- Elcen No. 49

2. Pipe supports for horizontal piping in trench below floor level shall be

adjustable pipe roller stands. Base shall be bolted to the trench floor utilizing all bolt holes. Adjustable pipe roller stands shall be steel and cast iron and shall be:

- B-Line Systems Fig. 83118
- Carpenter & Paterson Fig. 40
- Elcen No. 20
- ITT Grinnell Fig. 274
- Michigan Hanger Co. No. 619

2.4 PIPE SUPPORTS FOR VERTICAL PIPING

A. Supports for vertical piping shall be riser clamps sized to fit directly around the pipe.

1. Riser clamps shall be steel and shall be:
   - B-Line Systems Fig. B3373
   - Carpenter & Patterson Fig. 126
   - Elcen No. 39
   - ITT Grinnell Fig. 261
   - Michigan Hanger Co. No. 510
2. Offset pipe clamps shall be steel and shall be:
   - B-Line Systems Fig. B3148
   - Carpenter & Paterson Fig. 179
   - Elcen No. 44
   - Michigan Hanger Co. No. 700
3. Clamps for copper tubing shall be copper plated.

2.5 PIPE INSULATION PROTECTIVE SHIELDS AND SADDLES FOR HORIZONTAL PIPING

A. Shields shall be galvanized sheet metal type. Shields shall be 180 degrees type at all pipe hangers, except on trapeze hangers, pipe rack and on floor supported horizontal pipe shields shall be 360 degrees type. Shields sizes shall be:

Pipes 2 in and smaller - - *18 gage x 12" long*

Pipes 2 ½ in. thru 6" - - *16 gage x 18" long*

Pipes 8 in. and longer - - *14 gage x 24" long*

B. Saddles shall be steel and shall be:

INSULATION THICKNESS	*ELCEN*	*CARPENTER & PATERSON*	*ITT GRINNELL*	*B-LINE SYSTEMS*	*MICHIGAN HANGER CO*
1"	*251*	*351*	*160*	*B3160*	*630*
1 ½"	*252*	*352*	*161*	*B3161*	*631*
2"	*253*	*353*	*162*	*B3162*	*632*
2 ½ "	*254*	*354*	*163*	*B3163*	*633*
3"	*255*	*355*	*164*	*B3164*	*634*
4"	*256*	*356*	*165*	*B3165*	*635*

2.6 FACTORY - FABRICATED FRAMING CHANNELS AND FITTINGS

A. Factory fabricated framing channels and fittings shall be used for:

1. Constructing pipe racks for supporting multiple horizontal pipes where indicated on the drawings.
2. Constructing trapeze type hangers for suspending multiple horizontal

pipes where indicated on the drawings.

3. Securing vertical exposed water service drops for hose bibbs and wall hydrants.
4. Securing vertical exposed compressed air service drops for compressed air outlets.
5. Securing vertical exposed gas service drops for gas outlets and equipment.

B. Framing channels and fittings shall be provided with factory applied baked enamel finish.

C. Galvanized pipe clamps, including bolts and nuts, shall be provided with the framing channels and shall be used for securing pipes to channels, except pipe roller type supports shall be provided for pipes 2 ½ inches and larger for hot water heating, pipe roller supports shall include rollers, ½ inch diameter axle, nuts and angle brackets. Pipe clamps on insulated pipes shall fit around pipe, pipe insulation and pipe insulation protection shield. Pipe roller supports on insulated pipes shall be sized to fit around pipe saddles.

D. Framing channels and fittings shall be:

- Michigan O-Strut System
- B-Line Systems B-Line's Strut System
- Unistrut Metal Framing System

2.7 DIELECTRIC ADAPTERS/SEPARATORS

A. Dielectric adapters/separators shall be provided between copper and iron pipe connections and between ferrous and non-ferrous piping or equipment or between dissimilar metals.

PART 3 EXECUTION

3.1 HORIZONTAL PIPE SUPPORT INSTALLATION

A. Spacing of hangers and supports shall be as follows:

1. Cast iron pipe shall be supported at not more than four (4) feet intervals and near each hub or coupling & at base of all risers.
2. Copper Tubing:

Sizes ½" thru 1-/2":	*Piping supported from structural member of structure shall be at each member or 4'0" on centers, all sizes.*
Sizes 2" & Larger:	*Piping supported from structural member of structure shall be at each member or 4'0" on centers, all sizes.*

3. Steel Pipe:

All Sizes:	*Any piping supported from structural member of structure shall be at each member or 4'0" on centers, all sizes.*

B. Additional hangers shall be provided adjacent to all valves and fittings size 8" and larger.

C. Intermediate pipe supports shall be provided between building structural members so as not to exceed maximum support spacing hereinbefore specified.

1. In filler type concrete construction, intermediate angle supports shall be fastened to concrete joists or beams. In no case shall angle supports be fastened in floor slabs or in roof slabs. Intermediate supports shall be fastened to concrete slabs. Intermediate supports shall be fastened to concrete with concrete inserts or concrete anchors.

2. In steel construction, intermediate supports shall be welded to steel beams and to steel joists. In no case shall supports be attached to roof purlins, roof decks, or permanent metal forms.

3. In steel construction, install additional supports as recommended by Structural Engineer due to loading capacity of structure.

3.2 UNDERGROUND PIPING

A. Piping underground shall be laid on a firm bed of minimum 6" pea gravel for its entire length, provide minimum 6" cover of pea gravel. Refer to pipe trench detail.

1. Figure in bid backfilling with pea gravel. Should pipe manufacturer recommended riversand in lieu of pea gravel, then the contractor shall comply with the manufacturer's recommended installation guidelines and provide a credit back to the owner.

3.3 VERTICAL PIPE SUPPORT INSTALLATION

A. Supports for all pipes shall fit directly around the pipe. On insulated pipes, the support shall be insulated and provided with vapor barrier as specified for pipe insulation .

B. Vertical pipes passing through floors shall be provided with a riser clamp at each floor. Riser clamps shall have steel lugs, 1/4" thick x 2" high x 1 ½" long, welded to the clamp arms so that clamp does not come in contact with the pipe sleeve; the lugs shall support the clamp from the floor.

C. Where distance between floors is 15 ft. or more, in addition to the riser clamps, vertical pipes shall be provided with offset pipe clamps anchored to walls at the approximate midpoint between floors.

D. Exposed to sight vertical service drops to hose bibbs, and wall hydrants, and misc. outlets shall be supported with not less than two equally spaced sections of factory-fabricated framing channel with standard pipe clamps. Channel section shall be 8" long and shall be fastened to wall with not less than two spring wing toggle bolts.

E. Copper tubing supported by channel framing shall be provided with a lead sleeve to isolate the pipe from the framing channel and the pipe clamp.

F. Contractor to provide pipe supports for all domestic cold/hot water piping drops within walls to fixtures/equipment. Pipe clamp to be Anvil CT-138R copper plated split tubing clamp, provide 3/8" threaded rod as required to nearest wall framing member, provide 3/8" female threaded rod zinc-plated baseplate (Anvil 128R) fastened to wall framing member. Provide a minimum of one (1) support assembly at each drop in addition to copper plated holdrite system.

3.4 CONCRETE INSERTS AND ANCHORS

A. In filler type concrete construction, inserts and anchors shall be installed in joists or beams only. Install inserts in sides of joists or beams.

B. In framed type concrete construction, inserts and anchors shall be installed for all piping.

3.5 SHIELD AND SADDLE INSTALLATION

A. Shields shall be installed at all pipe hangers in horizontal insulated piping, as noted in section 2.1,F above.

B. Not used.

3.6 EXTERIOR PIPE SUPPORT COATINGS

A. All exterior pipe supports are to receive a brush painted, 2 layers, cold zinc galvanizing paint for exterior use.

END OF SECTION

8-21-26

SECTION 20 0533 - ELECTRIC HEAT TRACING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division I Specifications section, apply to work of this section.

1.02 DESCRIPTION OF WORK

A. Extent of electric heat tracing work is indicated by drawings and the requirements of this section. Provide electric heat tracing as follows:

1. At water make up assembly water systems @ chilled water & heating hot water systems (HVAC).
2. At backflow preventers.
3. At plumbing system utilities/piping located in areas subject to freezing.
4. At fire water piping located in areas subject to freezing (Porte Cache covered driveway, etc.)

1.03 QUALITY ASSURANCE

A. Manufacturer's: Firms regularly engaged in manufacture of electric heat tracing cables, of types and sizes required, whose products have been in satisfactory use in similar service.

B. Installer: Qualified with successful installation experience on projects with electric heat racing cable similar to that required for projects.

C. NEC Compliance: Comply with NEC (NFPA No. 70) applicable to installation of electric heat tracing cables.

D. UL Compliance: Provide electric heat tracing cables which are UL-listed and labeled.

1.04 SUBMITTALS

A. Product Data: Provide manufacturer's data on electric heat tracing cables.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING:

A Protect electric heat tracing cables from damage during shipping and handling.

B. Store electric heat tracing cables in original cartons and protect from weather and construction traffic. Wherever possible, store indoors; where necessary to store outdoors, store above grade and enclose with watertight wrapping.

PART 2 PRODUCTS

2.01 ELECTRIC HEAT TRACING CABLE

A. Electric Heat Tracing Cable: The self-regulating heater shall consist of two (2) 16 AWG tinned-copper bus wires embedded in parallel in a self-regulating polymer core that varies its power output to respond to temperature all along its length, allowing the heater to be crossed over itself without overheating, to be used directly on plastic pipe, and to be cut to length in the field. The heater shall be covered by a radiation cross-linked modified polyolefin dielectric jacket.

B. Regulation: In order to provide energy conservation and to prevent overheating, the heater shall have a self-regulating factor of at least 90 percent. The self-regulating factor is defined as the percentage reduction, with thermostatic control, of the heater output going from 40-degrees F. pipe temperature operation to 150-degrees F. pipe temperature operation.

C. Electrical: The heater shall operate on line voltage of 120 volts without use of transformers.

D. Capacity: The heater shall be sized in accordance to the following table. The required heater output rating is in watts per foot at 50-degrees F. (heater selection based on minimum 1" fiberglass or equivalent insulation on metal piping).

PIPE SIZE	*MINIMUM AMBIENT- 10 DEGREES F.*
4 inch or less	5 watt
5 inch or 6 inch	8 watt
8 inch	2 strips - 5 watt
10 to 14 inch	2 strips - 8 watt

E. Accessories: Power connection and end seal kits components shall be applied in the field.

F. Controls: The system shall be controlled by an ambient sensing thermostat set a 40-degrees F.

G. Pump Installation: For pump installation utilize heater designated for 6" pipe.

H. Manufacturer's:

Chromalox	Series RTSR
Pyrotenax	Series SR
Raychem	Series 8XC

PART 3 EXECUTION

3.01 INSTALLATION

A. Apply the heater linearly on the pipe under insulation after piping has been successfully pressure tested. Apply "electric traced" signs to the outside of the thermal insulation.

B. Install in strict accordance with manufacturer’s recommendations.

3.02 TESTS

A. After installation and before and after installing the thermal insulation, subject heat to testing using a 1000 VDC megger. Minimum resistance shall be 20 megaohms regardless of length. Replace faulty cable.

END OF SECTION

8-21-26

SECTION 20 0548 - VIBRATION ISOLATION FOR MECHANICAL SYSTEMS

PART 1 GENERAL

1.01 GENERAL

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.02 SUMMARY

A. Work Included:

1. Isolation Pads
2. Spring Isolators
3. Spring Hangers
4. Inertia Bases

1.03 SUBMITTALS

A. General: All submittals shall comply with the requirements of Division 1 - GENERAL REQUIREMENTS and Section 20 01 00 - General Provisions.

B. Product Data: Data shall be submitted on the following items:

1. Spring Hangers
2. Vibration Isolators
3. Inertia Bases

PART 2 PRODUCTS

2.01 SOLE SOURCE

A. All isolators and bases shall be from same manufacturer.

2.02 DEFLECTION

A. All spring isolators shall have 1" min. deflection unless otherwise specified.

2.03 TYPE I ISOLATORS

A. Type I Isolators shall be neoprene waffle embossed pads with crossed double ribs. A steel shim plate shall be provided between the two layers. Pads shall be molded using oil resistant 25,000 PSI tensile strength neoprene. Pads shall be:

Kinetics Noise Control	NPD Series
Amber Booth	NP-NR Series
Mason Industries	WMW Series

2.04 TYPE II ISOLATORS

A. Type II Isolators shall be double deflection neoprene type designed for loading in both shear and compression. Isolator shall be one piece molded assembly with ribbed base plate and top. Isolators shall be:

Kinetics Noise Control	RD Series
Amber Booth	NRV Series
Mason Industries	ND Series

2.05 TYPE III ISOLATORS

A. Type III Isolators shall be free-standing, un-housed, laterally stable steel springs incorporating leveling bolts and 1/4" thick ribbed neoprene isolation pads. The spring shall have a lateral spring stiffness, and shall be designed to provide 50% overload capacity over 5000 lbs. Springs shall be welded to the top and bottom load plate assemblies. Isolators shall be:

Kinetics Noise Control	FDS Series

Amber Booth	SW Series
Mason Industries	SLFH Series

2.06 TYPE IV ISOLATORS

A. Type IV Isolators shall be vertically restrained steel springs incorporating leveling blots, 1/4" thick ribbed noise isolation pads, and steel housing. Springs shall be designed to provide 50% overload capacity over 5000 lbs. Springs shall be welded to the top and bottom load plates assemblies. Assembly for outdoor installation shall be hot dipped galvanized after fabrication. Isolators shall be:

Kinetics Noise Control	FLS Series
Amber Booth	CT Series
Mason Industries	SLR Series

2.07 TYPE V ISOLATORS

A. Type V Isolators shall be combination spring and neoprene hangers, incorporating double deflection neoprene noise and vibration pads in series with the springs, all encased in welded steel brackets. Springs shall be designed for 50% overload capacity, and shall accommodate rod misalignment over a 30 degree arc. Brackets shall be designed to carry 50% overload without failure. Isolators shall be:

Kinetics Noise Control	SRH Series
Amber Booth	BSR Series
Mason Industries	DNSH Series

2.08 TYPE VI THRUST RESTRAINTS

A. Type VI Thrust Restraints shall be un-housed, laterally stable steel spring with 1/4" thick ribbed neoprene isolation pad in a steel frame. Spring shall be designed to provide 50% overload capacity over 5000 lbs. Units shall be factory set for thrust anticipated and adjusted in the field for a maximum 1/4" movement. Unit shall be provided with two rods and angle brackets for mounting. Thrust restraints shall be:

Kinetics Noise Control	HSR Series
Mason Industries	WB Series

2.09 TYPE VII STRUCTURAL STEEL BASE

A. Type VII Structural Steel Base shall have isolator support brackets and pre-packed and drilled anchor bolt holes. Isolators support brackets shall be welded to structural steel bases shall be rigid, distortion free and mounted on Type III Isolators - six isolators per base minimum. Bases shall be:

Kinetics Noise Control	SFB Series
Amber Booth	SW Series
Mason Industries	WFSL Series

2.10 TYPE VIII INERTIA BASES

A. Type VIII Bases shall be reinforced concrete inertia bases, the steel members of which are designed and supplied by the isolator manufacturer. The concrete shall be poured into a welded steel frame, incorporating pre-located equipment anchor bolts, 1/2" diameter reinforcing bars (nominal 8" centers each way) and recessed isolator mounting brackets to reduce the mounting height of the equipment but yet remain within the confines of the base. The thickness of the base shall be a minimum of 1/12th of the longest span of the base, but not less than 6 inches. Where inertia bases are used to mount pumps, the bases shall be wide enough to support piping elbows. Anchor bolts for supporting equipment shall be welded to the reinforcing bars. Bases shall be:

Kinetics Noise Control	CLB Series
Amber Booth	CPF Series

Mason Industries KSL Series

PART 3 EXECUTION

3.01 INSTALLATION

A. All isolation products shall be installed in accordance with the manufacturer's installation instructions.

B. All spring-mounted equipment shall be leveled.

C. Type II isolators shall be bolted to the floor or base and to the equipment or equipment base.

D. Type III isolators shall be bolted to the floor or base and to the equipment and base.

E. Type IV isolators shall have the bottom plate bolted to the structure and the top plate tack welded to the equipment rails in four places.

F. Type V isolators shall have jam nuts on the top and bottom rods to prevent movement of nuts.

G. Type VI thrust restraint shall have angle brackets welded or bolted to equipment, duct or structure, as applicable.

H. Type VII and VIII bases shall be bolted to the equipment.

3.02 ISOLATION SCHEDULE

A. Isolators and bases shall be installed on equipment and piping as indicated on schedule below:

ITEM	ISOLATOR	BASE	NOTES	MIN. DEFLECT.
PIPING	V	----	1	
PUMPS	III	VIII	----	1.50 IN.
AIR HANDLERS	III	--	2	1.50 IN.
FANS	V	--	----	0.75 IN.
CHILLER(S)	I	--	----	
CONDENSING UNITS	I	-- --	----	

B. Schedule Notes:

1. Provide additional vibration isolators as recommended by equipment manufacturers.
2. Type V isolators shall be installed in the first three pipe hangers from pumps in the chilled water, and hot water, systems and on first three pipe hangers on lines serving air handling units.
3. Spring vibrations isolators not required if AHU unit fan internally isolated (factory fabricated) and AHU equipped with uniform equipment rail and piping serving these AHU’s. Provide type I isolators in lieu of type III if fan is internally isolated.
4. Chiller to come with factory supplied spring isolators.

END OF SECTION

8-21-26

SECTION 20 0553 - IDENTIFICATION OF PIPING, VALVES AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

A. Work Included:

1. Valve Tags
2. Pipe Bands
3. Equipment Labels

1.3 SUBMITTALS

A. General: All submittals shall comply with the requirements of Division 1 - *GENERAL REQUIREMENTS*, AND Section 200100- *GENERAL PROVISIONS.*

B. Product Data: Data shall be submitted on the following items:

1. Valve Tags
2. Pipe Bands

1.4 QUALITY ASSURANCE

A. Standards:

1. American National Standards Institute (ANSI):
   a. Standard A13.1, The Scheme for Identification of Piping Systems, 1981 Edition.

PART 2 - PRODUCTS

2.1 GENERAL

A. Pipe identification shall comply with ANSI A13.1.

2.2 VALVE TAGS

A. Valve tags shall be 18 gauge (minimum) brass with 1 1/4" (minimum) height and width. Identification letters and numbers shall be stamped in tag and shall be filled with black enamel paint. Valve tags shall be:

Emedco	CB/W Series
Seton	Valve Tags
Brady	Valve Tags

B. Valve tag shape and designations shall be as indicated in Table I, hereinafter.

2.3 PIPE BANDS

A. Pipe identification bands shall be snap-on type with clear polyester exterior surface. Bands shall be of size, color and background as outlined in Table II and III,

hereinafter, with directional flow arrows and legends. Identification bands on pipe or coverings 5 ½" or less in diameter shall have stainless steel spring fasteners. Pipe identification bands shall be:

Seton / Setmark	SNA / STR
Series Brady	Snap-on Series

B. Contractor has option to use Seton Custom Opti-Code Self-Adhesive Pipe Markers in lieu of snap on labels, Seton style M4154. Secure with addtional cable tie (minimum two (2) per label).

2.4 EQUIPMENT LABELS / TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved white letters on black contrasting background color. Tag size minimum 1 ½ inch (40 mm) wide, length as required, with lettering minimum 3/4" tall.

2.5 TAPE

A. Identification tape shall be vinyl pressure sensitive type with adhesive backing. Tape width shall be a minimum of 2". Tape shall be color to match pipe identification band background. Tape shall be:

Emedco	T100 Series
Seton	PST Series
Brady	Tape

2.6 CABLE TIES

A. Cable ties for valve tag attached shall be self-locking nylon ties. Cable ties shall be:

Thomas & Betts	Ty-Rap-Nylon
Ideal	Double Lock Cable (Plain Head)
Efcor	Sure-Ty Self-Locking Cable Ties

2.7 VALVE CHART

A. Valve chart shall be typed listing of all valve tags. List shall include identification number, valve location in system (e.g., water heater, chilled water pump, etc.) And its function (e.g., shut-off, balancing, drain, etc.). Chart shall be mounted in a wooden frame with glass cover. Chart shall be mounted where shown on the drawings.

2.8 IDENTIFICATION

A. Valve tags shall be installed at all shut-off, balancing, metering, and drain valves in the following systems:

TABLE 1 - VALVE TAGS

SYSTEM	*SHAPE*	*IDENTIFICATION NUMBER*
Chilled Water	*Round*	*CH - 1, 2, 3, ...*
Natural Gas	*Octagonal*	*NG - 1, 2, 3, ...*
Domestic Cold Water	*Hexagonal*	*CW - 1, 2, 3, ...*
Domestic Hot Water	*Hexagonal*	*HW - 1, 2, 3, ...*
Domestic Hot Water Circulation	*Hexagonal*	*HWC - 1, 2, 3, ...*
Domestic Tempered Water	*Hexagonal*	*TW - 1, 2, 3, ...*
Domestic 110 degrees F Hot Water	*Hexagonal*	*110 - 1, 2, 3, ...*
Domestic 140 degrees F Hot Water	*Hexagonal*	*140 - 1, 2, 3, ...*
Fire Sprinkler	*Rectangular*	*AS - 1, 2, 3, ...*

B. Pipe identification shall comply with ANSI A13.1 - 1981 Standard entitled "Scheme for Identification of Piping Systems." Pipe identification bands shall be installed on piping at each valve, each piece of equipment, each change of direction, wall penetration, each branch take-off, and at a maximum spacing of 15 feet on exposed straight run piping. Pipe bands shall be installed on systems indicated below. Install on all piping exposed in mechanical rooms & above all ceiling, all piping to receive labels & directional flows arrows.

TABLE II - BAND AND LETTER SIZE

PIPE OR PIPE COVERING DIAMETER (inches)	WIDTH OF BAND (Inches)	LETTER & NUMBER SIZE (inches)
3/4 to 1 1/4	8	½
1 ½ to 2	8	3/4
2 ½ to 6	12	1 1/4
8 to 10	24	2 ½
Over 10	32	3 ½

TABLE III - BAND COLORING

PIPE	*BAND*	*LETTERING*	*LETTER COLORING*
Chilled Water Supply	*Dark Blue*	*CHILLED WATER SUPPLY*	*White*
Chilled Water Return	*Light Blue*	*CHILLED WATER RETURN*	*White*
Natural Gas (Inside Buildings)	*Safety Yellow*	*NATURAL GAS*	*Black*
Gas Valves on Interior to be painted Meter Gray			
Natural Gas (Outside Building)	*Meter Gray*	*NATURAL GAS*	*Black*
Gas Valves on exterior to be painted Safety Yellow			
Refrigerant Suction	*Yellow*	*REF. SUCTION*	*Black*
Refrigerant Liquid	*Yellow*	*REF. LIQUID*	*Black*
Domestic Cold Water	*Green*	*DOM. COLD WATER*	*White*
Domestic Hot Water	*Yellow*	*DOM. HOT WATER*	*Black*
Domestic Hot Water Circulation	*Yellow*	*CIRCULATION WATER*	*Black*
Domestic Tempered Water	*Green*	*TEMPERED WATER*	*White*
Domestic 110 degree Water	*Yellow*	*110 - HOT WATER*	*Black*
Domestic 140 degree Water	*Yellow*	*140 - HOT WATER*	*Black*
Fire Sprinkler	*Red*	*SPRINKLER - FIRE*	*White*
Chemical Feed	*Purple*	*CHEMICAL FEED*	*White*

B. Equipment identification labels with 2" high letters shall be installed on the following equipment:

TABLE IV - EQUIPMENT LABELS

ITEM	*BAND*	*LETTERING*	*LETTER COLORING*
AHU's, Pumps, Chillers, Domestic Hot Water Heaters,	*Yellow*	*See Equipment Schedules*	*Black*

PART 3 - EXECUTION

3.1 INSTALLATION

A. Valve tags shall be attached to the handwheel with cable ties.

B. Plastic pipe bands shall be wrapped around pipe or pipe covering under pressure so that no gaps or wrinkles occur. Bands on pipe or pipe covering 6" or smaller shall overlap and adhere to themselves. Bands on pipe or pipe covering larger than 6" shall be further secured at both ends with tape. Tape shall overlap and adhere to itself.

C. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

D. Install tags with corrosion resistant chain.

E. Install plastic pipe markers in accordance with manufacturer’s instructions.

F. Install plastic tape pipe markers complete around pipe in accordance with manufacturer’s instructions.

G. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

H. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices wit plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.

I. Identify control panels and major control components outside panels with plastic nameplates.

J. Identify valves in main and branch piping with tags or numbered plastic nameplates.

K. Identify piping, concealed or exposed, with plastic tape pipe markers. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 15 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

3.2 PAINTING

A. All surfaces requiring painting shall be left clean by the Mechanical Subcontractor. All painting shall be done by the General Contractor's painting Subcontractor. All exposed piping, grilles, or fans, in building or on roof will be painted. All insulated piping to be covered in color coated PVC Jackets, color to be determined by Owner. If owner has no preference, color to be same as band color in schedule. Paint pipe, equipment, hangers and accessories in Equipment Rooms including covering and foundations with two (2) coats of approved paint after thoroughly cleaning. Equipment having factory finish shall be touched up and given one (1) additional coat of machinery enamel color as selected. The above shall be done by the General Contractor. See Section PAINTING SECTION.

1. Gas Piping will be painted using a high quality solvent based paint. Aervoe “Direct to Metal” or approved equal paint. For all gas pipes located outside of a building or in an area exposed to the general public, pipes, meters and regulators will be painted Meter Gray with Key Valves painted Safety Yellow. For mechanical rooms, above ceilings and other inaccessible areas, the pipe will be painted safety yellow and gas valves and regulators will be painted meter gray. The contractor may use the exterior gray color in gyms or other similar conditions where aesthetics is a concern, coordinate with architect

prior to painting. All new and existing gas piping shall be painted.

B. All piping throughout project (HVAC, Plumbing, & Sprinkler) shall be identified with pipe markers with directional arrows. The color code shall be as per Table III above. Labels should appear every 10'-0" and at all changes in direction.

C. Provide color coded PVC jackets, piping labels, & directional flow arrows on all insulated piping (HVAC, Plumbing, & Fire Water) whether exposed or concealed above ceiling space. All piping (entire piping system) to have color coded PVC jackets, piping labels, & directional flow arrows. PVC jacket color to match band color as specified in Table III within these specifications. Fire water piping to receive piping labels.

END OF SECTION
8-21-26

SECTION 20 0700 - PIPE INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping Insulation

B. Jackets and Accessories

1.02 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Section 20 05 29 - Hangers and Support Devices

1.03 RELATED SECTIONS

A. Section 20 01 00 - General Provisions

1.04 REFERENCES

A. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

B. ASTM C177 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.

C. ASTM C195 - Mineral Fiber Thermal Insulation Cement.

D. ASTM C335 - Steady-State Heat Transfer Properties of Horizontal Pipe Insulation.

E. ASTM C449 - Mineral Fiber Hydraulic-setting Thermal Insulating and Finishing Cement.

F. ASTM C518 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

G. ASTM C534 - Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

H. ASTM C547 - Mineral Fiber Performed Pipe Insulation.

I. ASTM C552 - Cellular Glass Block and Pipe Thermal Insulation.

J. ASTM C578 - Preformed, Block Type Cellular Polystyrene Thermal Insulation.

K. ASTM C585 - Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing.

L. ASTM C591 - Rigid Preformed Cellular Urethane Thermal Insulation.

M. ASTM C610 - Expanded Perlite Block and Pipe Thermal Insulation.

N. ASTM C640 - Corkboard and cork Pipe Thermal Insulation.

O. ASTM C921 - Properties of Jacketing Materials for Thermal Insulation.

P. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.

Q. ASTM D1667 - Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Closed Cell Foam).

R. ASTM D2842 - Water Absorption of Rigid Cellular Plastics.

S. ASTM E84 - Surface Burning Characteristics of Building Materials.

T. ASTM E96 - Water Vapor Transmission of Materials.

U. NFPA 255 - Surface Burning Characteristics of Building Materials.

V. UL 723 - Surface Burning Characteristics of Building Materials.

1.05 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide product description, list of materials and thickness for each service, and locations.

C. Manufacturer’s Installation Instructions: Indicate procedures which ensure acceptable workmanship and installation standards will be achieved.

1.06 QUALITY ASSURANCE

A. Materials: Flame spread/smoke developed rating of 25/50 in accordance with ASTM E84, NFPA 255, and UL 723.

1.07 QUALIFICATIONS

A. Applicator: Company specializing in performing the work of this section.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to site under provisions of Section 01600.

B. Deliver materials to site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

C. Store insulation in original wrapping and protect from weather and construction traffic.

D. Protect insulation against dirt, water, chemical, and mechanical damage.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cement.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 GLASS FIBER

A. Manufacturers:
   1. Knauf - ASJ - SSL
   2. Owen Corning 25 ASJ/SSL

B. Insulation: ASTM C547; rigid molded, noncombustible.
   1. 'K' value: ASTM C335, 0.23 at 75 degrees F.
   2. Minimum Service Temperature: -20 degrees F.
   3. Maximum Service Temperature: 850 degrees F.
   4. Maximum Moisture Absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket:
   1. ASTM C921, white kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Transmission: AST E96; 0.02 perm inches.
   3. Secure with self sealing longitudinal laps and butt strips.
   4. Secure with white vapor barrier tape and vapor barrier mastic.
   5. Provide bonds for identification per Section 15190 Requirements.

D. Tire Wire: 16 gage stainless steel with twisted ends on maximum 12 inch centers.

E. Indoor Vapor Barrier Finish
   1. Manufacturers:
      a. Childers Model CP-30
      b. Manville Model Insulkote
   2. Vinyl emulsion type acrylic, compatible with insulation, white color.

F. Outdoor Vapor Barrier Mastic
   1. Manufacturers:
      a. Childers Model CP-30
      b. Manville Model Insulkote
   2. Vinyl emulsion type acrylic, compatible with insulation, white color.

G. Fittings:

1. Mitered segments of insulation held in place with white vapor barrier tape and Zeston 25/50 PVC, knauf 25/50 rated PVC, pre-molded insulated fitting covers.

2.02 CELLULAR GLASS

A. Manufacturers:

1. Pittsburgh Model Foamglass
2. Corning Model Foamglass

B. Insulation: ASTM C552.

1. 'K' value: 0.40 at 75 degrees F.
2. Maximum Water Vapor Transmission: 0.1 perm.

C. Vapor Barrier Jacket: Similar to Glass Fiber.

D. All joints to be caulked and glued with a vapor barrier sealant as per manufacturer's recommendations.

2.03 POLYURETHANE FOAM

A. Insulation:

1. 'K' value: ASTM 518; 0.14 at 75 degrees F.
2. Minimum Service Temperature: -250 degrees F.
3. Maximum Service Temperature: 250 degrees F.
4. Maximum Moisture Absorption: ASTM D2842; 0.054 percent by volume.
5. Moisture Vapor Transmission: 1.26 perm inches.
6. Maximum Flame Spread: ASTM E84; 20.
7. Connection: Waterproof vapor barrier adhesive.

2.04 CELLULAR FOAM

A. Manufacturers:

1. Armstrong Armaflex 25/50.
2. Aerotube 25/50.

B. Insulation: ASTM C534; flexible, cellular elastomeric, molded or sheet.

1. 'K' value: ASTM C177 or C518; 0.27 at 75 degrees F.
2. Minimum Service Temperature: 0 degrees F.
3. Maximum Service Temperature: 220 degrees F.
4. Maximum Moisture Absorption: ASTM D1056; 1.0 percent (pipe) by volume, 1.0 percent (sheet) by volume.
5. Moisture Vapor Transmission: ASTM E96; 0.20 perm inches.
6. Maximum Flame Spread: ASTM E84; 25.
7. Maximum Smoke Developed: ASTM E84; 50.
8. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive

1. Manufacturers:
   a. Armstrong 520
   b. Manville Elastomeric Adhesive
2. Air dried, contact adhesive, compatible with insulation.

2.05 JACKETS

A. PVC Plastic

1. Manufacturers:
   a. Proto

b. Zeston

2. Jacket: ASTM C921; One piece molded type fitting covers and sheet material. See color chart in Section 15190 for jacket colors.
   a. Minimum Service Temperature: -20 degrees F.
   b. Maximum Service Temperature: 140 degrees F.
   c. Moisture Vapor Transmission: ASTM E96; 0.002 perm inches.
   d. Maximum Flame Spread: ASTM E84; 25.
   e. Maximum Smoke Developed: ASTM E84; 50.
   f. Thickness: 30 mil.
   g. Connections: Brush on welding adhesive.
   h. Fitting covers with inserts supplied by the manufacturers.
3. Covering Adhesive Mastic:
   a. Manufactures:
      1. Proto PVC Glue.
      2. Zeston PVC Glue.
   b. Compatible with insulation.

B. Aluminum Jacket: ASTM B209.
1. Thickness: 0.016 inch sheet.
2. Finish: Smooth.
3. Joining: Longitudinal slip joints and 2 inch laps.
4. Fittings: .020 inch thick die shaped fitting covers with factory attached protective liner.
5. Metal Jacket Bands: ½ inch; 0.015 inch thick aluminum.

C. Stainless Steel Jacket: Type 304 stainless steel.
1. Thickness: 0.010 inch.
2. Finish: Smooth.
3. Metal Jacket Bands: ½ inch wide; 0.010 inch thick stainless steel.

2.06 AIR HANDLING UNIT ROOMS

A. Finish and install over entire areas of walls/doors/ceiling of air handling rooms/elevator equipment rooms 2" thick acoustical type fiberglass hullboard insulation 3# density, applied over Stick-Klips 12" on center. Stick-Klips shall be applied to wall with Construction Adhesive. Acoustical material shall be applied over Stick-Klips with duct linear adhesive spotted between pins. Joints to be sealed with fiberglass lagging tape.

B. Manufacturer:

1.Nautica IMO PFG Acoustic Board as manufactured by RB, LLC.

2.07 GLASS FIBER, FLEXIBLE

A. Insulation: ASTM C553; flexible, noncombustible blanket.
1. ‘K’ (“ksi”) value: ASTM C518, 0.29 at 75 degrees F.
2. Maximum service temperature: 250 degrees F.
3. Maximum moisture absorption: 0.20 percent by volume.
4. Density: 0.75 lb/cu ft.

B. Vapor Barrier Jacket
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
2. Moisture vapor transmission: ASTM E96; 0.04 perm.
3. Secure with pressure sensitive tape.

C. Vapor Barrier Tape

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

D. Tie Wire: Annealed steel, 16 gage.

2.08 PLENUM RATED INSULATION

A. Contractor to provide plenum rated insulation. Insulation to have a flame spread index of not more than 25 and a smoke developed index of not more than 50. Manufacturer to be Morgan Thermal Ceramics PlenumWrap+ or prior aproved equal. Insulation shall be listed to UL 1887, NFPA 262 (UL910), and ASTM E84. PlenumWrap+ core blanket shall be manufactured using Morgan Thermal Ceramics's patented Superwool fiber, a 2000F rated, non-combustible, alkaline-earth silicate wool with low biopersistence. Insulation shall be OPL (Intertek) Listed, and be part of both OPL's and UL's Listing and Follow-up Service Programs to ensure the consistent quality essential to the critical nature of this life-safety application. Install in strict accordance with manufacturer's recommendations.

1. Thickness: 1/2"

2.09 APPROVED MANUFACTURERS

A. Johns Manville, Knauf, DOW, Owens Corning

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. On exposed piping, locate insulation and cover seams in least visible locations.

C. Insulated dual temperature pipes or cold pipes conveying fluids below ambient temperature.

1. Provide vapor barrier jackets, factory applied or field application.
2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe.
3. Finish with glass cloth and vapor barrier adhesive.
4. PVC fitting covers shall be used.
5. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations.
6. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

D. For insulated pipes conveying fluids above ambient temperature:

1. Provide standard jackets, with or without vapor barrier, factory applied or filed applied.
2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe.
3. Finish with glass cloth and adhesive.
4. PVC fitting covers shall be used.
5. For hot piping conveying fluids below 140 degrees F, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

E. Inserts and Shields:

1. Application: All piping.
2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
3. Insert Location: Between support shield and piping and under the finish jacket.
4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.

5. Insert Material: ASTM C640 cork or other heavy density insulating material suitable for the planned temperature range.

F. Finish insulation at supports, protrusions, and interruptions.

G. For pipe exposed in mechanical equipment rooms, garage, or in exposed finished spaces, finish with color coded PVC jacket and fitting covers. Color to be as indicated in Section 200553 - Identification of Piping, Valves and Equipment.

H. For exterior applications, provide vapor barrier jacket. Insulate fittings, joints, and values with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

I. For air separator and pump housings - finish with mastic and glassfab, paint finished installation to match HVAC hydronic water piping.

J. All HVAC & Plumbing piping to have PVC color coded jacket, typical entire piping system s throughout entire project.

3.03 TOLERANCE

A. Substituted insulation materials shall provide thermal resistance within 10 percent at normal conditions, as materials indicated.

3.04 GLASS FIBER INSULATION SCHEDULE

SYSTEMS	*PIPE SIZE (inch)*	*THICKNESS (inch)*
1. Domestic Hot Water	½" thru 1-1/4"	1"
2. Domestic Hot Water	1-1/2" & Larger	1-1/2"
3. Domestic Cold Water	All	1"

Note: 1. All piping exterior to building (above grade, excluding refrigerant piping) shall be covered in 16 mil aluminum jacket with premolded aluminum fittings, no PVC (Zeston) fittings allowed.

2. All HVAC & Plumbing piping to have PVC color coded jacket, typical entire piping systems throughout entire project.

3.05 CELLULAR FOAM INSULATION SCHEDULE

SYSTEMS	*PIPE SIZE (inch)*	*THICKNESS (inch)*
1. Water Piping	½" - 4"	1"
(exposed to weather)		
2. Condensate Drain Lines	All Sizes	1"
3. Refrigerant Piping	All Sizes	1"

Note: 1. All piping exterior to building (above grade, excluding refrigerant piping) shall be covered in 16 mil aluminum jacket with premolded aluminum fittings, no PVC (Zeston) fittings allowed.

2. All insulated refrigerant lines exterior to building to receive two (2) coats of Aerocel Aerocoat pure acrylic emulsion paint. Allow 4 hours drying time in between coat applications.

3. All HVAC & Plumbing piping to have PVC color coded jacket, typical entire piping systems throughout entire project.

4. Insulate suction & vapor lines on Heat Pump systems in strict accordance with Heat Pump manufacturer recommendations.

3.06 CELLULAR GLASS INSULATION SCHEDULE

A.	SYSTEMS PIPE	SIZE (inch)	THICKNESS (inch)
	1. Chilled Water Piping	All Sizes	1 - ½"
	2. Chilled Water Piping	All Sizes	2"

Piping exterior to building & within AHU mechanical room.

Note:

1. *All piping exterior to building (above grade) shall be covered in 16 mil aluminum jacket with premolded aluminum fittings, no PVC (Zeston) fittings allowed.*
2. *All HVAC & Plumbing piping to have PVC color coded jacket, typical entire piping systems throughout entire project.*

3.07 PLENUM RATED INSULATION SCHEDULE

SYSTEMS	*PIPE SIZE (inch)*	*THICKNESS (inch)*

Not used.

3.08 LAVATORY P-TRAP AND SUPPLY LINES

A. Insulate P-trap, tailpiece and water supplies on all lavatories with Truebro Model 102, Handi Lav-Guard, Bocar “Trap Wrap” or approved equivalent insulating system.

B. All wall hung lavatory’s are to come with Truebro Lav-Shield in lieu of Lav-Guard, no exception.

3.09 PIPE SUPPORTS

A Contractor shall insulate down minimum 12" for all pipe supports in direct contact with HVAC water piping with same material and jacket as pipe insulation.

3.10 WASTE LINE P-TRAPS

A. P-traps receiving HVAC condensate and associated horizontal waste lines shall be insulated with fiberglass ductwrap insulation with aluminum foil vapor barrier. Insulation shall be sealed at all seams and joints.

3.11 FLEXIBLE GLASS FIBER PIPE INSULATION SCHEDULE

LOCATION	*THICKNESS (inch)*	*FINISH*
1. Not used.		

END OF SECTION

8-21-26

SECTION 20 0716 - EQUIPMENT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Equipment insulation.

B. Covering.

1.02 RELATED SECTIONS

A. Section 09900 - Painting: Painting insulation covering.

B. Section 20 05 53 - Identification of Piping, Valves and Equipment

1.03 REFERENCES

A. ASTM B209 - Aluminum and Aluminum - Alloy Sheet and Plate.

B. ASTM C195 - Mineral Fiber Thermal Insulation Cement.

C. ASTM C533 - Calcium Silicate Block and Pipe Thermal Insulation.

D. ASTM C534 - Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

E. ASTM C552 - Cellular Glass Block and Pipe Thermal Insulation.

F. ASTM C921 - Properties of Jacketing materials for Thermal Insulation.

G. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.

H. ASTM E96 - Water Vapor Transmission of Materials.

I. NFPA 255 - Surface Burning Characteristics of Building Materials.

J. UL 723 - Surface Burning Characteristics of Building Materials.

1.04 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide product description, list of materials and thickness for equipment scheduled.

C. Manufacturer’s Installation Instructions: Indicate procedures which ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALITY ASSURANCE

A. Materials: Flame spread/smoke developed rating of 25/50 in accordance with ASTM E84, NFPA 255 and UL 723.

1.06 QUALIFICATIONS

A. Applicator: Company specializing in performing the work of this section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 1600.

B. Deliver materials to site in original factory packaging, labeled with manufacturer’s density and thickness.

C. Store insulation in original wrapping and protect from weather and construction traffic.

D. Protect insulation against dirt, water, chemical and mechanical damage.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cement.

B. Maintain temperature during and after insulation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 GLASS FIBER, FLEXIBLE

A. Insulation: ASTM C553; flexible, noncombustible:

1. ‘K’ (ksi) value: ASTM C335, 0.24 at 75 degrees F.
2. Maximum service temperature: 850 degrees F.

3. Maximum moisture absorption: 0.2 percent by volume.
4. Density: 3 lb/cu ft density.

B. Vapor Barrier Jacket
1. ASTM C921, draft paper reinforced with glass fiber yarn and bonded to aluminized film.
2. Moisture vapor transmission: ASTM E96; 0.02 perm.
3. Secure with self sealing longitudinal laps and butt strips.
4. Secure with vapor barrier tape and vapor barrier mastic.

C. Tie Wire: 18 gage stainless steel with twisted ends on maximum 12 inch (300 mm) centers.

2.02 GLASS FIBER, RIGID

A. Insulation: ASTM C612; rigid, noncombustible.
1. 'K' (ksi) value: ASTM C335 at 75 degrees F.
2. Maximum service temperature: 850 degrees F.
3. Maximum moisture absorption: 0.1 percent by volume.
4. Density: 3.0 lb/cu ft. density.

B. Vapor Barrier Jacket
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
2. Moisture vapor transmission: AST< E96; 0.02 perm.
3. Secure with self sealing longitudinal laps and butt strips.
4. Secure with vapor barrier tape and vapor barrier mastic.

C. Facing: 1 inch galvanized steel hexagonal wire mesh stitched on one face of insulation.

2.03 CELLULAR GLASS

A. Insulation: ASTM C552
1. 'K' (ksi) value: 0.35 at 75 degrees F.
2. Density: 8.0 lb/cu ft.

B. All joints to be caulked and glued with a vapor barrier sealant as per manufacturer's recommendations.

2.04 CELLULAR FOAM

A. Insulation: ASTM C534; flexible, cellular Elastomeric, molded or sheet.
1. 'K' (ksi) value: ASTM C177 or C518; 0.27 at 75 degrees F.
2. Minimum service temperature: -40 degrees F.
3. Maximum service temperature: 850 degrees F.
4. Maximum moisture absorption: ASTM D1056; 1.0 percent (pipe) by volume, 1.0 percent (sheet) by volume.
5. Moisture vapor transmission: ASTM E96; 0.20 perm inches.
6. Maximum flame spread: ASTM E84; 25.
7. Maximum smoke developed: ASTM E84; 50.
8. Connection: Waterproof vapor barrier adhesive.

B. Elastomeric Foam Adhesive
1. Air dried, contact adhesive, compatible with insulation.

2.05 JACKETS

A. PVC Plastic
1. Jacket: ASTM C921, Sheet material, color per state standards (see Section 15190 for colors).
a. Minimum service temperature: -40 degrees F.
b. Maximum service temperature: 850 degrees F.
c. Moisture vapor transmission: ASTM E96; 0.002 perm inches.

d. Maximum flame spread: ASTM E84; 25.
e. Maximum smoke developed: ASTM E84; 50.
f. Thickness: 30 mil.
g. Connections: Brush on clear welding adhesive.
h. Covering Adhesive Mastic
i. Compatible with insulation.

B. Aluminum Jacket: ASTM B209.
1. Thickness: 0.016 inch sheet.
2. Finish: Smooth.
3. Joining: Longitudinal slip joints and 2 inch laps.
4. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

C. Stainless Steel Jacket: Type 316 stainless steel.
1. Thickness: 0.010 inch.
2. Finish: Smooth.
3. Metal Jacket Bands: ½ inch wide; 0.010 inch thick stainless steel.

2.06 APPROVED MANUFACTURERS

A. Johns Manville, Owens Corning, Knauf.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that equipment has been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign materials removed, and dry.

3.02 INSTALLATION

A. Install materials in accordance with manufacturers' instructions.

B. Do not insulate factory insulated equipment.

C. On exposed equipment, locate insulation and cover seams in least visible locations.

D. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Secure insulation to equipment with studs, pins, clips, adhesive, wires, or bands.

E. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor barrier cement.

F. Insulated dual temperature equipment or cold equipment containing fluids below ambient temperature:
1. Provide vapor barrier jackets, factory applied or field applied.
2. Finish with glass cloth and vapor barrier adhesive.
3. Insulate entire system.

G. For insulated equipment containing fluids above ambient temperature:
1. Provide standard jackets, with or without vapor barrier, factory applied or field applied.
2. Finish with glass cloth and adhesive.
3. For hot equipment containing fluids 140 degrees F or less, do not insulate flanges and union, but bevel and seal ends of insulation.

H. Inserts and Shields:
1. Application: equipment ½ inch diameter or larger.
2. Shields: galvanized steel between hangers and inserts.
3. Insert location: between support shield and equipment and under the finish jacket.
4. Insert configuration: minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
5. Insert material: ASTM C640 cork, hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

I. Finish insulation at supports, protrusions, and interruptions.

J. For equipment in mechanical equipment rooms or in finished spaces, finish with aluminum jacket stainless steel jacket.

K. For exterior applications, provide vapor barrier jacket or finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal equipment.

L. Cover glass fiber, cellular glass, cellular foam insulation with aluminum jacket.

M. Do not insulate over nameplate or ASME stamps. Bevel and seal insulation around such.

N. Install insulation for equipment requiring access for maintenance, repair, or cleaning, in such a manner that it can be easily removed and replaced without damage.

O. All insulation exposed outdoors shall be clad with 16mil aluminum jacket. This includes piping, valves, end caps, tanks, strainers, reducers, equipment, etc.

3.03 TOLERANCE

A. Substituted insulation materials shall provide thermal resistance within 10 percent at normal conditions, as materials indicated.

3.04 CELLULAR GLASS INSULATION SCHEDULE

EQUIPMENT	*THICKNESS INCH (mm)*
A. HVAC Hydronic Systems	
1. HVAC Hydronic Water Pump Bodies	2 “

2. Insulate pump housing with insulation arranged so that it can be removed without destroying the insulation. Finish with a vapor barrier mastic and Glassfab BF 30-35, Insulacoustic 501-C or equal. Contractor shall provide 16 mil aluminum jackets around pump housing. Housing to be removable for servicing and easy reinstallation. Inside of housing to be a solid mold section of insulation, miscellaneous spare pieces will stuffed in housing will not be acceptable.

3.05 CELLULAR FOAM INSULATION SCHEDULE

EQUIPMENT	*THICKNESS*
A. HVAC Hydronic Systems	
1. Expansion Tanks (New & Existing)	2"
2. Air & Dirt Separators (New & Existing)	2" (min)
3. Chiller Cold Surfaces (Cooling Only)	2"

Note: All insulation located outdoors to be equipped with aluminum jackets, min. 16 mils. thk. (Including valve body, end caps, transitions, etc.)

B. Hydronic System Valves: All hydronic water valves must be insulated with a factory fabricated removable/re-useable valve cover. Cover must be fabricated of 1" thk. closed cell cellular/elastomeric insulation complete with velcro closures as manufactured by Corick Inc.

1. All valve covers exterior to building to receive two (2) coats of Aerocel Aerocoat pure acrylic emulsion paint. Allow 4 hours drying time in between coat applications. Finish with aluminum jacket.

END OF SECTION

8-21-26

SECTION 20 2116 - PIPING SPECIALTIES

PART 1 GENERAL

1.01 GENERAL

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.02 SUMMARY

A. Work Included:

1. Piping specialties for plumbing and HVAC systems.

1.03 SUBMITTALS

A. General: All submittals shall comply with the requirements of Division 1 - GENERAL REQUIREMENTS and Section 20 01 00 - GENERAL PROVISIONS.

B. Product Data: Data shall be submitted on the following items:

1. Strainers
2. Pressure Reducing Valves
3. Air Vents
4. Dielectric Adapters
5. Thermometer and Test Wells
6. Pressure Gauges and Gauge Cocks
7. Triple Duty Valve
8. Suction Diffuser
9. Expansion Tank

1.04 QUALITY ASSURANCE

A. Standards

1. American Society of Mechanical Engineers (ASME):
   a. Boiler and Pressure Vessel Code, Section VIII - Unfired Pressure Vessels.
2. American Society for Testing and Materials (ASTM):
   a. Standard A53, Pipe, Steel, Black and Hot-Dipped Zinc-Coated, Welded and Seamless.
   b. Standard A74, Cast Iron Soil Pipe and Fittings.

PART 2 PRODUCTS

2.01 STRAINERS

A. All strainers, except those installed as integral part of equipment, shall be the product of a single manufacturer.

B. Y-Type Strainers:

1. Strainers 2 inches and smaller shall be iron-body with screwed end connections and screwed plug in blow-off. Strainers shall be rated for 400 pounds minimum and 250 pounds minimum SWP. Screens for water and steam service shall be 20 mesh model. Strainers shall be:

Keckley	Style B
Metraflex	Style S
Mueller	No. 11-FCB
Spirex Sarco	Type IT

2. Strainers 2 1/2 inches and larger shall be iron-body with 125-pound flanged end connections for installation between 150-pound raised face slip-on weld flanges. Strainers shall be rated for 175-pound minimum WOG and 125-pound minimum SWP. Strainers shall have blow-down connection which shall be provided with full size gats valve. Strainers shall be equipped with perforated baskets or perforated baskets lined with mesh

screens. Strainer screens and baskets shall be stainless steel in accordance with the following:

Size	*Service*	*Perforation Diameter*
2-1/2", 3"	Water	.033"
	Air or Gas	.009"
4", 5"	Water	1/8"
	Air or Gas	.033"
6", 8"	Water	1/8"
	Air or Gas	3/64"
10", 12"	Water	1/4"

Strainers shall be:

Schade Davis	No. 78M
McAlear	No. 528-8
Keckley	Style D
Metra Flex	Series M1
Mueller	No. 751 to 12", No. 752 14" & larger
Spirex Sarco	Type C1-125

C. Basket Strainers: Not Used.

2.02 PRESSURE REDUCING VALVES

A. Pressure reducing valves shall be field adjustable with outlet pressure set as specified hereinafter or as indicated on drawings.

B. All internal parts subject to wear shall be replaceable without removing the pressure reducing valve from the piping.

C. For Heating and Air Conditioning:

1. Water pressure reducing valves, 1" in size, shall be diaphragm actuated type with bronze body, 150 psi (minimum) working pressure. Valves shall be set to maintain a terminal pressure of 5 psi in excess of the static head on the system unless shown otherwise on the drawings. Valves shall be:

Watts U5LP Series

A.W. Cash Type E-41S

Thrush High Pressure Regulating Valve

D. For Plumbing Systems

1. Type "A" pressure reducing valves for water service shall be diaphragm actuated type with bronze body and 150 psi (minimum) working pressure. Valves shall have an adjustable outlet pressure range of not less than 10-35 psi. Valves shall be:

Watts U5LP

A.W. Cash Type E Series 3

2. Type "B" pressure reducing valves for water service shall be diaphragm actuated type with bronze body and 150 psi (minimum) working pressure. Valves shall have an adjustable outlet pressure range of not less than 35 to 75 psi. Valves shall be:

Watts No. 223-S Series

A.W. Cash Type E Series 3

3. Type "C" pressure reducing valves for compressed air service shall be diaphragm actuated type with an adjustable outlet pressure range of not less than 0 to 200 psi. Valves shall be:

Watts No. 199 Series

A.W. Cash Type E-55 Series

4. Plumbing contractor shall provide pressure reducing valve at dishwasher prior to connection to hot water line.

2.03 AIR VENTS

A. Automatic Air Vent: Designed to vent automatically with float principle; bronze body and nonferrous internal parts; working pressure; operating temperature; with discharge connection and inlet connection. Air vents shall be:

Armstrong No. 71

Hoffman No. 78

Thrush No. 8

Taco No. 424

B. Manual Air Vent: Bronze body and nonferrous internal parts; working pressure; operating temperature; manually operated with screwdriver or thumbscrew; with discharge connection and inlet connection.

2.04 DIELECTRIC ADAPTERS

A. Dielectric adapters shall be the union type for pipes 2" in size and smaller and flanged type for pipes 2-1/2 " in size and larger. Adapters shall have a working pressure of 250 psi for union type and 175 psi for flanged type. The insulating gasket shall have an operating range of 40°F to 240°F and shall limit the galvanic corrosion to a maximum of 1% of the short circuit current.

2.05 THERMOMETER AND TEST WELLS

A. Thermometers:

1. Thermometers shall be the blue-reading spirit-filled adjustable angle type. Thermometer shall be adjustable to any angle through a 180° arc and shall be provided with a locking device.
2. Thermometers shall have V-cast aluminum case with baked enamel separable sockets and where installed on insulated pipes, sockets shall be extension neck type to provide for 2" thick insulation.
3. Thermometer scale range shall be
   a. Not used.
   b. Chilled Water System - 0-100°F
   c. Domestic Water Systems - 30-240°F
   d. Not used
4. Thermometers shall be:

Weksler Adjust-Angle Series Type AA-5

Trerice Adjustable Angle Series Type BX

Weiss Vari-Angel Series Type BS

B. Test Wells:

1. Test wells shall be for use with engraved stem thermometers. Test wells shall be brass and shall be provided with cap and chain with gasket for sealing when not in use.
2. Wells installed in insulated pipes shall be extension neck-type to provide for 2" thick insulation.

2.06 PRESSURE GAUGE AND GAUGE COCKS

A. Pressure Gauges

1. Gauges shall be flangeless type and shall have 4-1/2 dials, cast aluminum cases, stainless steel rotary gear movements, phosphor bronze bourdon tubes, forged brass rod sockets and tips, 1/2% accuracy of scale range, Plexiglass dial covers, safety blow-out disc and 1/4 inch lower connections.
2. Gauges in pump suction line shall be the compound type. Gauges in all other locations and discharge shall be the plain pressure type.

3. Range for pressure gauges shall be selected so that the normal operating point for each application falls in the approximate midpoint of the gauge range. Shop drawings shall indicate ranges.
4. Gauges shall be:

Weksler Type AA1

Trerice No. 500X Series

Weiss Series PG

B. Gauge Cocks:
1. Gauge cocks shall be brass lever handle type. Gauge cocks shall be:

Weksler Type A

Trerice No. 880

Weiss type LC

2.07 TEMPERATURE/PRESSURE TEST FITTINGS

A. Fittings shall be the combination temperature pressure test type with brass body, self-sealing EPDM gasket, threaded connections and cap. Temperature/Pressure Test Fittings shall be:

	Pete's Plug
Sisco	P/T plug
Fairfax	Test plug

2.08 PIPE SLEEVES

A. Pipe Sleeves
1. Sleeve size shall be such as to provide an annular space of the sleeve and the passing pipe or pipe insulation.
2. Sleeve material shall be as follows:
   a. In walls below grade: Schedule 40 black steel pipe, ASTM A53.
   b. In concrete floors on grade: Service weight cast-iron pipe, ASTM A74.
   c. In walls and partitions above grade: 20-gauge galvanized sheet steel with lock-type longitudinal seams.
   d. In concrete floors above grade: 20-gauge galvanized sheet steel with lock-type longitudinal seams.
   e. In concrete roofs: Service weight cast-iron pipe, ASTM A74.

2.09 FLOOR, WALLS AND CEILING PLATES

A. Escutcheons shall be chrome-plated steel plates, hinged type with set screw.

B. Escutcheons for chrome-plated connections at plumbing fixture shall be as specified under the plumbing fixtures.

2.10 FLEXIBLE CONNECTIONS

A. Provide flexible rubber, single arch connection in piping to all pumps, etc., as shown on plans complete with control rods. Flexible connections shall be constructed with Nitrile (Buna N) tube, neoprene cover; zinc plated steel flange and steel bead flange retainer.

B. Joints shall be rated for a maximum of 210 psig and 240° F for sizes 1 1/2 thru 12 Flexible connectors shall be manufactured by Metraflex “Metrashpere” or Southeastern Hose #SEMC, Twin Hose approved equal.

2.11 EXPANSION TANKS

A. Captive Air Expansion Tank (HVAC Hydronic Systems)
1. Expansion tank shall be a pre-pressurized captive air bladder type. Tank shall be constructed of steel in accordance with requirements of the ASME Code for unfired pressure vessels, for working pressure of 125 psig. The tank shall contain a replaceable elastomeric bladder suitable for maximum operating temperature of 240°F. The bladder shall be factory pre-charged with air to pressure equal to the full pressure of the systems.
2. The tank shall be provided with the following connections:

a. 1-1/2" NPT System Connection.

b. 1-1/2" NPT Charging Valve Connection.

c. 1" NPT Remote Air Connection Coupling.

d. 3/4" NPT Drain

3. Tanks shall be:

Taco Model CA

Amtrol SX Series

B. Thermal Expansion Tank (Plumbing Systems)

1. Furnish and install as shown on drawings a pre-charged steel thermal expansion tank with a fixed FDA approved butyl bladder. The tank shall have a top NPT stainless steel system connection and a charging valve connection (standard tire valve) to facilitate the on-site charging of the tank to meet system requirements. The tank must be constructed in accordance with Section VIII of the ASME Boiler and Pressure Vessel Code and stamped 150 psi working pressure.

2. Thermal expansion tank to limit the pressure of the water being heated to no more than 80 pounds per square inch as required per section 613.2 of the International Plumbing Code (Current Edition)

3. Tanks shall be:

Wessels TTA Series

TACO, Bell & Gossett

2.12 AIR AND DIRT SEPARATORS

A. Manufacturers:

1. Taco, Inc; 4900 (size and capacity as called for on plans)

2. Spirotherm.

3. Flamco

4. Substitutions: See Section 01600 - Product Requirements.

B. Air and dirt removal device shall be constructed of steel. It shall be designed, fabricated and stamped per ASME Section VIII Division 1 with a maximum working pressure of 125 psi at 270̊F. Manufacturer shall be holder of ASME U stamp. Manufacturer to have optional 250 psi and 150 psi ASME units available.

C. Units up to three 3-inches in size shall be provided with threaded connections as standard. Units four 4-inch and larger shall be provided with flanged system connections as standard. Inlet and outlet connections to be in line with piping system. Both inlet and outlet to be in the same horizontal and vertical planes.

D. Each air and dirt removal device shall be equipped with a brass conical shaped air venting chamber designed to minimize system fluid from fouling the venting assembly. The air vent shall be able to be closed to allow flushing and purging of dirt via side port without dirt passing through vent on initial system fill.

E. A brass flushing cock shall be located on the side of each separator to facilitate system fast-fill and removal of the floating impurities from the air system interface within the separator.

F. A blow down valve shall be provided by the unit manufacturer on the bottom of each unit to allow blow down and cleaning. On units 2 ½” and smaller the valve and all of its fittings shall be 1”. On units three 3” and larger the valve and all openings shall be 2”.

G. The air and dirt removal device shall remove air down to 18 microns and shall remove dirt/debris down to 35 microns. The unit shall be 100% efficient at removing dirt down to 90 microns in 100 passes or less.

H. The unit manufacturer shall provide the owner and design engineer third party independent test data certifying that their unit performs to the above standards. Suppliers not providing these independent performance test results will not be acceptable and must be prior approved.

I. The air and dirt separator shall employ the use of high surface area pall rings to achieve optimal separation of air and dirt with minimal pressure drop. The pall rings shall be made of

stainless steel. Stainless steel will be the only acceptable material used for suppressing turbulence and increasing surface area for high efficiency air and dirt removal. Inferior materials of construction such as copper for the straining medium will not be acceptable.

J. Manufacturer must have at least 15 years of experience with micro bubble coalescing and dirt removal technology.

2.13 SUCTION DIFFUSER FOR PUMPS

A. All pump suctions to be fitted with a multifunction inlet suction diffuser fitting equal to that as manufactured by Taco, Inc. The suction guide body and cover plate shall be ductile iron and be rated for 250 psi for all jobs. The guide flanges shall be matched to suit the working pressure of the piping components on the job; with either ANSI class 125 flanges or ANSI class 250 flanges. The suction guide shall include the following components; full length S.S. straightening vanes, permanent S.S. strainer, disposable 16 mesh bronze start up strainer, blow down ports, and metering ports. For those pumps where an inlet guide fitting is not installed, there should be five pipe diameters of straight undisturbed flow going into the pump suction. The fitting shall be a Taco model SD inlet suction elbow or equivalent.

2.14 TRIPLE DUTY VALVES

A. All pumps shall be fitted with a discharge multi-purpose balancing valve or other means of providing system balance, isolation, and check feature for reverse flow. The gland shall be straight or angle pattern and shall be field convertible between the two. The valve shall be ductile iron and rated for 250 psi working pressure for all jobs. The valve flanges shall be matched to suit the working pressure of the piping components on the job; with either ANSI class 125 flanges or ANSI class 250 flanges. The valve shall include the following components; non-slam check valve with spring-loaded bronze disc and seat, stainless steel stem, and calibrated adjustment permitting flow regulation. Valve shall be serviceable under full system pressure. The valve shall be a Taco model MPV Plus Two multi-purpose valve or equivalent.

2.15 AUTOMATIC FILL VALVE

A. Equip fill valve with inlet strainer and anti-siphon check valve. Valve to be field-adjustable to inlet pressure required. Valve seat strainer and stem to be removable and of non-corrosive material. Provide valve with manual fast fill lever designed to facilitate fast filling of system and provide relief valve (Cash Acme series F30) on discharge side of fill valve.

B. Manufacturer: Bell and Gossett F-8, Cash Acme Model 82

2.16 HYDRONIC COIL VALVE PACKAGE

A. Contractor shall provide and install NEXUS, Hayes, Griswold or prior approved equal Hydronic Coil Piping Packages where indicated on drawings. The Hydronic Coil Piping Package may include but are not limited to, ball valves, strainers, flow control valves, unions, 2-way, 3-way temperature control valves, air vents, pressure/temperature test valves, drain valves, tees and other components as listed.

B. Automatic Flow Control Valves: Contractor shall provide and install UltraMatic, Model UM manufactured by NEXUS Valve.

C. Automatic Flow Control Valves shall be of non-clogging design with:

1. The flow cartridge’s non-clogging service design shall include no metal-to-metal contact, no segmented ports, and incorporate a flow nozzle and a metering disc controlled by a pressure compensating spring.
2. The flow cartridge shall be a single assembly, constructed with stainless steel moving parts and be accessible without removing the valve from the piping.
3. The flow cartridge shall be 100% factor flow tested and calibrated to maintain an accuracy of +/- 5%, the accuracy shall be maintained over an operating range of 2 – 45 PSID.
4. The flow cartridge shall carry a limited lifetime material warranty.
5. Valves 2” and smaller shall be forged brass Y-pattern body with a full port ball valve, (2) pressure/temperature ports, a tag indicating the model, flow rate and PSID range, blowout proof stem with dual Viton o-ring seals, interchangeable union end with Viton o-ring seal, hard chrome plated stem with Teflon seats, and rated at 600 psi WP, 275’F.

D. Combination Strainer/Ball Valves (2” and Smaller) used for supply side shutoff and strainer requirements shall be forged brass construction, NEXUS Model UY with:

1. A minimum rating of 600 WOG, 325'F.
2. Interchangeable union end with Viton o-ring seal.
3. ¼" pressure/temperature plug.
4. Blowout proof stem with dual Viton o-rings seals.
5. Hard chrome plated ball with Teflon seats.
6. A 20 mesh 304 stainless steel filter screen, accessible without effecting the valve piping, (In/Line basket type strainer will not be acceptable).
7. Bowdown/drain valves complete with ¾" hose connection and cap.

E. Unions (2" and smaller) shall be full port forged brass NEXUS Model UU with:
1. A minimum of 600 psi WP, 325'F.
2. ¼" pressure/temperature plug and manual air vent.
3. Viton o-ring seal (ground joint are not acceptable).
4. Union tailpieces may be used to reduce pipe sizes to match coil and ACT valve size(s).

F. Accessories to Hydronic Coil Piping Package shall conform to the following:
1. Shaft extension (2" and smaller) for chilled water insulated pipe shall be at least 2-1/4" tall and constructed of brass with a stationary external shaft housing to ensure vapor barrier seal.

2.17 AUTOMATIC FLOW CONTROL VALVES

A. Contractor shall provide and install UltraMatic, Model UM manufactured by NEXUS Valve, Hayes & Griswold approved equal.

B. Automatic Flow Control Valves shall be of non-clogging design with:
1. The flow cartridge's non-clogging service design shall include no metal-to-metal contact, no segmented ports, and incorporate a flow nozzle and a metering disc controlled by a pressure compensating spring.
2. The flow cartridge shall be a single assembly, constructed with stainless steel moving parts and be accessible without removing the valve from the piping.
3. The flow cartridge shall be 100% factor flow tested and calibrated to maintain an accuracy of +/- 5%, the accuracy shall be maintained over an operating range of 2 – 45 PSID.
4. The flow cartridge shall carry a limited lifetime material warranty.
5. Valves 2" and smaller shall be forged brass Y-pattern body with a full port ball valve, (2) pressure/temperature ports, a tag indicating the model, flow rate and PSID range, blowout proof stem with dual Viton o-ring seals, interchangeable union end with Viton o-ring seal, hard chrome plated stem with Teflon seats, and rated at 600 psi WP, 275'F.
6. Contractor shall provide with auto-flow control valve submittal a schematic of proposed HVAC hydronic coil piping installation. Schematic to include all thermometers, pressure gauges, unions, test ports, control valves, isolation valves, valves, flex connections, strainers, ¾" drain hose connections (with ball valve), manual air vents, etc.

7. Cartridge housing for auto flow valves shall be able to receive cartridges rated at 125% of scheduled flow. Provide auto flow valves sized to accomplish this.

2.18 DOMESTIC WATER MULTI-TURN FLOW CONTROL VALVE

A. General: Contractor shall provide and install certified low lead multi-turn flow control valves at all locations as specified in the construction documents.

B. Multi-Turn Flow Control Valves – Low Lead:
1. Manual Flow Control devices shall be Multi-turn balancing type accurate to at least ±5%.
2. MFCV ½" – 1" shall be forged DZR Lead Free brass Y-pattern globe style with (2) pressure/temperature test ports, visual turns indicator, locking handle tag, and rated at 600 PSI WOG, 325 degrees F. Valves shall be available with NPT connections; like Nexus UltraMB™ (Model MBNL.)

3. Valve shall contain less that 0.25% lead content by weight on wetted surfaces in accordance to NSF-61 for hot and cold potable water service, and shall be certified to meet to the requirements of NSF-372.
4. Provide extended pressure and temperature test plugs and handles.
5. Valve shall carry a LIFETIME product warranty.
6. Approved Manufacturers: a. Nexus Valve, Inc. or prior approved equal.
7. Balance to Flow Rate (GPM) as noted on Plumbing Drawings.

PART 3 EXECUTION

3.01 GENERAL

A. All equipment shall be installed where indicated on the drawings and shall be installed in accordance with manufacturer's instructions.

B. Unless otherwise indicated on the drawings, thermometers and pressure gauges shall be installed no higher than 8 feet above finished floor. Final position of each thermometer and pressure gauge shall be such that it is readable from the floor.

C. Pipe sleeves in walls, partitions and roofs and in floors on grade shall be cut flush with each surface except where clamping flanges are used. Sleeves through floors above grade shall e cut flush with the underside of the floor and shall extend 1" above the top side of the floor. Where pipes penetrate existing slabs above grade, install a 2" high concrete water dam around pipe.

D. Except where otherwise specified, pipes passing through concrete and masonry walls, concrete and masonry partitions, concrete floors and roofs, and fire rated gypsum board or plaster partitions shall be provided with pipe sleeves which shall be installed at the time of construction of walls, partitions, floor or roof. Sleeves are not required for water and waste connections through a wall or partition to an individual fixture not for cast-iron pipe through concrete slab on grade. Sleeves shall not be installed in structural members except where specifically indicated or approved by the Architect. The annular spaces between pipe and sleeve and between insulation and sleeve, including drain pipes at water closets, shall be sealed. In addition, penetrations through fire-rated walls and partitions and through floors above grade shall be packed solid with Fiberglass insulation behind a backup material and sealant.

E. A strainer shall be provided on the inlet side of each pressure reducing valve. Pressure reducing valves provided with an integral strainer do not require a separate strainer.

F. Air vents shall be installed at all high points in piping systems and elsewhere as indicated on the drawings. Inlet of each vent shall be equipped with pet cock to provide for manual operation. Provide U-Tube on air vent discharge made of soft drawn copper tubing.
   1. Provide manual air vents at all high points of system, including each branch of the piping system.
   2. Provide automatic air vents at high point of system within mechanical room and as shown on plans.
   3. All air vents installed above ceilings shall be manual type.

G. Dielectric adapters shall be installed between copper and iron pipe connections and between ferrous and non-ferrous metal piping or equipment.

H. Test wells shall be installed above the horizontal so as to hold oil and wells shall be filled with oil.

I. Pressure gauges shall be connected to the piping system with threaded brass pipe and screwed brass fittings. Install gauge cock on inlet pipe to gauge. All gauges used on services exceeding 200°F shall be mounted on a brass pigtail siphon.

J. Where exposed piping, bare or insulated, passes through floors, walls and ceiling, except in Mechanical rooms, escutcheons shall be provided.

K. Contractor shall use domestic water multi-turn flow control valves to balance the domestic hot water system.

L. Expansion tank shall be mounted as indicated on the drawing.

M. Air & dirt separator tank shall be suspended independent of the piping system. Provide with blow-down line with gate valve and run to drain.

N. All sanitary sewer piping routed up thru grade beams shall be down within cast iron pipe sleeve one pipe size larger than service pipe. Pack annular space between cast iron pipe and service piping with closed cellular foam insulation.

END OF SECTION

8-21-26

SECTION 21 0303 - AUTOMATIC SPRINKLER SYSTEM

PART 1 GENERAL

1.1 GENERAL

A. The General Conditions of the Contract and Supplementary Conditions of the Contract shall govern the work under this Section of the specifications. The Contractor is specifically directed to refer to said conditions.

B. It is understood that these specifications, and the accompanying drawings, complete apparatus, fully erected and in successful operating condition. All work must be preformed in the best and most substantial manner.

C. These specifications are intended to provide complete, and in proper operation, all sprinkler system piping, equipment, heads, valves, controls, and accessories, all as specified herein or shown on the accompanying drawings, or reasonably implied in either. The building shall be provided with complete coverage sprinkler system for the spaces designated on the drawings classification as required. System shall consist of calculated sprinkler systems unless indicated otherwise. Verify all pertinent criteria. The systems shall conform to layout shown and meet all requirements of agencies listed under "REGULATIONS AND STANDARDS" below. Refer to plans and specifications for additional information.

1.2 SYSTEM LAYOUT:

A. Where plans indicate layout of system components, the layout shall be verified to comply with "REGULATIONS AND STANDARDS" and shall be revised if required to comply. All layout routes, pipe sizes, head locations, etc. are to be used as a guide, it shall be the sprinkler contractor's ultimate responsibility to design and size the sprinkler system in strict accordance with NFPA 13. Revisions shall be at Contractor's expense. Any such revisions shall be verified with the Architect.

1.3 ELECTRICAL WORK:

A. See "COORDINATION".

1.4 SPRINKLER SYSTEM CONTRACTOR:

A. It is intended that the work under this section is to be preformed by a qualified Fire Protection Piping Systems Contractor regularly engaged in this type of work. The Contractor is to hold a current license to perform this work and be certified by the State Fire Marshal. All documents shall bear this certification.

1.5 REGULATIONS AND STANDARDS:

A. It is the intention of these specifications and the accompanying drawings, that all elements and features of the fire protection system shall be in accordance with the standards of the National Fire Association (NFPA), the State Fire Marshal, all applicable building codes, Owner's Insurance Agency and Property Insurance Association of Louisiana whether so indicated or not. NFPA standards are on file in office of Architect and may be examined at the Contractor's request.

B. MANUFACTURER'S OR TRADE NAMES: Where the plans or specifications mention the names of manufacturers or the products of specific manufacturers, it is intended that the contractor shall furnish the item or items as specified. Products of manufacturers that are not mentioned shall be subject to prior review by the Architect and shall in any case mentioned shall be subject to prior reviews by the Architect as stated in Instruction to Bidders, page 1B-3, Paragraph 3.3 substitutions.

1.6 SHOP DRAWINGS AND SUBMITTAL DATA:

A. Within fifteen (15) days of award of the contract, the contractor shall submit six (6) copies of system piping shop drawings and six (6) copies of manufacturer's data and descriptive literature and drawings for all equipment and materials. Additionally, provide a reproducible (sepia) copy of the system piping shop drawings. All drawings, literature and data on all equipment shall be submitted at the same time; this material shall contain complete layout, capacity data, dimensions and other pertinent information necessary for the Architect/Engineer to properly review and evaluate the item that necessary to meet the requirements for submittal to the State Fire Marshall.

B. The contractor shall obtain approval of agencies listed under "REGULATIONS AND STANDARDS" before submitting to the Architect, except that the date for State Fire Marshal's review shall be submitted to the Architect prior to submitting to the Fire Marshal. All required review fees and applicable requirements shall be by the contractor. No item of equipment or material shall be place on order until Final Review comments have been received from the Architect. See "DRAWINGS" below.

1.7 ORDINANCES, RULES AND REGULATIONS:

A. All material and construction shall conform to the requirements of all building, plumbing and sanitary codes and laws in force in the locality in which the work is to be done. All materials and construction shall also conform to the rules and regulations listed above under "REGULATIONS AND STANDARDS".

1.8 DRAWINGS:

A. The contractor shall submit detailed drawings for all sprinkler system showing exact locations and sizes of all elements in the system before fabrication is begun. Architect shall have the prerogative of changing the position or configuration of these systems without changing the total scope of work involved to comply with "REGULATIONS AND STANDARDS".

B. Drawings shall provide the following data and catalog cuts:

1. Project name and locations.
2. Roof and ceiling construction.
3. Water supplies and sizes.
4. Make and type of sprinklers.
5. Number of sprinklers on each riser and total per fire area.
6. Make, type, model and size of alarm check valves, etc.
7. Location of all risers, mains, lines, etc.
8. Cutting length of pipe.
9. Crosses, Tees, riser nipples and size.
10. Type hangers and spacing.
11. Hydraulic calculations.
12. Siamese fire department connection.
13. Underground sprinkler supply riser co-ordinate with foundation drawings.
14. Valves.
15. Inspection test stations.
16. Location of spare sprinkler head cabinets and quantities to be provided of each type of head.

1.9 GUARANTEE:

A. The contractor shall guarantee all materials and workmanship under this contract for a period of one (1) year from date of final acceptance of his work and shall repair or replace any such defective materials and workmanship without cost to the Owner.

B. The guarantee shall include complete service, including adjustment service and inspection, during the guarantee period as required by agencies listed under "REGULATIONS AND STANDARDS".

1.10 EXTRA STOCK:

A. Provide extra sprinkler heads under provisions of NFPA 13.

B. Provide suitable wrenches for each head type.

C. Provide metal storage cabinet in sprinkler riser room.

PART 2 PRODUCTS

2.1 GENERAL:

A. Furnish and install in a neat workmanlike manner, all required to provide a complete, properly operating installation. All piping and accessories shall conform to standards as applicable.

B. Run piping parallel with the lines of the building, unless specifically shown or noted otherwise. All pipe, fittings, valves, etc., shall have sufficient clearance from other work to finish at least 1/2 inch from other work or finished covering of other piping.

C. Provide all necessary hangers, anchors, thrust blocks, etc., to properly support and protect piping system, as required by agencies listed under "REGULATIONS AND STANDARDS".

D. Under no circumstances is the contractor to attach to or support from any bar joist bridging. Any supports to the bar joists or any structural systems are to be approved by the Engineer. All supplement angle or channel iron required to support equipment of this specification is to be furnished by the contractor and is to be independent of any other supports.

2.2 SLEEVES AND PLATES:

A. Wherever pipes pass through concrete slabs, furnish and install sleeves, properly located for the work.

B. Use sleeves of sufficient size to allow the specified pipe covering to pass through the sleeves and finish sleeves flush with walls and ceiling.

C. Sleeves shall be galvanized steel not lighter than 24 gauge.

D. Seal spaces between sleeve and pipe. Use packing device or material for UL rating to match rating of wall or floor/ceiling as rated under UL File R9658.

2.3 ESCUTCHEONS:

A. Where pipes passing through floors, walls or ceiling exposed to view in finished areas, provide pressed steel split plates which cover the opening and fit snugly to pipe.

2.4 SPRINKLER HEADS:

A. Temperature rating on fusible links to suite specific hazard area with minimum margin of safety 50-degrees F.

B. Sprinkler heads installed under suspended finished ceilings (unless noted here-in- after)shall be fully-recessed type with cover plate with custom color finish. Sprinkler heads installed under solid/sheetrock finished ceilings (unless noted here-in-after) shall be fully-recessed type with cover plate with custom color finish. Extended coverage sprinkler heads to be allowed based on approval of aesthetics of sprinkler head by architect/owner.

C. For exposed areas, provide standard upright type with chrome finish. In mechanical rooms, janitors closet, etc. finish may be brass.

D. For Sidewall applications, provide sidewall type with chrome plated finish and escutcheons.

E. Dry pipe sprinkler heads shall be the closed, automatic type with spray deflector, fusible link and white finish.

F. All sprinkler heads shall be Underwriter's Laboratories and Factory Mutual Labeled.

G. All sprinkler heads to be quick response type.

H. All porches to be protected with dry type sidewall heads.

I. Provide chrome-plated wire cages, including attachment devices, in areas with upright heads (Gymnasium, etc.).

1. Wire cages shall be heavy duty type & UL listed for use with respective sprinkler head.

2.5 SPRINKLER VALVE STATION:

A. Provide approved automatic valve station with OS&Y shutoff valve, alarm valve, main alarm check valve, with variable pressure trimming, including water pressure gauges, retard chamber, alarm test line with valve, drain lines with valves, outside water

alarm, etc.

B. Wet pipe alarm check valve shall be designed for vertical installation. Valve shall have cast iron body with all surfaces in contact with water non-ferrous. Valve shall be UL Listed or FM Approved, iron body, bronze mounted, variable pressure type with retarding chamber. Provide basic trimmings for alarm test by-pass, gages, drain connections, mounting supports for retarding chamber, and drip funnel. Provide pressure sensitive alarm switch to actuate the fire alarm system.

C. Water Motor Alarm: Provide alarms of the approved weatherproof and guarded type, to sound locally on the flow of water in such sprinkler system to which it is connected. Mount alarms on the outside of the outer walls of each building, at a location indicated on the plans.

D. Inspector's Test Connection: Provide test connections about 6 feet above the floor for each sprinkler system equipped with an alarm device and locate at the hydraulically most remote part of each system. Provide test connection piping to a location where the discharge will be readily visible and where water may be discharged without damage.

E. Main Drains: Provide drain piping to discharge at safe point outside each building. Provide auxiliary drains as required by NFPA 13.

F. Flow Switches: Flow switch shall be paddle type, designed for direct immersion in water and vertical and horizontal pipe mounting. Switch shall be normally open type with two single pole, double throw switches, pneumatic retard (adjustable), and 120 volt power. Switch shall be UL and Factory Mutual labeled.

G. Supervisory Switches: Valve supervisory switches shall be designed for valve mounting, vertical and horizontal. Switch shall be normally closed type capable of detecting any motion from the valve full open position. Switch shall be UL labeled. Provide at fire water backflow preventer.

H. Dry Pipe Valve: UL Listed, flanged, iron body. Provide basic trimmings for alarm test by-pass, pressure switches, gages, drain connections, drip funnel, accelerator and necessary pipe, fittings and accessories required to provide a complete installation.

2.6 SIAMESE FIRE DEPARTMENT CONNECTIONS:

A. Provide wall & remote mounted siamese fire department connection with chrome plated finish, local fire department threads, dust caps and chains, 3/4" automatic drip, marked "SPRINKLER - FIRE DEPARTMENT CONNECTION" (on chrome plated placard with raised chrome letters. Contractor shall co-ordinate with local Fire Department to match their size and type threads. FDC to be sufficient to provide flow required by sprinkler system design.

2.7 VALVES, PIPING AND FITTINGS:

A. Refer to Section 210516: Fire Protection Piping.

2.8 AUTOMATIC VALVES AND FLOW SWITCHES:

A. Automatic valves and flow switches shall have bodies of brass or bronze, threaded, for 150 lbs. pressure, electrically operated, 110 volts, UL Listed.

B. Automatic valves shall be solenoid operated, 110 volts. Valves shall remain open upon loss of power

C. Water Flow Indicators: The Sprinkler Contractor shall furnish and install all electrical wiring required in connection with sprinkler system. A 120 volt electric water flow indicator shall be installed in the main sprinkler supply to each individual zone. This shall include wiring from each of the indicators to connect with individual zones in the building fire alarm panel.

2.9 FIRE HYDRANTS:

A. Refer to Civil Engineering Documents.

2.10 AIR SUPPLY SYSTEM

A. Air supply system for dry pipe sprinkler system compressed air system.

B. Provide air compressor specifically approved for a dry sprinkler system with UL Listed or FM Approved dry valves. Compressor shall maintain the required operating pressure on the dry system. Provide a 120-volt electrical connection with disconnect, compressor to be hard wired (plug in to outlet not acceptable).

C. Provide an automatic air pressure maintenance device to automatically reduce pressure and supply air to the sprinkler system at a set requirement. Air maintenance device shall include pressure regulator, 1/2" valve bypass, relief valve, pressure gage, air supervisory pressure switch and pipe, fittings, valves and accessories necessary to provide a neat, compact and complete operable system.

D. Air compressor serving the dry pipe sprinkler system shall be inline pipe mounted high volume type, single unit, electric motor driven, ASME rated horizontal receiver tank, air pressure operated electric switch, motor, motor starter, safety valves, check valves, automatic tank drain, muffler filter, belt guard, and controls capable of required free air delivery from 0 to 40 psig within 30 minutes of start.

2.11 STANDPIPE VALVE CABINET (FIRE RATED) AND ACCESSORIES:

A. Not used.

PART 3 EXECUTION

3.1 DESIGN:

A. The sprinkler systems shall be designed as required for occupancies specified by experienced personnel with competency in the execution of such work. Sprinkler system design shall be performed only by engineers licensed by the State of Louisiana. Provide the following:

1. Wet pipe systems for all areas.

a. New construction, contractor to provide wet pipe sprinkler system, light hazard, (0.10 gpm/sq/ ft/ over the most remote 1500 sq. ft.), except kitchen, storage room(s), mechanical rooms, breakrooms, and janitors closets (Refer to NFPA 13) which shall be ordinary hazard, group 2 (0.15 gpm/sq/ ft/ over the most remote 1500 sq. ft.).

b. Contractor to design system with a mandatory 15 pound cushion.

c. The following occupancies and areas have been taken from NFPA 13 for the convenience of the contractor. It is the contractors responsibility to design the sprinkler system in accordance with the most current version of NFPA 13.

Light Hazard Occupancies

Churches, Clubs, Eaves & Overhangs (made of combustible material), Educational, Hospitals, Institutional, Libraries, except large stack rooms, Museums, Nursing or Convalescent homes, Offices (including data processing), Residential, Restaurant Seating Areas, Theaters & Auditoriums (excluding stages and prosceniums), Unused Attics

Ordinary Hazard, Group 1

Automobile parking and showrooms, Bakeries, Beverage Manufacturing, Canneries, Dairy products manufacturing and processing, Electronic plants, Glass and glass products manufacturing, Laundries, Restaurant service areas, kitchen, storage room(s), mechanical rooms, breakrooms, and janitors closets.

Ordinary Hazard, Group 2

Cereal mills, Chemical plants (ordinary), Confectionery products, Distilleries, Dry cleaners, Feed mills, Horse stables, Leather goods manufacturing, Libraries (large stack rooms), Machine shops, Metal working, Mercantile, Paper and pulp mills, Paper process plants, Piers and wharves, Post offices, Printing and publishing, Repair garages, Resin application area, Stages, Textile manufacturing, Tire manufacturing, Tobacco products manufacturing, Wood machining, Wood product

assembly.

B. Contractor to provide additional sprinkler heads under any obstructions, overhangs, ductwork, equipment, etc. 4'0" and wider. Contractor to provide sprinkler heads in all exterior overhangs required to protect window walls, above and below.

C. Contractor to provide any and all sprinkler heads for water curtains required at all rated walls containing glass to maintain designated rating.

D. All sprinkler heads shall be located in the center of suspended ceiling tile.

E. Sprinkler contractor shall include in his bid the backflow preventer with isolation valve as required by Department of Health and include pressure drop in hydraulic calculations. Backflow preventer to be located on site, refer to architect/engineer for exact location. It shall be sprinkler contractor responsibility to co-ordinate all facets of system not just inside building for a complete system. Contractor to

F. Sprinkler contractor shall co-ordinate routing of piping with mechanical and electrical. Contractor can assume that there will be conflicts and shall include in his bid for these possibilities. No additional compensation will be allowed regarding this matter.

G. Sprinkler contractor to refer to architectural reflected ceiling drawings for fully concealed heads to be custom colored to match color of respective metal/wood panel ceilings.

H. Contractor shall provide dry type heads in freezer and cooler.

I. Provide wire guards for all sprinklers heads located in storage rooms if head located less than 8'0" from finished floor.

J. All sprinkler piping shall be located above ceilings and below sheetrock (underneath side of floor joist assembly).

K. Due to the complexity of the ceiling heights, sprinkler contractor shall include a preliminary submittal of routing of main sprinkler piping for Architect/Engineers approval prior to submitting final drawings to Fire Marshal.

L. Sprinkler contractor shall co-ordinate routing of piping with mechanical and electrical. Contractor can assume that there will be conflicts and shall include in his bid for these possibilities. No additional compensation will be allowed regarding this matter.

M. Sprinkler piping shall be protected from freezing during the lay-a-way period.

N. The design shall comply with NFPA 13 (latest editions), codes, standards, and recommended practices. No extra charges will be approved for changes to drawings, piping, etc. required to conform to NFPA 13 to be used.

O. Sprinkler system shall be design on basis of latest available flow test available.

P. NFPA rules and regulations governing the design shall be scrupulously adhered to specifically, NFPA 13 of the National Fire Codes shall govern the design of the sprinkler system.

Q. Piping shall be installed in accordance with NFPA Chapter 13.

R. Co-ordinate all sprinkler alarm/supervisory tie-in connection points with fire alarm contractor prior to bid, whether shown on drawings or not. General contractor to coordinate with sprinkler contractor & fire alarm contractor prior to bid as to ensure a complete and working system.

S. All sprinkler heads located in coolers, freezers and storage area with ceiling heights of eight (8) feet or less shall be protected with basket type cages.

T. Provide sprinklers at top of stairwell, all floors, & underneath first floor intermediate landing as per NFPA 13.

U. Provide cage guards for all upright heads in exposed areas.

V. Not used.

W. Testing & Training to be in accordance with NFPA 25.

X. Provide hose cabinets as per NFPA.

Y. Not used.

Z. Provide sprinklers at top & bottom of elevator shafts per NFPA with smoke & heat detectors.

AA. Provide automatic air vent (with shutoff valve) near high point of the sprinkler system to allow air to be removed from sprinkler piping system. Automatic air vent shall be Potter Roemer model PAV or prior approved equal.

3.2 INSTALLATION:

A. Run piping concealed above furred ceiling and in joists to minimize obstructions. Expose only heads.

B. Coordinate sprinkler piping routing and heads with all trades.

C. Protect sprinkler heads against mechanical injury.

D. Sprinkler heads location indicated on plans is to be used as a guide only, exact location and numbered to be based and determined by design of sprinkler system, any additional heads required shall be installed as part of the contract with no additional compensation.

E. Provide additional heads which may be required for coordinated ceiling pattern, without additional cost, even though number of heads may exceed code minimum requirements.

F. Include all costs of shop drawings review and approval from authorities in price.

G. Locate outside alarm on wall of building adjacent to siamese department connections and/or as noted on drawings.

H. Provide where directed cabinet containing required number of spare heads as per NFPA 13, of each type, along with wrench suitable for each type of head.

I. Provide flow switch on leaving side of main valve and monitoring switch on main valve. Flow switch shall sense flow and sound appropriate zone of fire alarm system monitoring switch on each main valve; when valve is started to its "closed" position shall indicate trouble on appropriate zone of fire alarm system and sound local audible alarm. Wiring between flow switches and monitoring switches and fire alarm system shall be provided and coordinated by sprinkler contractor, fire alarm contractor and electrical contractor.

J. Furnish and install sprinkler zone valves and flow switches where indicated on the drawings for the zoning of the system. Each of these devices shall be connected into the fire alarm system as indicated for the main valve, including local alarming.

K. Provide all test and drain valves as required for system.

L. Support sprinkler piping in accordance with NFPA 13.

M. Provide new water service as shown on the drawings, incur all costs, fees, permits, etc.

N. Paint all exposed sprinkler piping, color selection to be by architect in field during construction.

O. All branch pipe connections to sprinkler heads are to be made with swing joints.

3.3 COORDINATION:

A. All interlock and signal wiring runs to the annunciator panel will be furnished and installed by the Fire Detection Contractor and as part of the Electrical Work.

B. This contractor shall provide for all switches and interlocking devices on all valves as required.

C. The sprinkler contractor is to provide plans to fire alarm contractor as to ensure all valve, sensors devices, are monitors and have power. General contractor to ensure a complete and working system.

D. Sprinkler contractor to coordinate with fire alarm contractor prior to bid, general contractor to ensure a complete and working system per NFPA.

3.4 UNDERGROUND PIPING:

A. Underground fire protection system piping shall be installed in accordance with the requirements of NFPA 24, Private Fire Service Mains and Their Appurtenances. Provide concrete thrust blocking at each change of direction of the piping and at all tees, plugs, and caps in accordance with NFPA 24. Where thrust blocking is impractical, fittings with a mechanical joint retainer gland, approved for the piping material utilized, may be used in lieu of thrust blocking.

3.5 ADDITIONAL CLOSE OUT DOCUMENTS

A. Provide a copy of NFPA 25 with sprinkler system close out documents.

3.6 THIRD PART REVIEW

A. The sprinkler contractor shall have his design reviewed , approved, and stamped by a Louisiana Licensed Mechanical Engineer. Third party review & approval to be performed prior to submitting to design team.

3.7 SYSTEM TESTING AND FLUSHING

A. Testing, cleaning, flushing and inspection shall be done in accordance with NFPA requirements.

B. The installing Contractor shall complete and sign the appropriate Contractor's Material and Test Certificates included within NFPA 13 and 14.

3.8 TRAINING

A. Contractor shall provide for the service of a competent, trained and experienced agent to instruct and acquaint the Owner with the proper functioning, operation and maintenance of the fire protection systems and all installed components.

END OF SECTION
8-21-26

SECTION 21 0516 - FIRE PROTECTION PIPING

PART 1 – GENERAL

1.1 GENERAL

A. Pipe, fittings, valves, and connections for installation of sprinkler as indicated on drawings.

1.2 RELATED SECTIONS

A. Section 200100 - General Provisions.

B. Section 200529 - Hangers and Support Devices.

C. Section 210303 - Automatic Sprinkler System

1.3 REFERENCES

A. ANSI/ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.

B. ANSI/ASME B16.3 - Malleable Iron Threaded Fittings, Class 150 and 300.

C. ANSI/ASME B16.4 - Cast Iron Threaded Fittings, Class 125 and 250.

D. ANSI/ASME B16.5 - Pipe Flanges and Flanged Fittings.

E. ANSI/ASME B16.9 - Factory-made Wrought Steel Butt welding Fittings.

F. ANSI/ASME B16.11 - Forged Steel Fittings, Socket-welding and Threaded.

G. ANSI/ASME B16.25 - Buttwelding Ends.

H. ANSI/ASME B36.10 - Welded and Seamless Wrought Steel Pipe.

I. ANSI/ASME Sec 9 - Welding and Brazing Qualifications.

J. ANSI/ASTM A135 - Electric-Resistance-Welded Steel Pipe.

K. ANSI/ASTM A47 - Malleable Iron Castings.

L. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-coated Welded and Seamless.

M. ASTM A234 - Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.

N. ASTM A795 - Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.

O. AWS D10.9 - Specifications for Qualification of Welding Procedures and Welders for Piping and Tubing.

1.4 QUALITY ASSURANCE

A. Sprinkler Systems: Perform work to NFPA 13.
B. Welding Materials and Procedures: Perform to ASME Code.

C. Valves: Bear UL or FM label or marking. Provide manufacturer's name and pressure rating marked on valve body.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers, with labeling in place.
B. Provide temporary protective coating on cast iron and steel valves.
C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

PART 2 PRODUCTS

2.1 SPRINKLER, ABOVE GROUND

A. Steel Pipe: ASTM A53; ANSI/ASTM A135; ASME B36.10; Schedule 40 black and galvanized, in strict accordance to NFPA 13. All piping 1" to 2-1/2" is to be schedule 40 black steel. All piping 3" and larger to be schedule 40 black steel. Dry Sprinkler System Piping to be galvanized schedule 40. Drain piping to be schedule 40 galvanized steel with screwed galvanized malleable iron fittings. All sprinkler piping, valves, & fittings shall have a working pressure of 200psi, minimum.
   1. Steel Fittings: ANSI/ASME B16.9, wrought steel, buttwelded; ANSI/ASME B16.25, buttweld ends; ASTM A234, wrought carbon steel and alloy steel; ANSI/ASME B16.5, steel flanges and fittings; ANSI/ASME B16.11, forged steel socket welded and threaded.
   2. Cast Iron Fittings: ANSI/ASME B16.1, flanges and fittings; ANSI/ASME B16.4, screwed fittings.
   3. Malleable Iron Fittings: ANSI/ASME B16.3, screwed type. ANSI/ASTM A47.
   4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped composition sealing gasket, steel bolts (security type), nuts, and washers; galvanized for galvanized pipe.

2.2 GATE VALVES

A. Up to and including 2 Inches : Bronze body, bronze trim, rising stem, handwheel, inside screw, single wedge or disc, threaded ends.

B. Over 2 Inches: Iron body, bronze trim, rising stem, handwheel, OS&Y, single wedge, flanged ends.

2.3 GLOBE OR ANGLE VALVES

A. Up to 2 Inches: Bronze body, bronze trim, rising stem and handwheel, inside screw, renewable composition disc, screwed ends, with backseating capacity, repack able under pressure.

B. Over 2 Inches: Iron body, bronze trim, rising stem, handwheel, OS&Y, plug-type disc, flanged ends, renewable seat and disc.

2.4 BALL VALVES

A. Up to and including 2 Inches: Bronze or Stainless steel one piece body, stainless steel ball, teflon seats and stuffing box ring, lever handle, and balancing stops, threaded ends.
B. Over 2 Inches: Cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle, or gear drive handwheel for sizes 10 inches and over, flanged.

2.5 BUTTERFLY VALVES

A. Bronze body, stainless steel disc, resilient replaceable seat, threaded ends, extended neck, handwheel and gear drive and integral indicating device ,and built-in tamper proof switch.

B. Cast or ductile iron body, chrome plated ductile iron disc, resilient replaceable EPDM seat, wafer or lug ends, extended neck, handwheel and gear drive and integral indicating device, and built-in tamper proof switch.

2.6 CHECK VALVES

A. Up to and including 2 Inches: Bronze swing disc, screwed ends.

B. Over 2 Inches: Iron body, bronze trim, swing disc, renewable disc and seat, flanged ends.

C. Iron body, bronze trim, stainless steel spring, renewable composition disc, screwed, wafer or flanged ends.

2.7 DRAIN VALVES

A. Bronze compression stop with hose thread nipple and cap.

B. Brass ball valve with cap and chain, hose thread.

2.8 UNDERGROUND PIPING

A. Underground fire protection system piping shall be installed in accordance with the requirements of NFPA 24, Private Fire Service Mains and Their Appurtenances. Provide concrete thrust blocking at each change of direction of the piping and at all tees, plugs, and caps in accordance with NFPA 24. Where thrust blocking is impractical, fittings with a mechanical joint retainer gland, approved for the piping material utilized, may be used in lieu of thrust blocking.

B. Piping: Ductile-iron Pipe (DIP), AWWA C 106, with fittings complying with AWWA C 110 and rubber gaskets complying with AWWA C111 or polyvinylchloride (PVC) C-900 for fire service, 200 psi, UL listed.

C. Fire water service piping Riser into building: Riser to be AMES Series IBR stainless steel riser (type 304) with end cap. UL listed, FM approved. Designed to meet NFPA 24-2007 section 10.6.5. AWWA C900 Inlet/DIP with AWWA C606 outlet. Custom lengths for inlet to be outside of building slab perimeter (minimum 24”), outlet to be minimum 12” above finished slab (riser to clear perimeter grade beam).

D. Where applicable, Pipe stubbed up from grade for remote mounted pedestal fire department connection shall be schedule 40 galvanized pipe above ground (coated and wrapped per NFPA 24).

2.9 VALVE TAGS

A. Brass plate, integral legible 1/4" high die-stamped identification.

B. Provide chain looped thru tag and valve wheel for each valve.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and foreign material, from inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

A. Install piping in accordance with NFPA 13 for sprinkler systems, NFPA 14 for standpipe and hose systems, NFPA 24 for service mains.

B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

C. Install piping to conserve building space, and not interfere with use of space and other work.

D. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

G. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

H. Do not penetrate building structural members unless indicated.

I. Provide sleeves when penetrating footings, floors and walls. Seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required.

J. Die cut screw joints with full cut standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.

K. Install valves with stems upright or horizontal, not inverted.

L. Provide gate, ball or butterfly valves for shut-off or isolating service.

M. Provide drain valves at main shut-off valves, low points of piping and apparatus.

N. All underground piping shall be installed a minimum 36" below grade.

O. Provide brightly colored, metallic-core, non-deteriorating, minimum 2" wide identification ribbon tape set 24" below finished grade, directly above piping. Install tracer wire on all non-metallic pipe.

END OF SECTION
8-21-26

SECTION 22 0523 - PLUMBING SYSTEM VALVES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Work Included

1. Valves for Domestic Water System
2. Valves for Natural Gas System

1.03 SUBMITTALS

A. General: All submittals shall comply with the requirements of Division 1 - GENERAL REQUIREMENTS and Section 20 01 00 - GENERAL PROVISIONS.

B. Product Data: Data shall be submitted on the following items:

1. Valves

PART 2 PRODUCTS

2.01 GENERAL

A. Valves shall have the name or trademark of the manufacturer and the working pressure stamped or cast on the valve body.

B. All valves in each system, except for special types, shall be the product of a single manufacturer.

C. All valves requiring packing shall be designed and constructed such that they can be repacked under pressure.

D. Valve hand wheels shall be malleable iron except where specified otherwise.

E. All domestic water valves to be lead-free type.

F. Approved Manufacturer's: Kitz, Nibco.

2.02 VALVES FOR DOMESTIC WATER SYSTEM

A. Gate valves (4" in size and larger) shall have iron body, bronze trim, non-rising stem, solid wedge, and flanged ends for 200 pound W.O.G. Valves to be lead-free. Valves shall be:

Crane	No. 461
Hammond	IR1138
Stockham	G-612
Nibco	F-619
Grinnell	6060A

B. Ball Valves (3" in size and smaller) shall be bronze body, full port, with PTFE Seats. Full port brass ball, orifice must be drilled, hollow ball is not acce3ptable. Stem shall be blowout-proof, lever handle, solder ends adjustable packing gland. Ball valve shall be rated for 150 WSP. Valves to be lead-free. Valves shall be:

Watts
Hammond
Apollo

C. Check valves (4" in size and larger) shall be horizontal swing type with iron body, bronze trim, and flanged ends for 200 pound W.O.G. Valves to be lead-free. Valves shall be:

Crane	No. 373
Hammond	IR1124
Stockham	G-931
Nibco	F-918-B

Grinnell	6300A

D. Check valves (3" in size and smaller) shall be horizontal swing type with bronze body, composition disc, and solder ends for 200 pound W.O.G. Valves to be lead-free. Valves shall be:

Crane	No. 1342
Hammond	IB943
Stockham	B-310-B
Nibco	S-413-W
Grinnell	3315 SJ

E. Globe valves (2 ½" in size and larger) shall have iron body, bronze trim, rising stem, and flanged ends for 200 pound W.O.G. Valves to be lead-free. Valves shall be:

Crane	No. 351
Hammond	IR116
Stockham	G-512
Nibco	F-718-B

F. Globe valves (2" in size and smaller) shall have bronze body, rising stem, composition disc, and solder ends for 200 pound W.O.G. Valves to be lead-free. Valves shall be:

Crane	No. 1310
Hammond	IB423
Stockham	B-14-T
Nibco	S-211-Y
Grinnell	3210 SJ

G. Hose and drain valves shall be 3/4" in size with bronze body, non-rising stem, solid wedge, threaded inlet, and hose outlet with cap and chain for 200 pound W.O.G. Valves to be lead-free. Valves shall be:

Crane	No. 451
Jenkins	372
Nibco	T-113-H

H. Underground Gate Valves and Valve Boxes:

1. Gate valves (4" in size and larger) shall be AWWA approved with iron body, bronze trim, non-rising stem, parallel seat double disc, square operating nut, and [mechanical joint ends] [hub ends] for 200 pound W.W.P. Valves to be lead-free. Valves shall be:

	Mechanical Joint	*Hub Ends*
Mueller	A-2380-20	A-23 80-5
American Darling	55	53
Stockham	G-743-0	G-744-0

2. Gate valves (2" & 3" in size) shall have iron body, bronze trim, non-rising stem, parallel seat double disc, square operating nut, and threaded ends for 200 pound W.W.P. Valves to be lead-free. Valves shall be:

Mueller Company	A-2380-8
Stockham	G-739-0

3. Gate valves (1 ½" in size and smaller) shall have bronze, non-rising stem, solid wedge, square operating nut, and threaded ends for 200 pound W.W.P. Valves to be lead-free. Valves shall be:

Mueller Company	H-10280

4. Valve boxes shall be provided over each underground gate valve. Valve boxes shall be adjustable cast iron roadway type with belled lower section and removable lid at grade. Lid shall be labeled “Water” and boxes not in paved areas shall be set in a 24" x 24" x 6" concrete pad. Valves to be lead-free. Valve boxes shall be:

Mueller Company	H-10360
Central Foundry	B-5003
Tyler Pipe Company	6850
Russell Foundry	B-122

5. Provide one T-wrench for each size operating nut.

2.03 VALVES FOR NATURAL GAS SYSTEM

A. GAS COCKS:

1. Up to 2 Inches: Bronze body, bronze tapered plug, non-lubricated, teflon packing, threaded ends.
2. Over 2 Inches: Cast iron body and plug, non-lubricated, teflon packing, flanged ends.
3. Powell Model 961, Mueller Model H-11170, or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. All valves installed in horizontal lines shall be installed with the stems horizontal or above. Valve hand wheels shall be oriented, when installed, to provide maximum accessibility for operation.

B. All valves located within ceiling space are to have two (2) complete wraps of 1" wide red reflective tape around ceiling grid hanger/support directly below valve. Tape to be concealed above ceiling.

C. Provide color coded self adhesive “dot” of ceiling grid (T-Bar directly below valve).

D. All valves to be located within 12" of finished ceiling. Offset piping down as required.

E. ADDITIONAL CLOSE DOCUMENTS: Contractor to provide a set of plans shows valve schedule & valve location on plans (full size set, 24"x36 plans). Plans to have valve type, manufacturer and model #. Also provide replacement part contact information for each valve.

F. All valves underground shall be gate valve type.

G. All domestic water valves are to be lead-free.

END OF SECTION

8-21-26

SECTION 22 1000 - DOMESTIC WATER SYSTEM

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provision of the contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Work Included

1. Domestic Water Piping
2. Water Hammer Arrestors
3. Hose Bibbs
4. Vacuum Breakers
5. Backflow Preventers
6. Disinfecting
7. Valve Boxes
8. Refrigerator Valve Box w/ Valve
9. Washing Machine Connection Box

B. Description

1. Provide systems of domestic water piping and accessories so that every fixture and piece of water using equipment in the building will be furnished with a water supply.
2. Extend the domestic cold water service to point shown on the drawings.

1.03 SUBMITTALS

A. General: All submittals shall comply with the requirements in Division 1 - GENERAL REQUIREMENTS and Section 20 01 00 - GENERAL PROVISIONS.

B. Product Data: Data shall be submitted on the following items:

1. Domestic Water Piping
2. Water Hammer Arrestors
3. Hose Bibbs
4. Vacuum Breakers
5. Backflow Preventers
6. Valve Boxes
7. Refrigerator Valve Box w/ Valve
8. Washing Machine Connection Box

C. Operation and Maintenance Instructions: Data shall be provided for the following items:

1. Hose Bibbs
2. Vacuum Breakers
3. Backflow Preventers
4. Water Hammer Arrestors.
5. Washing Machine Connection Box

1.04 QUALITY ASSURANCE

A. Standards

1. American National Standards Institute (ANSI):
   a. Standard B16.18, Cast Copper Alloy Solder-Joint Pressure Fittings, 1978 Edition.
   b. Standard B16.21, Non-Metallic Gaskets for Pipe Flanges, 1962 Edition.

c. Standard B16.22, Wrought Copper and Bronze Solder-Joint Pressure Fittings, 1980 Edition.

d. Standard B16.24, Bronze Flanges and Flanged Fittings, 150 and 300 Pound, 1979 Edition.

e. Standard B31.1, Power Piping and Addendum, 1977 Edition.

2. American Society for Testing and Materials (ASTM):

a. Standard A307, Carbon Steel Externally and Internally Threaded Standard Fasteners, 1980 Edition.

b. Standard B88, Specification for Seamless Copper Water Tube, 1983 Edition.

3. American Water Works Association (AWWA):

a. Standard C110, Grey-Iron and Ductile-Iron Fittings, 3 inc. through 48 inc., for Water and Other Liquids, 1977 Edition.

b. Standard C111, Rubber-Gasket Joints for Cast-Iron and Ductile-Iron Pressure Pipe Fittings, 1979 Edition.

c. Standard C151, Ductile-Iron Pipe, Centrifugally Cast In Metal Molds or Sand-Lined Molds, for Water or other Liquids, 1976 Edition.

4. Federal Specifications (Fed. Spec.):

a. Specification BB-C-120B, Chlorine, Technical: Liquid.

b. Specification WW-U-516C, Unions, Brass or Bronze, Threaded Pipe Connections, and Solder Joint Tube Connections.

5. Plumbing and Drainage Institute (PDI):

a. Standard WH-201, Water Hammer Arrestors, 1977 Edition.

B. Qualifications of Manufacturer

1. All copper piping to be a product of the United States of America. Manufacturer's of copper pipe to be Cerro, Reading, & Mueller. Contractor to provide submittals of pipe as noted within this specification.

C. Qualifications of Installers

1. All welders employed for the work shall be qualified under the requirements of ANSI B31.9.0, Section 127.5. Certification of welder's qualifications shall be submitted to the Architect before any welds are made.

PART 2 PRODUCTS

2.01 PIPING AND FITTINGS

A. Pipe and fittings shall be as listed herein and shall be used on the services indicated.

B. PVC Pipe: ASTM D1785, Schedule 80, or ASTM D2241. SDR for not less than 200 psig pressure rating; Fittings: ASTM D2467, PVC; and Joints: ASTM D2672, solvent weld for:

1. All site domestic water piping shown on Mechanical/Plumbing drawing to 5'-0" from building slab.

2. All HVAC condensate piping.

Note: Refer to civil specifications for all site domestic water piping shown on civil engineering utility plan drawing.

C. Domestic water service piping Riser into building: Riser to be AMES Series IBR stainless steel riser (type 304) with end cap. UL listed, FM approved. Designed to meet NFPA 24-2007 section 10.6.5. AWWA C900 Inlet/DIP with AWWA C606 outlet. Custom lengths for inlet to be outside of building slab perimeter (minimum 24"), outlet to be minimum 12" above finished slab (riser to clear perimeter grade beam). In-Building Riser shall be installed as indicated on the drawings. Riser shall be composed of a single extended 90 degree fitting of fabricated ASTM A312 304 stainless steel tubing, maximum working pressure 200 psi (14 bar). The fitting shall have a grooved-end connection on the outlet (building) side and a CIPS coupler on the inlet

(underground) side. The grooved end shall include a coupler and cap to facilitate testing of the underground piping. Riser to be NSF 61 & 372 certified.

D. **CPVC Domestic Water Piping – Copper Tube Size (CTS):** Provide CPVC water distribution piping and fittings manufactured by Charlotte Pipe or approved equal, conforming to **ASTM D2846** for SDR 11 CPVC pipe and fittings, Copper Tube Size (CTS), suitable for potable hot and cold water distribution. Pipe and fittings shall be manufactured from NSF/ANSI/CAN 61 and NSF/ANSI 14 certified CPVC material and shall be rated for the temperatures and pressures of the domestic water system. Provide solvent-cemented joints using CPVC solvent cement conforming to **ASTM F493**, with primer where required by the pipe and fitting manufacturer. Install piping, fittings, supports, hangers, and joints in strict accordance with the manufacturer's published installation instructions and applicable plumbing codes. Do not use CPVC piping for applications or temperatures exceeding the manufacturer's published limitations. Provide transition fittings where connecting CPVC to metallic piping or other piping materials. **Pressure test completed piping with water at the test pressure and duration required by the applicable plumbing code and project specifications, with no visible leakage permitted. Do not use compressed air or other compressed gases for pressure testing unless specifically permitted in writing by the CPVC manufacturer.**

1. Above-ground cold water piping, all sizes.
2. Above-ground hot water piping, all sizes.

E. **PEX Domestic Water Piping – Uponor:** Provide crosslinked polyethylene (PEX) domestic water distribution piping and fittings manufactured by Uponor or approved equal. PEX piping shall conform to **ASTM F876/F877**, be listed to **NSF/ANSI/CAN 61** for potable-water applications, and be rated for the temperatures and pressures of the domestic hot- and cold-water system. Provide Uponor PEX-a piping with compatible Uponor fittings and connections, including **ProPEX® expansion fittings and rings**, installed in accordance with the manufacturer's current published installation requirements. Fittings shall be of the manufacturer's approved material and configuration and shall be rated for the intended service. Provide properly sized supports, sleeves, clamps, and protection from abrasion, excessive heat, ultraviolet exposure, and physical damage. **Connections between PEX and CPVC piping shall be made using listed and manufacturer-approved transition fittings specifically compatible with both piping materials.** Where connecting to CPVC piping and fittings, provide a threaded, flanged, or mechanical transition fitting as recommended by Uponor; do not solvent-cement PEX piping or fittings. Transition fittings shall be accessible where required for maintenance and shall be installed without imposing stress, bending, or twisting loads on either piping system. Install all PEX piping, fittings, transitions, and supports in strict accordance with Uponor's published installation instructions and applicable plumbing codes. Pressure test completed piping with water at the test pressure and duration required by the applicable plumbing code and project specifications. Do not use compressed air or other compressed gases for testing unless specifically permitted by the PEX manufacturer and applicable code. PEX piping shall comply with ASTM F876, ASTM F877. PEX fittings shall comply with ASSE 1061, ASTM F877, ASTM F1807.

1. Above-ground cold water piping, all sizes.
2. Above-ground hot water piping, all sizes.
3. Underground water piping to trap primers. No joints under slab allowed.

Note: 1. All piping underslab shall be fitted with a color coded (red for "hot" and blue for "cold") polyethylene sleeve which shall be extended a minimum 6" above the slab.

F. All potable water pipes, pipe related products, and materials that join or seal pipes conform to ANSI/NSF 61.

G. All solvent cements and primers used to join and seal PVC materials shall comply with the requirements of ANSI/NSF 14.

H. All underslab piping to be in polyethylene sleeve.

2.02 WATER HAMMER ARRESTORS & AIR CHAMBERS

A. Contractor shall provide either of the following at every plumbing fixture. If Water Hammer Arrestors are used, they shall be installed in strict accordance with manufacturer's recommendations.

1. Water Hammer Arrestors shall have a spun closed copper tube chamber permanently sealing a pressurized inert gas chamber, O-ring sealed piston and certification stamp as conforming to PDI WH-201. Water hammer arrestors shall be:

Watts	Number 15
Josam	75000-S Series
Sioux Chief	Hydra-rester

2. Air Chambers: Air chambers shall be Type “L” copper tubing 12" in length and one pipe size larger than the pipe on which it is installed.

2.03 DIELECTRIC ADAPTERS

A. Dielectric adapters shall be provided between copper and iron pipe connections and between ferrous and non-ferrous piping or equipment. Refer to Section 20 2116- Piping Specialties.

2.04 UNIONS

A. Unions in copper tubing shall be cast bronze, Fed. Spec. WW-U-516C, with threaded or solder joint ends to match pipe connections.

B. Unions between ferrous and non-ferrous piping shall be dielectric type as specified hereinbefore under Dielectric Adapters.

2.05 FLANGES

A. Flanges in copper tubing shall be 150 pound cast bronze, ANSI B16.24, with solder neck and raised or flat face to mate with adjacent flange, valve, fitting, or piece of equipment.

B. Flanges between ferrous and non-ferrous piping shall be dielectric type as specified hereinbefore under Dielectric Adapters.

C. Flange gaskets shall be 1/16 inch non-metallic, ring type, ANSI B16.21.

D. Flange gaskets shall be carbon steel, all threaded type. Nuts shall be carbon steel hexagon type. Steel for bolts and nuts shall conform to ASTM A307, Grade A.

2.06 VACUUM BREAKERS

A. Vacuum breakers shall be the screw on vandal proof type with finish to match outlet finish - (i.e. chrome plated vacuum breakers on chrome plated hose outlets). Vacuum breakers shall be:

Watts	8A
A.W. Cash	VB101
Nidel	34HD

2.07 BACKFLOW PREVENTERS

A. Backflow preventers shall be the same size as the pipe on which it is installed unless noted otherwise on the drawings.

B. Backflow preventers to be lead-free.

C. Domestic Water BFP: Refer to Civil Engineering Specifications.

D. Fire Water BFP: Refer to Civil Engineering Specifications.

E. Beverage Dispenser Water Supply – Dual Check Valves: Certified to ANSI/NSF Standard 18. Tested and certified under ASSE Standard 1022. Atmospheric port. 316 stainless steel body. Rated maximum pressure 150 psi and working temperature 33 to 130 degrees F. Sizes ¼” and 3/8” – Watts Regulator Company Series SD-3.

F. BFP-1: Reduced Pressure Principle Backflow Preventer: The Reduced Pressure Principle Backflow Preventer shall be certified to NSF/ANSI 372, shall be ASSE® 1013 Listed, rated to 180° F and supplied with full port union ball valves. The main body and access covers shall be low lead bronze (ASTM B584), the seat ring and all internal polymers shall be NSF® Listed Noryl™ and the seat disc elastomers shall be silicone. The first check shall be accessible for maintenance without removing the relief valve. If installed indoors, the installation shall be supplied with integral monitor switch and air gap piped to a properly sized drain. The Reduced Pressure Principle Backflow Preventer shall be a ZURN WILKINS Model 975XL2U.

E. BFP-2: Lead-Free Reduced Pressure Principle Backflow Preventer: The Reduced Pressure Principle Backflow Preventer shall be certified to NSF/ANSI 372 shall be ASSE® Listed 1013, rated to 180° F, and supplied with full port ball valves. The main body and access covers shall

be low lead bronze (ASTM B 584), the seat ring and all internal polymers shall be NSF® Listed Noryl™ and the seat disc elastomers shall be silicone. The checks shall be oriented at a 45° angle upward and accessible for maintenance without removing the relief valve or the entire device from the line. If installed indoors, the installation shall be supplied with an air gap and "Y" type strainer. The Reduced Pressure Principle Backflow Preventer shall be a ZURN WILKINS Model 975XL2.

2.08 REFRIGERATOR VALVE BOX

A. Refrigerator valve box shall be fully recessed flush mounted type constructed of 20 gauge steel (faceplate to be 20 gauge) with powder coat white finish finish. Metal box to have flame spread of 94 (UL) and 94BHB (ASTM). Valve shall comply with NSF 61 & ASME A112.18.1. Valve to be low-lead type. Valve box to have nail support brackets with screw-on faceplate frame. Valve to be 1/4 turn. Supply connection shall be 1/2" copper sweat connection. Provide with water hammer arrestor (ASSE 1010 compliant).

B. Manufacturer: Guy Gray Model 88531, Oatey 39140

2.09 FIXED AIR GAPS

A. Fixed air gaps shall be:

	3/4" - 1"	*1 1/4" - 4"*
Watts	Series AG	Series AG
J.R. Smith	Series 3950	Series 3951
Josam	Series 1801	Series 1800
Zurn	Series Z-1025	Series Z-1025
Josam	88900	

2.10 TRAP PRIMER

A. Trap primer shall be automatic type with cast bronze body, removable valve mechanism, integral vacuum breaker, and ½ inch diameter socket tube ends.

1. Trap primer shall be:

J.R. Smith	2699-1
Josam	88250
Wade	W-2400-CS
Zurn	Z-1022
Precision	PR-500
Josam	Series 88250

2. Trap Primer serving more than one (1) floor drain shall be:

Precision	P-1
Mifab	MI-DU

3. Automatic trap primer shall be equipped with backflow preventer as required by Current Edition, International Plumbing Code.

B. Drainage-Type Trap Seal Primer Valves: ASSE 1044, fixture-trap, waste-drainage-fed type, with the following characteristics:

1. Chrome-plated, cast-brass, NPS 1-1/4 DN 32 minimum, lavatory P-trap with NPS 3/8 DN 10 minimum, trap makeup connection.
2. Contractor shall utilize white PVC flexible tubing for water pipe connection from p-trap connection to wall.
3. All piping within wall & under slab to be ½" soft rolled copper with no joints.

2.11 ICE MAKER CONNECTION BOX

A. Ice maker valve box shall be fully recessed flush mounted type constructed of 20 gauge steel (faceplate to be 20 gauge) with powder coat white finish finish. Metal box to have flame spread of 94 (UL) and 94BHB (ASTM). Valve shall comply with NSF 61 & ASME A112.18.1. Valve to

be low-lead type. Valve box to have nail support brackets with screw-on faceplate frame. Valve to be 1/4 turn. Supply connection shall be 1/2" copper sweat connection. Provide with water hammer arrestor (ASSE 1010 compliant).

B. Manufacturer: Guy Gray Model 88531, Oatey 39140

2.12 WASHING MACHINE CONNECTION BOX (FIRE RATED)

A. All washing Machine (laundry) connection boxes shall be fully recessed flush mounted type constructed of bulk molding compound (BMC) with UL-classified intumescent pads and UL-classified fyrewrap insulating material. The connection box shall include ½" FIP inlet valves (hot and cold water) and 2" drain. Supply connection shall be ½" mpt or 5/8" sweat connection. Box to be 2 hour fire rated. Provide with water hammer arrestor (ASSE 1010 compliant).

B. Manufacturer: Oatey Model 38478

2.13 COFFEE MAKER/MACHINE WATER VALVE

A. Where coffee maker/machine are shown on drawings (architectural and/or plumbing drawings) the contractor shall provide & install 1/2" cold water line inside wall, stub out directly behind coffee machine with 1/2"x3/8"x3/8" quarter turn shut off valve (with chrome escutcheon plate at wall penetration). Provide 3/8" stainless steel braided hose to coffee machine water connection. Coordinate with architect/owner for exact location prior to installation.

2.14 DOMESTIC WATER BOOSTER PUMP

A. Not used.

2.14 DOMESTIC WATER SOLENOID VALVES "SV"

A. Provide direct mount ball valve by Jomar Valve #A101 Series (2 piece, full port, threaded connection, 600 WOG, ISO mounting pad, stainless steel ball & stem, lead free, NSF 61 & 372 compliant). Square valve stem for direct mounting to any ISO actuator.

B. Electric Actuator to be Jomar Valve #AE-180-24VAC (double acting, NEMA 4x, manual override, 24vac). Hard anodized aluminum hosing with external powder coating fr severe duty appliances, IP67 enclosure, ISO 5211 mounting, 90 degree operation, position indicator, manual override standard, 24vac, thermally protected induction motor.

2.15 ALLOWANCES

A. Plumbing Contractor shall assume a minimum of twenty (20) additional water drops (3/4" and below) with ball valves due to possible changes in equipment requirements/additions. These drop will come off nearest available source of sufficient size.

PART 3 EXECUTION

3.01 INSTALLATION

A. A union or flange shall be provided at all piping connection to equipment.

B. Faucets, flush valves, and shower heads shall be cleaned of dirt and debris.

C. Changes in pipe size shall be made with reducing fittings. No bushings will be allowed.

D. Underground water piping shall have a minimum cover of 3' - 0" to the top of the pipe. Provide tracer warning tape, refer to General Provisions Specifications.

E. Install water hammer arrestors within the chase or in the wall on the hot and cold water branch lines serving fixtures; on the cold water branch lines serving individual flush valve water closets and urinals; and elsewhere as indicated on the drawings.

F. Install air chambers on the hot and cold water branch lines to all fixtures not provide with water hammer arrestors. Individual fixtures in a battery or fixtures with water hammer arrestors on the supply line will not require an air chamber.

G. Vacuum breakers shall be provided on all hose outlets unless the drawings indicate that a backflow preventer is to be provided on the piping serving the outlet.

H. The atmospheric relief from backflow preventers shall be piped through a fixed air gap to a floor drain.

I. Underground piping from trap primer to floor drains shall be installed without fittings.

J. Contractor shall obtain prices from the local water company for their services if required or applicable. Prices shall include all necessary equipment, labor, etc. for tie-ins to mains including but not limited to all meters, valves, backflow preventers, etc.. Contractor's bid shall

include the cost for these services. Contractor is responsible for coordinating all tie-ins to mains with the local utility companies. All fees to be paid for by this contractor (including sewer impact fee).Contractor to include all associated costs as to ensure a complete and working system.

K. The owner provided equipment shall be furnished and set in place under another section of these specifications and/or by separate contract. Plumbing Contractor shall provide necessary rough-in required for this equipment and shall completely connect all plumbing services for this equipment, providing cut-off valves and union for all plumbing supply service to each piece of equipment. It is the obligation of the plumbing contractor to obtain correct roughing-in dimensions and drawings for this equipment as well as the equipment furnished under this contract.

L. Contractor to test all new backflow preventers in accordance with International Plumbing Code (current edition) & in accordance with one of the following standards: ASSE 5013, ASSE 5015, ASSE 5020, ASSE 5047, ASSE 5048, ASSE 5052, ASSE 5056, CSA B64.10.1, USC's FCCC & HR's "Manual of Cross- Connection Control", or UFL's TREEO's "Backflow Prevention – Theory and Practice". Provide initial certification (at project completion). Include certification within closeout documents (O&M manuals).

M. Where coffee maker/machine are shown on drawings (architectural and/or plumbing drawings) the contractor shall provide & install 1/2" cold water line inside wall, stub out directly behind coffee machine with 1/2"x3/8"x3/8" quarter turn shut off valve (with chrome escutcheon plate at wall penetration). Provide 3/8" stainless steel braided hose to coffee machine water connection. Coordinate with architect/owner for exact location prior to installation.

3.02 JOINTS

A. Mechanical joints for ductile iron pipe shall be made with a follower gland, gasket, bolts, and nuts as per AWWA C111.

B. Push-on joints for ductile iron pipe shall be made with a one piece lubricated compression rubber gasket as per AWWA C111.

C. Threaded joints shall be made up with Teflon tape. After cutting but prior to threading, pipe shall be reamed and shall have burrs removed.

D. Brazed joints shall be made using a BcuP-5 brazing alloy with a compatible flux.

E. Solder joints shall be made using a 95-5 tin-antimony solder with a compatible flux.

F. Flanged joints shall be made with ring type non-metallic gaskets, bolts and nuts.

G. At contractor's option, tee branches in aboveground copper tubing may be made using the T-drill method. Joint between main and branch tubing shall be sealed using a BcuP-5 brazing alloy with a compatible flux.

3.03 ADJUSTING

A. Adjust and balance all water systems to obtain operating flows at all fixtures and water using equipment. Also adjust and balance the hot water circulation from all portions of the building.

3.04 DISINFECTION

A. All domestic water service and supply piping installed under this DIVISION shall be disinfected with chlorine before it is placed into operation in strict accordance with International Plumbing Code, Current Edition. The Contractor shall submit to the Architect written certification that the system was disinfected. Certification that the system was disinfected. Certification shall include name of project, name of owner, and name of operators, date of disinfection, times of disinfection period, maximum chlorine level, and residual chlorine level.

B. Flush water system a minimum of three (3) times prior to owner occupancy. Provide in writing record of flush to mechanical engineer on contractor letterhead.

C. The following is an excerpt of the International Plumbing Code (2021), 610: Disinfection of Potable Water System. The plumbing official may require that a potable water system or any part thereof installed or repaired be disinfected in accordance with one of the following methods before it is placed in operation.

> New potable water systems shall be purged of deleterious matter and disinfected prior to utilization. The method to be followed shall be that prescribed by the health authority or water purveyor having jurisdiction or, in the absence of a prescribed method, the procedure

described in either AWWA C651 or AWWA C652, or as described in this section. This requirement shall apply to "on-site" or "in-plant" fabrication of a system or to a modular portion of a system.

1. The pipe system shall be flushed with clean, potable water until dirty water does not appear at the Points of outlet.

2. The system or part thereof shall be filled with a water/ chlorine solution containing not less than 50 parts per million (50 mg/L) of chlorine, and the system or part thereof shall be valved off and allowed to stand for 24 hours; or the system or part thereof shall be filled with a water/chlorine solution containing not less than 200 parts per million (200 mg/L) of chlorine and allowed to stand for 3 hours.

3. Following the required standing time, the system shall be flushed with clean potable water until the chlorine is purged from the system.

4. The procedure shall be repeated where shown by a bacteriological examination that contamination remains present in the system.

3.05 PROTECTIVE COATING FOR UNDERGROUND PIPING

A. Refer to specification section 200200.

3.06 WATER FLOW TEST

A. The contractor shall provide A/E written documentation of water flow test results at new connection to existing water system. Test existing water system prior to construction.

3.07 FLUSHING OF SYSTEM

A. Contractor shall flush new and existing system three (3) times prior to turning facility over to owner.

END OF SECTION

8-21-26

SECTION 22 1123 - NATURAL GAS SYSTEM

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

A. Work Included

1. Pipe standard compliance certificates.
2. Pressure regulators.
3. Gas Piping & Fittings.
4. Pipe connection methods.
5. Single Seal Anodeless Risers.
6. Gas Connection to Equipment

B. Description

1. Provide system of natural gas piping to all equipment requiring gas. Provide new gas meter and regulator. The new gas regulator plus extension into the building will be installed by the contractor. Fees for such work shall be the responsibility of the Contractor. Contractor to coordinate with local gas company for delineation point of work (coordinate where gas company will run pipe to and where this contractor begin work). Contractor to coordinate with local gas company and include all associated fees, permits, connections, etc. (including cost of bringing gas pipe service to building). Contractor to provide a complete and working system & include all associated costs (including connection to building from city main).

1.3 SUBMITTALS

A. General: All submittals shall comply with the requirements of Division 1 - GENERAL REQUIREMENTS and section 200100 - GENERAL PROVISIONS.

B. Product Data: Data shall be submitted on the following items:

1. Pipe standard compliance certificates.
2. Pressure regulators.
3. Gas Piping & Fittings.
4. Pipe connection methods.
5. Single Seal Anodeless Risers.
6. Gas Connection to Equipment

C. Operation and Maintenance Instructions: Data shall be provided for the following items:

1. Pressure Regulators.
2. Solenoid valves.

1.4 QUALITY ASSURANCE

A. Standards

1. American National Standards Institute (ANSI):
   a. Standard B16.3, Malleable Iron Fittings, 1977 Edition.
   b. Standard B16.5, Steel Pipe Flanges and Flanged Fittings, Joint Pressure Fittings, 1981 Edition.
   c. Standard B16.18, Cast Copper Alloy Solder - Joint Pressure Fittings, 1978 Edition.
   d. Standard B16.21, Non-Metallic Gaskets for Pipe Flanges, 1962 Edition.
   e. Standard B16.22, Wrought Copper and Bronze Solder - Joint Pressure Fittings, 1980 Edition.
   f. Standard B31.1, Power Piping and Addendum, 1977 Edition.

2. American Society for Testing and Materials (ASTM):
    a. Standard A120, Pipe, Steel, Black and Hot-dipped Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses, 1983 Edition.
    b. Standard A234, Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures, 1982 Edition.
    c. Standard A307, Carbon Steel Externally and Internally Threaded Standard Fasteners, 1982 Edition.
    d. Standard B88, Specification for Seamless Copper Water Tube, 1983 Edition.
    e. Standard D2513, Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings, 1984 Edition.
3. Federal Specifications (Fed. Spec.):
    a. Specification WW-U-516C, Unions, Brass and Bronze, Threaded Pipe Connections, and Solder Joint Tube Connections.
    b. Specification WW-U-531E, Union, Pipe, Steel or Malleable Iron, Threaded Connection, 150 lbs. and 250 lbs.

B. Qualifications of Manufacturer:
1. Pipe and fittings shall be manufactured in the United States.

C. Qualification of Installers:
1. All welders employed for the work shall be qualified under the requirements of ANSI B31.2.0, Section 127.5. Certification of welders qualifications shall be submitted to the Architect/Engineer before any welds are made.

PART 2 PRODUCTS

2.1 GENERAL

A. All gas equipment specified herein shall be designed and constructed for use with natural gas.

2.2 PIPE AND FITTINGS

A. Pipe and fittings shall be listed herein and used on the services indicated.

B. Schedule 40 black steel pipe, ASTM A153, with welded joints and standard weight black steel butt welding fittings, ASTM A234, for:
1. Above ground gas piping 2-1/2" in size and larger downstream of regulator.
2. All piping within building above concealed ceiling.

C. Schedule 40 black steel pipe, ASTM A120, with screwed joints and 150 pound threaded malleable iron fittings, ANSI B16.3, for:
1. Above ground gas piping 2" in size and smaller downstream/upstream of regulator.

D. Polyethylene Pipe: ASTM D2513, SDR 11.5, with fittings: ASTM D2683 to ASTM D2513, socket type and joints shall be fusion welded, for:
1. Gas piping installed underground.

E. Corrugated Stainless Steel Tubing:
1. Not used.

F. Schedule 80 black steel pipe, ASTM A153, with welded joints and standard weight black steel butt welding fittings, ASTM A234, for:
1. Gas piping serving natural gas generator.
    a. All aspects of the natural gas supply shall be in accordance with NFPA, 37, 54 and 110. Where the gas supply is connected to the building gas supply system, it shall be connected on the supply side of the building main gas shutoff valve and marked as supplying an emergency generator. The building's main gas shutoff valve shall be marked to indicate the existence of the separate generator shutoff valve. Gas piping shall be Schedule 80, black steel, painted ANSI "Natural Gas" Yellow and installed by a licensed plumbing contractor. The connection at the generator is to be made with a flexible piping connection provided by the generator manufacturer. Gas trains shall

include an equipment isolation valve at the generator, a manual shutoff valve in a remote location, a regulator and two automatic safety shutoff valves at the generator each with manual leak test valves. The automatic safety shutoff valves shall stop the flow of fuel in the event the engine stops for any cause. All gas piping shall be tested and purged in accordance with NFPA 54:8.

2.3 UNIONS

A. Unions in copper tubing shall be cast bronze, Fed. Spec., WW-U-516C, with threaded or solder joint ends to match pipe connections.

B. Unions in steel piping shall ve 150 pound malleable iron, Fed. Spec. WW-U-531E, with threaded ends to match pipe connections.

C. Unions between ferrous and non-ferrous piping shall be dielectric type as specified hereinbefore under Section 202130 - PIPING SPECIALTIES.

2.4 FLANGES

A. Flanges in steel pipe shall be 150 pound steel, ANSI B16.5, slip-on type welding flange with raised or flat face to mate with adjacent flanges, valve, fittings, or piece equipment.

B. Flanges between ferrous and non-ferrous piping shall be dielectric type as specified hereinbefore under Section 202130- PIPING SPECIALTIES.

C. Flange gaskets shall be 1/16 inch non-metallic, ring type, ANSI B16.21.

D. Flange bolts shall be carbon steel, all threaded type. Nuts shall be carbon steel hexagon type. Steel for bolts and nuts shall conform to ASTM A307, Grade A.

2.5 GAS PRESSURE REGULATORS

A. Service Pressure Regulator(s): Gas service pressure regulator(s) shall be as provided by the serving utility company (upstream gas meter).

B. Line Pressure Regulator(s): Line pressure regulator(s) shall be provided for precise control of the gas pressure and flow rate delivered to gas-burning appliances. Line pressure regulator's shall be provided and installed by the contractor.

C. Regulators shall be installed where line pressure exceeds the gas pressure ratings for appliances supplied thereof and as shown on Drawings.

D. Regulators shall be required to ensure protection for gas-fired appliances against emergency gas exposure of at least 2 psig.

E. Regulators shall comply with ANSI Z21.80 and fabricated with internal parts that are corrosion–resistant. Regulators shall be capable of maintaining outlet pressure under no flow condition or dead end lock up situation. Approved model # shall be GOVERNOR by Pietro Fiorentini or prior approved equal.

F. Venting of Gas Regulators: If located indoors, gas pressure regulators shall have an independent vent pipe routed to the outside of the building. The vent pipe shall be arranged so as to preclude the entry of water or foreign objects. Separate vent piping is not required if the regulator is less than 1¼", is equipped with and is labeled for utilization with approved vent-limiting device installed as per the manufacturer's recommendations.

G. Plumbing contractor to co-ordinate with General Contractor on all Owner supplied equipment which require gas. Contractor to provide additional regulators at each piece of equipment.

2.6 SINGLE SEAL ANODELESS RISERS

A. Provide single seal anodeless riser (premanufactured epoxy coated steel to polyethylene gas pipe riser)as manufactured by Elster Perfection. Provide single fused joint under grade at riser connection to polyethylene piping (Medium Density PE2406).

1. Provide where gas piping extends from below grade to above grade.

2. Provide at all gas piping entry points into building.

2.7 GAS CONNECTION TO EQUIPMENT

A. The contractor shall provide final connection of all equipment/appliances requiring natural gas. Install connection to equipment in strict accordance with equipment manufacturer's recommended installation guidelines. Where equipment manufacturer allows for the use of flexible connections the contractor shall provide.

B. Provide connections, shutoff valves, regulators and unions at each and every appliance and piece of equipment requiring natural gas, including equipment furnished under other Divisions of these Specifications and/or by the Owner.

C. Provide and install union type connections at all equipment to permit removal of service piping.

D. Gas service connections shall have a diameter at least one pipe size larger than that of the inlet connection to the equipment as provided by the manufacturer and be of adequate size to provide the total input demand of the connected equipment.

E. Not used.

F. Rigid metallic pipe and fittings shall be used at service connections to all stationary equipment.

G. Provide 6” dirt/drip leg with threaded cap at connection to all appliances/equipment requiring natural gas.

PART 3 EXECUTION

3.1 INSTALLATION

A. A valve and union shall be provided at each connection to a piece of equipment. Equipment provided with a flanged inlet shall have a flanged connection.

B. Horizontal gas piping shall slope up in the direction of flow not less than 1/4 inch in 15 feet.

C. Drip legs, 6-inches long, shall be provided in gas piping at ends of horizontal runs, at the base of risers, and at connections to equipment.

D. Gas piping from the regulator shall be run above ground on the existing pipe rack.

E. Branch piping shall be taken off the top or sides of horizontal lines but not from the bottom.

F. Changes in pipe size shall be made with reducing fittings. No bushings will be allowed.

G. Contractor shall obtain prices from the local gas company for their services. Prices shall include all necessary equipment, labor, etc. for tie-ins to mains including but not limited to all meters. Contractor's bid shall include the cost for these services. Contractor is responsible for coordinating all tie-ins to mains with the local utility companies.

H. The owner equipment shall be furnished and set in place under another section of these specifications and/or by separate contract. Plumbing Contractor shall provide necessary rough-in required for this equipment and shall completely connect all plumbing services for this equipment, providing cut-off valves and union for all plumbing supply service to each piece of equipment. It is the obligation of the plumbing contractor to obtain correct roughing-in dimensions and drawings for this equipment as well as the equipment furnished under this contract.

I. ALL PE pipe to be traced with copper wire when bored, when installed using open trench the pipe shall have a metallic tracer tape with words “caution gas”.

J. A steel striker barrier not less than 0.0508" thick, or equivalent, shall be installed between the gas tubing (within walls) and the finished wall and extend a minimum of 4" beyond the concealed penetrations of plates, fire stops, wall studs, and so forth.

K. Route pipe vents from gas pressure reducing valves and pipe casing sleeves to the exterior of the building and terminated with outlet turned down and capped with corrosion resistant insect screen. Vent terminations shall be at least seven feet above grade or pedestrian traffic and a minimum three (3) feet above or ten (10) feet horizontally from all air intakes or building openings.

L. Provide access to the regulator and ensure that the device is properly installed by following the arrow indicating the gas flow direction. Line pressure regulator must be installed in a horizontal position if the device is equipped with a vent limiter.

3.2 JOINTS

A. Threaded joints shall be made with a mixture of graphite and oil applied to male threads only. After cutting and prior to threading, pipe shall be reamed and shall have burrs removed.

B. Welded joints shall be fusion welded in accordance with ANSI B31.1, Section 6.

C. Flanged joints shall be faced true, provided with gasket, and made square and tight.

D. Brazed joints shall be made up using a BCuP-5 brazing alloy with a compatible flux.

E. Polyethylene Pipe: Fused joints shall be made by applying electric resistance heat to the joint in accordance with Federal Register 192.285, Title 49.

3.3 GENERATOR GAS PIPING INSTALLATION

A. All aspects of the natural gas supply shall be in accordance with NFPA, 37, 54 and 110. Where the gas supply is connected to the building gas supply system, it shall be connected on the supply side of the building main gas shutoff valve and marked as supplying an emergency generator. The building's main gas shutoff valve shall be marked to indicate the existence of the separate generator shutoff valve. Gas piping shall be Schedule 40, black steel, painted and installed by a licensed plumbing contractor. The connection at the generator is to be made with a flexible piping connection provided by the generator manufacturer. Gas trains shall include an equipment isolation valve at the generator, a manual shutoff valve in a remote location, a regulator and two automatic safety shutoff valves at the generator each with manual leak test valves. The automatic safety shutoff valves shall stop the flow of fuel in the event the engine stops for any cause. All gas piping shall be tested and purged in accordance with NFPA 54:8.

1. Automatic Emergency Shut-off Valves shall be U.L. Listed F.M. Approved for natural gas service, 2-way electrically tripped solenoid type; fail safe closed; manual reset; Type 3; 24 volt; solenoid enclosure; Aluminum body; POM core guide; PTFE Rider Ring, stainless steel core and plugnut; NBR seals and disc; stainless steel core tube and springs; copper shading coil; manufactured by ASCO Red Hat Series 8214 or prior approved equal (Emerson approved manufacturer). UL listed to standard 429. FM approved to class 7400. CSA certified to standard C22.2, Automatic Gas Valves Z21.21, & Automatic Gas Safety Shutoff Valves File 112872.

3.4 TRACER WIRE & WARNING TAPE

A. Refer to General Provisions specification.

3.5 WELD TESTING:

A. All welds are subject to inspection, visual and/or x-ray, for compliance with Specifications. The Owner will at the Owner's option, provide employees or employ a testing laboratory for the purposes of performing said inspections and/or x-ray testing. Initial visual and x-ray inspections will be provided by the Owner. The Contractor shall be responsible for all labor, material and travel expenses involved in the re-inspection and retesting of any welds found to be unacceptable. In addition, the Contractor shall be responsible for the costs involved in any and all additional testing required or recommended by ASME/ANSI Standards B31.1 and B31.3 due to the discovery of poor, unacceptable or rejected welds.

B. Welds lacking penetration, containing excessive porosity or cracks, or are found to be unacceptable for any reason, must be removed and replaced with an original quality weld as specified herein. All qualifying tests, welding and stress relieving procedures shall, moreover, be in accord with Standard Qualification for Welding Procedures, Welders and Welding Operators, Appendix A, Section 6 of the Code, current edition.

END OF SECTION

8-21-26

SECTION 22 1300 - SANITARY WASTE & VENT AND STORM DRAINAGE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Work Included

1. Piping
2. Floor Drain(s)
3. Drainage Accessories
4. Cleanouts
5. Traps
6. Flashing

1.03 SUBMITTALS

A. General: All submittals shall comply with the requirements of Division 1 - GENERAL REQUIREMENTS and Section 20 01 00 - GENERAL PROVISIONS.

B. Product Data: Data shall be submitted on the following items:

1. Piping
2. Floor Drain(s)
3. Drainage Accessories
4. Cleanouts
5. Traps
6. Flashing

1.04 QUALITY ASSURANCE

A. Standards

1. American National Standards Institute (ANSI):
    a. Standard B16.3, Malleable Iron Threaded Fittings, 1977 Edition.
    b. Standard B16.5, Steel Pipe Flanges and Flanged Fittings, 1981 Edition.
    c. Standard B16.12, Cast-Iron Threaded Drainage Fittings, 1977 Edition.
    d. Standard B16.18, Cast Copper and Bronze Solder-Joint Pressure Fittings, 1978 Edition.
    e. Standard B16.21, Non-metallic Gaskets for Pipe Flanges, 1962 Edition.
    f. Standard B16.22, Wrought Copper and Bronze Solder-Joint Pressure Fittings, 1980 Edition.
2. American Society for Testing and Materials (ASTM):
    a. Standard A74, Cast Iron Soil Pipe and Fittings, 1982 Edition.
    b. Standard A120, Pipe, Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses, 1983 Edition.
    c. Standard A234, Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures, 1982 Edition.
    d. Standard A307, Carbon Steel Externally and Internally Threaded Standard Fasteners, 1980 Edition.
    e. Standard B43, Specification for Seamless Red Brass Pipe, Standard Sizes, 1984 Edition.
    f. Standard B88, Specification for Seamless Copper Water Tube, 1983 Edition.

g. Standard B306, Specification for Copper Drainage Tube, 1983 Edition.

h. Standard C444, Specification for Perforated Concrete Pipe, 1980 Edition.

i. Standard C564, Specification for Rubber Gaskets for cast Iron Soil Pipe and Fittings, 1970 Edition.

j. Standard D2148, Specification for Polyethylene Plastics Molding and Extrusion Materials, 1981 Edition.

k. Standard D2146, Specification for Propylene Plastic Molding and Extrusion Materials, 1982 Edition.

B. Qualifications for Manufacturer

1. Pipe and fittings shall be of domestic manufacturer. Manufacturers of cast iron to be Charlotte Pipe or Tyler Pipe of Texas. PVC pipe manufacturers to be Charlotte Pipe or JM Eagle.

PART 2 PRODUCTS

2.01 PIPE AND FITTINGS

A. Pipe and fittings shall be as listed herein and shall be used for the services indicated.

B. PVC pipe: Solid Wall Schedule 40 ASTM D 2665 (cellular “Foam Core” NOT allowed) with PVC fittings and joints ASTM D 2665 shall be solvent welded, for:

1. All below ground (under building slab) & above slab sanitary sewer waste, & sewer vent piping.

2. All site sanitary sewer piping shown on mechanical/plumbing site plan.

NOTES: 1. Refer to civil specifications for all site sanitary sewer & storm drainage piping shown on civil documents.

C. Wrought copper and wrought copper alloy solder-joint drainage fittings for plumbing drainage waste & vents, ASTM B306; Wrought Copper Fittings ASME B16.29, or Cast Copper ASME B16.23:

1. Not used.

D. Cast Iron Pipe: ASTM A74, service weight; Fittings: Cast iron; Joints: Hub-and-spigot, CISPI 301 HSN, NSF listed compression type with ASTM C564 neoprene gaskets or lead and oakum for:

1. Not used.

E. GREASE WASTE: Cast Iron Pipe: ASTM A74, service weight; Fittings: Cast iron; Joints: Hub-and-spigot, CISPI 301 HSN, NSF listed compression type with ASTM C564 neoprene gaskets or lead and oakum for:

1. Not used.

F. Type “L” hard down copper tubing, ASTM B88, with soldered joints and wrought copper, ASME B16.22, or cast copper ASME B16.18, socket fittings for:

1. Not used.

G. Polypropylene Pipe: ASTM-4101, NSF Standard 14, ASTM-F1412; flame-retardant polypropylene pipe and fittings.

1. Not used.

2.02 NO-HUB COUPLINGS

A. Furnish & install hub-less soil pipe couplings designated Heavy Weight (HW) as manufactured by Charlotte Pipe by Ideal Tridon, Fernco, Anaco, or prior approved equal, made of extra wide, heavy duty, corrugated series 304 stainless steel with axially slotted, heavy duty worm drive clamps tightened to 80 in. Lbs. of torque. Flanged gasket to be made of neoprene rubber, meeting the requirements of ASTM C-564, with sealing rubber rings under each stainless steel clamp. Coupling to be ASTM 1540 compliant. Couplings shall have FM1680 approval.

2.03 FLANGES

A. Flanges in steel pipe shall be 150 pound steel, ANSI B16.5, slip-on type welding flange with raised or flat face to mate with adjacent flanges, valve, fitting, or piece of equipment.

B. Flange gaskets shall be 1/16 inch non-metallic, ring type, ANSI B16.21.

C. Flange bolts shall be carbon steel, all threaded type, Nuts shall be carbon steel hexagon type. Steel for bolts land nuts shall conform to ASTM A307, Grade A.

2.04 FLOOR DRAINS

A. FD (Restrooms and General Use): Floor drains shall have a cast iron body with adjustable 6"x6" square nickel bronze strainer and flashing flange. Drains shall be:

Manufacturer	*Hub & Spigot / No hub*
Wade	1100-G

Approved Equal: J.R. Smith, Watts, Zurn, Mifab, Josam

B. FD2 (Mechanical Rooms - Air Handling Rooms): Floor drains shall have a cast iron body with adjustable 8" round polished bronze strainer, recessed lip, and flashing flange. Drains shall be:

Manufacturer	*Hub & Spigot / No hub*
J.R. Smith	2005-F37
Josam	30000-E1
Wade	W-1100ER
Zurn	ZN-415-7I
Watts	FD-100-ER7
Mifab	F1100-C-ER7-1

C. FD4 (Main Mechanical/Equipment Room, Ground Floor.): Floor drains shall have a cast iron body with 12x12 cast iron grate, slotted sediment bucket, and flashing flange. Drains shall be:

Manufacturer	*Hub & Spigot*
J.R. Smith	2630
Josam	35450
Wade	W-2370
Zurn	Z-566
Mifab	F1480-4

D. All floor drains shall be equipped with trap primer connections.

E. All floor drains to have barrier type trap primers in addition to the automatic/electronic trap primers. Barrier type trap primers to be SureSeal Waterless Inline Drain Trap Seal as manufactured by Rectorseal or prior approved equal. Typical entire project.

2.05 CLEANOUTS

A. Cleanouts shall be provided where shown on the drawings and shall be the same size as the pipe on which installed except cleanouts on underground piping shall be a maximum of 4". Contractor to provide cleanouts whether indicated on drawings or not (with cast iron boxes and covers marked “CO”) every eighty (80) feet (max.) or change in direction as required by International Plumbing Code, current Edition.

B. Cleanouts in waterproofed floors shall have flashing clamp.

C. Exterior Cleanouts: Exterior cleanouts shall be as detailed on drawings.

D. For Exposed Horizontal Piping: Cleanout shall be a cast iron ferrule with countersunk taper thread bronze plug for insertion in end of pipe. Cleanout shall be:

	Hub & Spigot	*No-Hub*
J.R. Smith	4420	Blind Plug
Josam	58540	Blind Plug
Wade	W-8550-D	Blind Plug

Zurn	Z-1470-7	Blind Plug
Mifab	C1450	

E. For Exposed Vertical Piping: Cleanout shall be countersunk bronze plug with taper threads for insertion into tapped cast iron cleanout tee. Cleanouts shall be:

	Hub & Spigot	*No-Hub*
J.R. Smith	4472-U	4470
Josam	58540-15	58540
Wade	W-8590-D	W-8590-D
Zurn	Z-1470-8-VP	Z-1470
Mifab	C1430	C1430

F. For masonry and steel stud walls: Cleanout shall be countersunk bronze plug tapped for machine screw, tapered threads, shallow stainless steel face-of-wall access cover, and vandal proof securing screw. Cleanout shall be inserted into tapped cast iron cleanout tee. Cleanout shall be:

	No-Hub
J.R. Smith	4472
Josam	58890
Wade	W-8470-R-75
Zurn	Z-1460-8
Mifab	C1430-RD-3

G. For piping concealed in pipe chase or shaft: Cleanout shall be a countersunk bronze plug with taper threads for insertion into a tapped cast iron cleanout tee. Locate a 10" x 10" chrome plated flush-with-wall access cover, with vandal proof securing screw adjacent to cleanout plug. Cleanout and cover shall be:

Cleanout	*No-Hub*
J.R. Smith	4472
Josam	58890
Wade	W-8590-D
Zurn	Z-1470
Jonespec	63000NH
Mifab	C1430
Cover	
J.R. Smith	4735
Josam	58640
Wade	W-8480-S
Zurn	ZANB-1460
Mifab	C1400-S9

H. For concrete floors: Cleanout shall have cast iron body, adjustable square scoriated nickel bronze cover and rim, securing screw, and countersunk bronze plug with taper threads. Cleanout shall be manufactured by JR Smith, Josam, Wade, Zurn, Mifab or prior approved equal.

I. For quarry tile or ceramic tile floors: Cleanouts shall have cast iron body, adjustable square scoriated nickel bronze cover and rim, securing screw, and countersunk bronze plug with taper threads. Cleanouts shall be manufactured by JR Smith, Josam, Wade, Zurn, Mifab or prior approved equal.

J. For resilient tile floors: Cleanout shall have cast iron body, adjustable square nickel bronze cover recessed for tile, securing screws, and countersunk bronze plug. Cleanouts shall be manufactured by JR Smith, Josam, Wade, Zurn, Jonespec, Mifab or prior approved equal.

K. For carpeted floors: Cleanout shall have cast iron body, adjustable square nickel bronze cover and rim, carpet marker, and countersunk bronze plug with taper threads. Cleanouts shall be manufactured by JR Smith, Josam, Wade, Zurn, Mifab or prior approved equal.

L. For cleanouts to grade: Cleanout shall have cast iron ferrule and countersunk bronze plug with taper threads. Where not in paved areas, cleanouts shall be set in a 12" x 12" x 6" deep poured concrete pad set flush with grade. Cleanout shall be:

J.R. Smith	4400
Josam	58500
Wade	WL-8550-S
Zurn	Z-1440
Mifab	C1450

2.06 TRAPS

A. Traps other than those furnished as a part of the plumbing fixture, shall be of the same materials and size as the pipe into which they discharge, unless specified otherwise hereinafter. Where not underground, traps shall be provided with cleanout plugs on the bottom.

2.07 DRAINAGE ACCESSORIES

A. Backwater valves shall be cast iron with bronze backwater flap, adjustable cast iron body and collar, hub inlet spigot outlet. Backwater valves shall be:

J.R. Smith	7022
Zurn	Z-1095
Jonespec	76000
Mifab	BV-1200-R

B. Fixed air gaps shall be cast iron with spigot outlet. Fixed air gaps shall be:

J.R. Smith	3955
Josam	1800
Zurn	Z-1025
Wade	W-2490
Mifab	MI-CAG

2.08 DECONTAMINATION TANK

A. Not used.

2.09 FLOOR SINK

A. “FS”: Floor sink shall be 12” square, cast iron, 6” deep with acid resisting porcelain enameled interior double drainage flange with weepholes, bottom outlet, inside caulk connection, aluminum interval dome strainer, and cast-iron, 3/4 acid resisting grate, sediment bucket, ½” trap primer connection. Floor sink shall be Josam 49320A series, Wade or approved equal.

B. “FS2”: Floor sink shall be 8” square, cast iron, 6” deep with acid resisting porcelain enameled interior double drainage flange with weepholes, bottom outlet, inside caulk connection, aluminum interval dome strainer, and cast-iron, 3/4 acid resisting grate, sediment bucket, ½” trap primer connection. Floor sink shall be ZURN Z1910 Series, Josam, Wade or approved equal.

2.10 SMOKE TEST

A. Contractor shall perform smoke test on entire sanitary sewer system at completion of project and shall include all associated costs in bid, re: Section 200213.

2.11 ROOF DRAINS:

A. Roof Drains (RD & ORD): Cast iron with clamping device for making watertight connection. Free openings through strainer shall be twice area of drain outlet. For roof drains not installed in connection with a waterproof membrane, provide a soft copper membrane 12 inches in diameter greater than outside diameter of drain collar. Provide four pound lead flashing 12 inches in diameter greater than outside diameter of drain collar. Provide an integral gravel stop

for drains installed on roofs having built-up roofing covered with gravel or slag. Provide integral no-hub, soil pipe gasket or threaded outlet connection. All beehive or dome strainers to be cast iron.

1. Flat Roofs: Beehive or dome shaped strainer with integral flange not less than 12 inches in diameter. For insulated roofs, provide a roof drain with an adjustable drainage collar, which can be raised or lowered to meet required insulation heights, sump receiver and deck clamp. Bottom section shall serve as roof drain during construction before insulation is installed.
2. Canopy Roofs: Beehive or dome shaped strainer with the integral flange not larger than 200 mm (eight inches) in diameter. For insulated roof provide a roof drain with an adjustable drainage collar, which can be raised or lowered to meet the required insulation heights, sump receiver and deck clamp. Bottom section shall serve as roof drain during construction before insulation is installed.
3. Promenade Deck Drains (DD, Smoking Balconies): Same as for canopy roofs, except decks shall have flat, round, loose, non-slip, and bronze grate set in square, non-slip, bronze frame. Overflow balcony drain to be same except mounted at high elevation.
4. Portico Roofs and Gutters: Horizontal angle type drain with flat bottom and horizontal outlet at the same elevation as the pipe to which it is connected. Strainer shall be removable angle grate type.
5. Protective Roof Membrane Insulation Assembly: Perforated stainless steel extension filter, non-puncturing clamp ring, large sump with extra wide roof flange and deck clamp.
    a. Non-pedestrian Roofs: Large polypropylene or aluminum locking dome.
    b. Pedestrian Roof: Bronze promenade 14 inches square, set in square secured frame support collar.

B. Expansion Joints: Heavy cast iron with cast brass or copper expansion sleeve having smooth bearing surface working freely against a packing ring held in place and under pressure of a bolted gland ring, forming a water and air tight flexible joint. Asbestos packing is prohibited.

C. Interior Downspouts: Provide an expansion joint, specified above, at top of run on straight, vertical runs of downspout piping 40 feet long or more.

D. Downspout Nozzle: The nozzle fitting shall be of brass, unfinished, with internal pipe thread for connection to downspout. Coordinate height of nozzle with architect for approval of location prior to installation.

E. Roof Drain & Overflow Drain to be JR Smith model 1015BS with cast iron dome strainer, drain receiver, & under deck clamp. Roof drain to be adjustable type. Oveerflow drains to have 2” external dam.

2.12 SANITARY SEWER MANHOLES

A. Refer to Civil Engineering Documents.

2.13 GREASE TRAP

A. Not used.

2.14 OIL INTERCEPTOR

A. Not used.

2.15 LINT FILTER BOX

A. Not used.

PART 3 EXECUTION

3.01 INSTALLATION

A. Horizontal soil and waste piping 2 ½ inches in size and smaller shall be sloped at a minimum of 1/4 inch per foot. Horizontal soil and waste piping 3", 4", 6" shall be sloped at a minimum of 1/8 inch per foot. Horizontal soil and waste piping 8 inches in size and larger shall be sloped at a minimum of 1/16 inch per foot.

1. Horizontal “GREASE WASTE” piping shall be sloped at a minimum ¼ inch per foot (typical all pipe sizes).

B. Horizontal vent branches shall be kept above the highest fixture served by the vent branch in order to preclude the possibility of vents being used as waste pipes. Horizontal vent branches shall be sloped to prevent the accumulation of waste or scale therein.

C. Horizontal storm drainage piping 2 ½ inches in size and smaller shall be sloped at a minimum of 1/4 inch per foot. Horizontal storm drainage piping 3" in size and larger shall be sloped at a minimum of 1/8 inch per foot.

D. On soil, waste and vent piping changes in pipe size shall be made with reducing fittings and changes in pipe direction shall be made with fittings. No bushings allowed.

E. On storm drainage piping changes in pipe size shall be made with reducing fittings and changes in direction shall be made with fittings. No bushings will be allowed.

F. Caulked hubs on all drainage and vent piping shall have the open hub end facing against the direction of flow.

G. During construction all pipe openings, not being worked on, shall be plugged or capped to prevent foreign objects from entering system.

H. Except for special types, floor drains shall be set flush with the floor at the low points designated on the architectural drawings.

I. Open hub drains shall be installed as shown on the drawings and have the hub set in the floor with top 1" above the finished floor. Indirect waste piping shall terminate 2" above the top of the hub.

J. Cleanouts on underground drainage shall have piping extended to the floor and finished with cleanout plug and removable floor plate.

K. Cleanouts in vertical piping shall be roughed with centerline not more than 1'-6" above the finished floor, but high enough to clear the baseboard.

L. STAINLESS STEEL PIPE HANGERS:

1. Provide stainless steel pipe hangers for all piping located under building slab.
    a. Piping up to 6" (Outer Diameter) and less shall utilize 1/4" thick stainless steel hanger rods.
    b. Piping greater than 6" (Outer Diameter) up to 10" (Outer Diameter) shall utilize 3/8" thick stainless steel hanger rods.
    c. Piping greater than 10" (Outer Diameter) shall utilize 1/2" thick stainless steel hanger rods.
2. Hanger rods to span two (2) steel re-bars with 90 degree bend (2" in length) at ends of hanger rods within slab.
3. Twist hanger rods tightly around top of piping two (2) complete 360 degree turns.
4. Provide hanger rods every 4'-0", at all changes in directions, and at all fittings & joints.

M. All vertical storm drainage leader to be equipped with cleanout at base of all risers, provide access door suitable in size for servicing of the cleanout.

N. At project completion the contractor shall remove all debris (concrete, dirt, etc.) from all exterior cleanouts & manhole covers, then apply two-part epoxy coating (black) for all exterior cleanouts, manhole covers, and valve covers.

O. Install all manufacturer’s components in accordance with respective manufacturer’s recommended installation guidelines.

3.02 JOINTS

A. Gasketed joints for cast iron pipe shall be made with lubricated neoprene compression gaskets.

B. Clamped joints for hubless cast iron pipe shall be made with bolted stainless steel clamps and neoprene gasket. Clamps shall be tightened by alternately tightening screws to 60 in. lb. torque.

C. Threaded joints for steel pipe shall be made with a mixture of graphite and oil applied to male threads only. After cutting, but prior to threading, pipe shall be reamed and have burrs removed.

D. Soldered joints for type ‘L’ copper tubing and cast DMV bronze pipe shall be made with 95-5 tin-lead solder and a compatible flux.

E. Brazed joints for red brass pipe shall be made with BcuP-5 brazing alloy and a compatible flux.

F. Clamped joints for storm drainage & waste drainage hubless cast iron pipe 6" and larger shall contain tie rods on the vertical to horizontal and horizontal to vertical.

G. Not used.

H Not used.

3.03 FLASHING

A. Vent pipe (in membrane roofs) shall be flashed and made water tight at roof with flashing recommended or provided by roofing manufacturer.

B. Roof drains (in membrane roofs) shall be flashed and made watertight at the roof with flashing recommended or provided by roofing manufacturer. The flashing shall be secured to the roof drain with the flashing clamp furnished with the drain.

END OF SECTION

8-21-26

SECTION 22 33 00 - WATER HEATERS AND ACCESSORIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Work Included

1. Water Heaters
2. Circulating Pump
3. Tempering Valve

1.03 SUBMITTALS

A. General: All submittals shall comply with the requirements of Division 1 - GENERAL REQUIREMENTS and Section 20 01 00 - GENERAL PROVISIONS.

B. Product Data: Data shall be submitted on the following items:

1. Water Heaters
2. Circulating Pump
3. Tempering Valve

C. Operation and Maintenance Instructions: Data shall be provided for the following items:

1. Water Heaters
2. Circulating Pump
3. Tempering Valve

1.04 QUALITY ASSURANCE

A. Standards

1. American Society of Heating, Refrigeration, Air Conditioning Engineers (ASHRAE):
   a. Standard 90 A, Energy Conservation in New Building Design, 1980 Edition.
2. American Society of Mechanical Engineers (ASME):
   a. Boiler and Pressure Vessel Code, Section IV Low-Pressure, Heating Boilers, 1980 Edition.
   b. Boiler and Pressure Vessel Code, Section VIII - Unfired Pressure Vessels, 1980 Edition.

PART 2 PRODUCTS

2.01 GENERAL

A. Refer to the drawings for capacities and electrical characteristics of water heaters.

B. Water heaters shall be provided with all openings for specified and detailed accessories.

C. Where heater storage volume is 120 gallons or greater, tank shall be constructed in accordance with ASME Code Section IV for 125 psig working pressure.

2.02 TEMPERATURE AND PRESSURE RELIEF VALVES

A. Temperature, pressure, and combination relief valves, if not factory installed, shall be automatic type with bronze body, threaded ends and manual test level. The temperature relief setting shall be 210 degrees F and the pressure relief setting shall be equal to the water heater tank working pressure. Relief valves shall be:

Watts

A.W. Cash

Robert Shaw

2.03 ELECTRIC WATER HEATER - TANK TYPE

A. The heater shall be a glass-lined Custom Xi commercial electric model No. DSE as manufactured by A.O. Smith Corporation, State or approved equal. Heater should be rated at as scheduled on plans and constructed in accordance with ASME Code, shall bear appropriate symbol and be listed with the National Board as requires. Heater shall be listed with Underwriters' Laboratories and approved to the National Sanitation Foundation Standard No. 5. All internal surfaces of the tank shall be glass-lined with an alkaline borosilicate composition that has been fused -to-steel by firing at a temperature of 1600 degree Fahrenheit. Tank shall be cathodically protected with powered anodes. The entire vessel is to be enclosed in a round steel enclosure with baked enamel finish. Water heater shall have an electronic control with large LCD displaying current water heater status; provide real time element status and sensing, low water cutoff and economy mode operation. Shall house 120 volt control circuit transformer, transformer fusing, magnetic contractor(s), element fusing per N.E.C., and commercial grade incoloy sheathed flange mounted elements with prewired terminal leads. Temperature controls include limiting switch which will require resetting manually in the event the temperature reaches 190 degree Fahrenheit. Foam insulation shall meet or exceed the thermal efficiency and/or standby loss requirements of the U.S. Department of Energy and current edition of ASHRAE/IESNA 90.1. Heater shall include a CSA Certified and ASME Rated T&P relief valve and drain valve.

B. Start-up shall be performed by a factory trained technician, with a written report to the Architect/Engineer.

C Refer to plans for size and capacity.

D. All piping from pop-off to be type "L" copper with soldered joints.

E. Provide ASME certification rating.

F. Warranty: For 3 Years, in the event of a tank leak, repair/replace the defective water heater. For 1 Year, in the event of part failure, repair/replace the defective part. Warrant this product against defects in materials or workmanship. Provide ASME certification rating.

2.04 WATER TEMPERING VALVES

A. General: High-Low type, manually adjustable, thermostatically controlled water tempering valve; bronze body; and adjustable temperature setting.

B. System Water Tempering Valves: Piston or discs controlling both hot- and cold-water flow, capable of limited antiscald protection. Include threaded inlets and outlet.

C. Finish: rough bronze.

D. Integral combination checkstops with strainers and wall support.

E. Available Manufacturers: Leonard model XL-32A-LF-BDT-IT, lawler, or prior approved equal.

F. Water Tempering Valves to be lead-free.

G. Water tempering valve to be ASSE 1017 compliant.

H. Provide inlet thermometers.

2.05 DOMESTIC WATER THERMAL EXPANSION TANK

A. Furnish and install, as shown on the plans, ASME Precharged steel Thermal Expansion Tank with a fixed bladder. The tank shall have a top NPT stainless system connection and a .301" - 32 charging valve connection (standard tire valve) to facilitate the on-site charging of the tank to meet system requirements. The tank must be constructed in accordance with Section VIII of the ASME Boiler and Pressure Vessel Code, stamped for 150 psi working pressure. Unit shall be designed and constructed per ASME Section VII. Manufacturer: Wessels TTA Series.

B. Thermal expansion tank to limit the pressure of the water being heated to no more than 80 pounds per square inch as required per the International Plumbing Code (current edition)

2.06 DOMESTIC HOT WATER CIRCULATION PUMPS

A. Domestic hot water circulation pump shall be the in-line centrifugal type designed for 125 psi working pressure with stainless steel body and impeller, mechanical seals and stainless steel impeller shaft. The pump motor shall be the ECM permanent magnet technology design with ceramic bearings, built-in thermal over-load protectors, built in timer, and shall operate at 1750 RPM. Pump shall have the capacities as shown on the drawings. Pump shall be:

Taco 0034ePlus

PART 3 EXECUTION

3.01 INSTALLATION

A. Hot water heaters to be installed over auxiliary drain pan per International Plumbing Code (2021 Ed.) Install water heaters to be installed in strict accordance with manufacturer's recommendations.

B. Floor mounted hot water heaters to be installed on 6" thick reinforced housekeeping pad with chamfered edges.

C. Temperature control valves shall be installed in accordance with manufacturers requirements.

D. Temperature, pressure, and combination relief valves shall have discharge piped full size to exterior wall & turn down (terminate no less than 6" and no more than 12" above finished grade). If water heater is not installed by exterior wall, pipe to nearest floor sink (indirect waste receptor).

3.02 OPERATING MANUAL (DOMESTIC HW HEATERS)

A. Instructions for installation, operation and maintenance of the water heater shall be contained in a manual provided with each boiler unit. Provide four (4) manuals with the submittal process for use by the installing contractor during the installation process.

B. A wiring diagram corresponding to the water heater shall be affixed to the water heater near the electrical panel.

3.03 MARKING

A. All water heaters shall bear the following, or equal wording on a visible decal or label by the manufacturer:

"There shall be installed at time of heater installation a combination temperature and pressure relief valve, selected and located in conformance with the requirements of ANSI Z21.22."

END OF SECTION

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SECTION 22 4000 - PLUMBING FIXTURES AND TRIM

PART 1 GENERAL

1.01 GENERAL

A. Plumbing Fixtures and Trim.

1.02 RELATED WORK

A. Section 20 01 00: General Provisions

B. Section 22 05 23: Plumbing System Valves

C. Section 22 10 00: Domestic Water System

D. Section 22 33 00: Water Heaters and Accessories

E. Section 22 13 00: Sanitary Waste and Vent Drainage System

1.03 SUBMITTALS

A. Submit manufacturer's product data and installation instruction complete with rough-in sheets.

B. Submit a copy of the linear shower trench drains specified within the architectural contract documents to the mechanical engineer for coordination with the installing contractor and the contractor.

1.04 GENERAL REQUIREMENTS

A. Plumbing Contractor shall furnish and install plumbing fixtures as shown on the accompanying drawings and in accordance with the approved rough in drawings. This will include service sinks, lavatories, water closets, urinals, etc., with all brass in connections with supply with tubing, traps, escutcheons, stop and basin cocks, etc. All fixtures shall be new and must be delivered to the building properly crated and in perfect condition.

B. All brass must be best quality. All brass pipe to be seamless brass tubing and all fixture traps shall be heavy with C.O. plugs. Nipples shall be extra heavy. Lightweight goods will not be accepted.

C. All exposed metal on fixtures shall be C.P. or Chromard. All "P" traps shall be complete with cleanout plug.

D. Plumbing contractor shall submit in his fixture brochure for approval, a rough in sheet of each fixture and indicate any variation required for the fixtures. Fixtures are to be roughed in accordance with these approved rough-in sheets and anchored so that piping cannot be moved.

E. All plumbing fixtures, materials, and units shall conform to applicable standards (ANSI/NSK, ASME, ASSE, ASTM, FS, UL, etc.) as required International Plumbing Code, Current Edition.

1.05 JOB CONDITIONS

A. Check millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

1.06 GENERAL REQUIREMENTS AND JOB CONDITIONS

A. Plumbing Contractor shall furnish and install plumbing fixtures as shown on the accompanying drawings and in accordance with the approved rough in drawings. This will include service sinks, lavatories, water closets, urinals, etc., with all brass in connections with supply with tubing, traps, escutcheons, stop and basin cocks, etc. All fixtures shall be new and must be delivered to the building properly crated and in perfect condition.

B. All brass must be best quality. All brass pipe to be seamless brass tubing and all fixture traps shall be heavy with C.O. plugs. Nipples shall be extra heavy. Lightweight goods will not be accepted.

C. All exposed metal on fixtures shall be C.P. or Chromard. All "P" traps shall be complete with cleanout plug.

D. Plumbing contractor shall submit in his fixture brochure for approval, a rough in sheet of each fixture and indicate any variation required for the fixtures. Fixtures are to be roughed in accordance with these approved rough-in sheets and anchored so that piping cannot be moved.

E. Check millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

F. Rough-in locations shall be carefully spotted to result in a symmetrical pattern with sufficient spacing to accommodate full escutcheons.

G. All fixtures shall have supplies with stops. Stops shall be chrome plated brass. Trim shall be polished, chrome plated brass, same manufacturer as fixture unless otherwise indicated. All pipe, fittings, etc. in connection with supply or drain trim shall be chrome plated. In cases where fixtures may have hot and cold water trim without hot water service, connect cold water to both trim inlets.

H. Trap separately each fixture and piece of equipment requiring connection to drainage, unless otherwise shown on drawings. Place traps as near to the fixture as possible. Not fixture shall be double trapped. Unless indicated otherwise, drain "P" traps shall be polished, chrome plated cast brass with cleanout plug and 17 gauge tubular outlet to wall. For floor drains, hub drains or other similar devices with under floor traps, drain "P" traps shall be same material as the branch piping system.

I. All plumbing fixtures, materials, and units shall conform to all applicable standards (ANSI/NSF, ASME, ASSE, ASTM, etc.) as required by the International Plumbing Code, Current Edition.

J. All low water consumption fixtures and flush valve to be provided by the same manufacturer.

PART 2 PRODUCTS

2.01 PLUMBING FIXTURES

A. FIXTURES: Refer to schedule on drawings.

B. All plumbing fixtures are to be lead-free.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install each fixture in accordance with rough-in drawings as per manufacturer's recommendations. At completion thoroughly clean plumbing fixtures and equipment. Anchor fixtures rigidly; anchor piping in walls so that piping cannot be moved.

B. Provide chrome plated rigid or flexible supplies to fixtures with stops, reducers and escutcheons.

C. Solidly attach floor water closets to floor with lag screws and finishing caps.

D. Existing fixtures on project in remodeled areas, not shown refused and/or relocated, shall be removed and turned over to the Owner, capping off all existing services behind finished surfaces.

E. Install each fixture with trap, easily removable for servicing and cleaning.

F. Mount fixtures to the following heights above finished floor (unless otherwise noted on architect’s elevation drawings, ARCHITECTURAL DRAWINGS TO GOVERN FIXTURE HEIGHTS):
   1. Water Closets:
      a. Standard 15" to top of bowl rim
      b. Handicapped 18" to top of seat
   2. Urinal:
      a. Standard 22" to top of bowl rim
      b. Handicapped 17" to top of bowl rim
   3. Lavatories:
      a. Handicapped 32" to top of basin rim
   4. Water Closet Flush Valves:
      a. Standard 11" min. above bowl rim

G. Provide stop valves on all hot and cold water supplies to all fixtures.

H. Furnish fixture carriers to suit wall construction (and drainage fittings where necessary) on wall hung water closets, wall hung urinals and lavatories. Carriers to be anchored securely to floor.

I. Install all fixtures according to manufacturer's recommendation.

J. Mount wall hung water closets with rim at height required by applicable codes.

K. All exposed screws and fasteners on all plumbing penal fixture including floor drains, cleanout covers, access panels on equipment, etc. shall be vandal proof and tamper resistant.

L. Provide insulation on hot water, cold water and sanitary piping below handicapped lavatories.

M. At each toilet on plan provided with a floor drain (or drains), provide a trap primer assembly as specified herein at the handicapped water closet installation or sink/lavatory and extend a trap primer supply line to floor drain or trap connection in accordance with the manufacturer's recommendations.

N. All flush valves installed on handicapped water closet (ADA) shall be installed with handle to wide side of toilet. Handles on all tanks (applicable to tank water closets) shall be installed with handle to wide side of toilet.

O. Contractor shall provide copper plated bracket between wall stubs to anchor water piping for flush valves for both water closets and urinals. Contractor shall spot solder water pipe to bracket.

P. Contractor to provide offset in vertical flush valve piping as not to conflict with installation if grab bars.

Q. All hardware utilized to secure plumbing fixtures is to be stainless steel. Submit product cut sheet to A/E for review prior to installation.

3.2 FIXTURE ROUGH-IN SCHEDULE

A. Rough-in fixture piping and size connections shall be in accordance with the following table of minimum sizes for particular fixtures unless noted different on the drawings:

==========

WATER PIPE SIZING TABLE

==========

UNLESS SHOWN OTHERWISE, DOMESTIC WATER LINES SHALL RUN CONCEALED OVERHEAD AS DESIGNATED IN PLUMBING FIXTURE SCHEDULE AND BE SIZED ACCORDING TO TABLE BELOW. PLANS AND RISER DIAGRAMS DO NOT NECESSARILY SHOW ALL PIPING RUNS. INSTALL A FACTORY SHOCK ABSORBER AT TOP OF EACH FIXTURE GROUP AND ALSO AT WATER HEATERS.

==========

NUMBER OF FIXTURES	*PIPE SIZE (IPS)*
2 or Less	½"
3 to 5	3/4"
6 to 10	1"
11 to 15	1-1/4"
16 to 28	1-1/2"

**FLUSH VALVE WATER CLOSET IS EQUIVALENT TO SIX (6) FIXTURES*

B. SIZES INDICATED ABOVE ARE MINIMUM SIZES TO BE USED UNLESS OTHERWISE SPECIFIED DIFFERENT.

END OF SECTION

8-21-26

SECTION 22 61 00 - DENTAL SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION: Provide dental compressed air system, & dental vacuum system. Dental Air Compressor & Dental Vacuum Pump(s) are to be provided by Contractor, Contractor installed. Systems shall be complete, ready for operation, including all necessary piping, fittings, valves, cabinets, outlets, ceiling services, gages, control panels, air compressors, electric motors and starters, receivers, air dryers, filters, pressure regulators, and all necessary parts, accessories, connections and equipment.

1.2 QUALITY ASSURANCE

A. Materials and Installation: In accordance with this specification.

B. Equipment Installer: Show technical qualifications and previous experience in installing medical gas equipment on similar projects. Submit names and addresses of referenced projects.

C. Equipment Supplier: Show evidence of equivalent product installed at installations similar to this project that has been in satisfactory and efficient operation. Submit names and addresses where the product is installed.

D. Independent Medical Gas System Testing Organization:
   1. Testing agency that is financially independent of medical gas equipment manufacturer supplier and installer.
   2. Provide names of three projects where testing of medical gas systems has been performed by the testing agency. Include the name of the project, names of such persons at that project who supervised the work for the project owner, or who accepted the report for the project owner, and a written statement that the projects listed required work of similar scope to that set forth in this specification.
   3. Submit the testing agency's detailed procedure which will be followed in the testing of this project. Include details of the testing sequence, procedures for cross connection tests, outlet function tests, alarm tests, purity tests, as required. Include data on test methods, types of equipment to be used, and calibration sources and method references for purity tests procedures.

E. Certification: Provide documentation upon completion of the testing to include all test results, the names of individuals performing work for the testing agency on this project, detailed procedures followed for all tests, and a certification that all results of tests were within limits specified.

1.4 SUBMITTAL

A. Manufacturer's Literature and Data: Piping, Valves, Outlets, Ceiling services, Gages, Switches (pressure), and equipment.

B. Station Outlets and Inlets: Submit letter from manufacturer stating that outlets and inlets are designed, manufactured, and comply with NFPA 99. Outlets and inlets shall bear label of approval as assembly of Underwriters Laboratories, Inc. or Associated Factory Mutual Research Corporation. In lieu of above labels, certificate may be submitted by a nationally recognized independent testing laboratory, satisfactory to the Contracting Officer, certifying

that materials, appliances and assemblies conform to published standards, including methods of tests, of above organizations.

C. Certification: Completed systems have been installed, tested, purged and analyzed in accordance with the requirements of this specification.

PART 2 - PRODUCTS

2.1 PIPING:

A. Vacuum (Oral Evacuation, Suction) Piping:

Poly (Vinyl Chloride) (PVC): PVC Piping: ASTM D1785, Type 1 (normal impact), Grade 1 (chemical resistance), Schedule 80 pipe. Provide socket ASTM D2566 fittings and ASTM D2564 PVC solvent cement with PVC primer recommended by manufacturer. Provide wye cleanouts. Cleanouts: Same size and material as pipe. Provide accessible and easily removable cleanouts.

B. Compressed Air Piping:

Copper Tubing: Type "K", ASTM B819, or seamless, copper tube, hard drawn temper, with wrought copper fittings conforming to ANSI B16.22 or brazing fittings complying with MSS SP-73. Size designated reflecting nominal inside diameter.
Brazing Alloy: AWS A5.8, Classification BCuP, greater than 537 degrees C (1000 degrees F) melting temperature. Flux is prohibited for copper-to-copper connections.
Screw Joints: Degreased polytetrafluoroethylene (teflon) tape.

D. Apply piping identification in accordance with NFPA 99. Supplementary color identification shall be in accordance with CGA pamphlet C-9.

E. PIPE ISOLATORS: Flexible rubber, couple band, sealed clamps to isolate the turbine from the piping. Size coupling in accordance with the turbine's intake and output connections and provide steel coupling guards.

2.2 PVC BODY BALL VALVES - VACUUM SYSTEM:

A. PVC Body double-seal ball valves with replaceable neoprene or TFE seat seals. Provide valves suitable for at least 690 kPa (100 psig), cold water, non-shock working pressure. design especially for vacuum service. Operating parts of valve shall be removable without removing from line.

2.3 VALVES - AIR

A. Ball: 3-inches and smaller: Fed. Spec. WW-V-35, Type II, Class A, Style 1, with brazed connections. Full ported, three-piece, Teflon seat seals, full flow, 300 psi minimum working pressure.

B. Check:3-inches and smaller: Brass body, self-aligning, spring loaded ball type check mating with teflon cone seat.

2.4 OUTLETS**:**

A. Outlet Units: Furnished by Owner, contractor to connect directly to owner furnished equipment as per dental equipment manufacturer's recommendations. Contractor to co-ordinate with Owner and/or Architect prior to installation.

2.5 **DENTAL OIL-LESS AIR COMPRESSOR:** Provide **Midmark PowerAir Series Model P32** oil-less dental air compressor, factory assembled, tested, and complete with all components and accessories required for a complete operating system. Compressor shall be specifically designed and manufactured for dental compressed-air service and shall be suitable for supplying clean, dry, oil-free compressed air to dental treatment equipment. Unit shall be a three-head oil-less compressor rated for **7.8 CFM at 80 psig**, with **2.25 total horsepower**, **208-230 volts, single-phase, 60 Hz**, **11 amperes total operating current**, and **20-ampere circuit breaker**. Provide integral **20-gallon receiver tank**, automatic start/stop controls, pressure switch, pressure gauge, safety relief valve, intake filtration, discharge filtration, and all manufacturer-standard controls and protective devices. Compressor shall provide compressed air suitable for dental applications and shall include the manufacturer's integral air filtration system, including **0.01-micron coalescent filtration**, and associated air-drying equipment required to provide clean, dry compressed air. Provide manufacturer-furnished sound cover where indicated on Drawings or required by the installation conditions. Compressor shall be capable of serving approximately **3 to 5 dental users** and shall be installed in accordance with the manufacturer's current written installation requirements. Provide vibration isolation and flexible connections as recommended by the manufacturer. Provide condensate drains and route condensate to an approved indirect waste receptor where required by code. Coordinate compressor discharge connection, dental compressed-air distribution piping, and the requirements of the dental equipment manufacturer. Provide dedicated electrical power, disconnecting means, grounding, and overcurrent protection in accordance with the manufacturer's requirements and applicable codes. Coordinate equipment access, service clearances, ventilation, ambient temperature, electrical requirements, and condensate drainage with the manufacturer's installation instructions. Submit manufacturer's product data, dimensional information, electrical requirements, sound data, installation instructions, and maintenance requirements for approval. Upon completion, start and commission the compressor and verify proper operating pressure, automatic controls, filtration, air-drying operation, condensate drainage, and satisfactory operation of the dental compressed-air system. Basis of Design: **Midmark PowerAir Model P32**; no substitution permitted without written approval by the Engineer.

2.6 **DENTAL WET-RING VACUUM PUMP:** Provide **Midmark ClassicSeries Model CV5R Wet-Ring Vacuum, Water-Recycling Type**, factory assembled, tested, and complete with all components and accessories required for a complete operating dental vacuum system. Unit shall be specifically manufactured for dental vacuum service and shall be suitable for continuous operation serving up to **five dental users**. Vacuum pump shall be a single-pump, **2 horsepower**, wet-ring design capable of producing vacuum levels up to **12 inches Hg**, with **208-230 volt, single-phase, 50/60 Hz** electrical service. Provide integral water-recycling system to minimize fresh-water consumption, water-recycling bypass, sound-reducing muffler, durable aluminum-bronze pump construction, automatic operating controls, motor overload protection, and all manufacturer-standard safety and protective devices. Unit shall be **UL/CUL classified** and designed to comply with applicable requirements of **NFPA 99** for dental vacuum equipment. Provide manufacturer-recommended inlet filtration, condensate/drain provisions, fresh-water connection, isolation valve, flexible connector, and other accessories required for proper operation. Install pump on manufacturer-approved vibration isolation and provide adequate access, ventilation, service clearances, and ambient operating conditions in accordance with the manufacturer's current installation instructions. Coordinate electrical power, disconnecting means, grounding, water supply, drainage, vacuum piping, and equipment connections with the manufacturer's requirements and applicable codes. Provide drainage from the vacuum pump and water-recycling system to an approved indirect waste receptor where required by applicable

plumbing codes. Start, test, and commission the complete dental vacuum system after installation; verify proper vacuum level, automatic operation, water-recycling operation, drainage, electrical operation, and satisfactory performance at the most remote dental vacuum outlet. Submit manufacturer's product data, dimensional data, electrical requirements, installation instructions, maintenance requirements, and certification of compliance with applicable standards. **Basis of Design: Midmark ClassicSeries Model CV5R Wet-Ring Vacuum, Water-Recycling Type; no substitution permitted without written approval by the Engineer.**

2.7 **AMALGAM SEPARATOR:** Provide **Solmetex NXT Hg5 Amalgam Separator, Model NXT-HG5-001**, factory assembled and complete with collection container, mounting backplate, floor/wall mounting provisions, inlet and outlet couplings, and all accessories required for a complete operating installation. Separator shall be specifically designed for dental vacuum wastewater service and shall capture amalgam, mercury-containing solids, and other heavy solids from the dental vacuum waste stream. Unit shall be **ISO 11143:2008 certified with a minimum 99 percent amalgam separation efficiency** and shall be suitable for use with wet or dry dental vacuum systems. Standard NXT Hg5 shall accommodate **one through ten dental operatories** without exceeding the manufacturer's rated capacity. Install the separator in the dental vacuum piping **downstream of all dental treatment rooms and upstream of the vacuum source**, in an accessible location permitting inspection and replacement of the collection container. Do not connect the separator to the outlet of a separating tank or to the outlet of a wet-ring vacuum pump. Install the separator with the outlet positioned higher than the vacuum tank or pump inlet and minimize the required water lift height in accordance with the manufacturer's installation requirements. Provide and install the manufacturer's furnished inlet and outlet couplings; **do not glue, solvent-weld, or otherwise permanently bond piping directly to the separator inlet or outlet connections.** Securely mount or support the separator using the manufacturer's mounting hardware and provide adequate service clearance for collection-container removal and replacement. Provide collection containers with manufacturer's recycling kits and maintain the separator in accordance with the manufacturer's requirements. Used amalgam collection containers shall be packaged, transported, recycled, and documented through an appropriate amalgam recycling program in accordance with applicable federal, state, and local requirements. Upon completion, test the dental vacuum system under operating conditions and verify proper flow through the separator, airtight connections, proper vacuum operation, accessibility for maintenance, and satisfactory operation of the collection container. Submit manufacturer's product data, ISO 11143 certification, installation and operation instructions, dimensional data, mounting requirements, collection-container replacement procedures, and recycling documentation. **Basis of Design: Solmetex NXT Hg5 Amalgam Separator, Model NXT-HG5-001; no substitution permitted without written approval by the Engineer.**

2.8 **REMOTE WATER CONTROL VALVE WITH FILTER:** Provide **Air Techniques Model 53170 Remote Water Control Valve with Filter and Transformer**, factory assembled and complete with solenoid valve, integral water filter, low-voltage transformer, unions, filter housing, controls, and accessories required for a complete operating installation. Valve shall be specifically designed for remote control of the water supply serving dental vacuum equipment and shall provide positive automatic shutoff of the water supply when the associated dental vacuum system is not operating. Unit shall be **24-volt** control type and shall include an integral water filter and manufacturer-furnished low-voltage transformer. Valve assembly shall be suitable for installation in a horizontal run of potable water piping in an accessible location and shall be provided with union connections to facilitate removal and servicing of the valve and filter assembly. Provide all manufacturer-furnished adapters, unions, filter housing, filter element, and accessories required for installation. Water pressure at the valve shall not exceed **100 psig** and water temperature shall not exceed **100°F**. Install assembly in a location protected from freezing, direct sunlight, and physical damage, with sufficient clearance below the filter housing to permit removal of the filter

element using the manufacturer's filter wrench without disassembling adjacent piping. Provide accessible isolation valves upstream and downstream of the assembly where required to permit servicing without draining the dental water system. Connect the remote control wiring to the associated dental vacuum control panel or control switch in accordance with the manufacturer's requirements. Provide electrical power, grounding, transformer, control wiring, and connections in accordance with applicable electrical codes and manufacturer's installation instructions. Coordinate valve operation with the associated dental vacuum pump so that water supply is automatically enabled when the vacuum system requires water and positively shut off when the system is disabled. Provide filter element and initial replacement filter as recommended by the manufacturer. Install, test, and commission the complete assembly; verify proper remote operation, solenoid valve operation, water flow direction, filter installation, transformer output, automatic shutoff, and leak-free operation. Submit manufacturer's product data, installation instructions, wiring diagrams, dimensional data, and maintenance requirements for approval. **Basis of Design: Air Techniques Model 53170; no substitution permitted without written approval by the Engineer.**

PART 3 - EXECUTION

3.1 INSTALLATION - COMPRESSED AIR

A. In strict accordance with NFPA 99.

B. Keep open ends of tube capped or plugged at all times or otherwise sealed until final assembly.

C. Cut piping square and accurately with a tube cutter (sawing not permitted) to measurements determined at place of installation. Ream tube to remove burrs, being careful not to expand tube, and so no chips of copper remain in the tube. Work into place without springing or forcing. Bottom tube in socket so there are no gaps between tube and fitting. Exercise care in handling equipment and tools used in cutting or reaming of tube to prevent oil or grease being introduced into tubing. Where contamination has occurred, material is no longer suitable for dental air service.

D. Spacing of Hangers: NFPA 99.

E. Rigidly support valves and other equipment to prevent strain on tube or joints.

F. While being brazed, joints shall be continuously purged with oil-free dry nitrogen. The flow of purge gas shall be maintained until joint is cool to touch.

G. Do not bend tubing. Use fittings.

H. Support ceiling column assembly from heavy sub-mounting castings furnished with the unit as part of roughing-in. Anchor with 1/2-inch diameter bolts attached to angle iron frame supported from structural ceiling, unless otherwise indicated.

I. Install pressure and vacuum switches, transmitters and gauges to be easily accessed, and provide access panel where installed above plaster ceiling. Install pressure switches and sensors with orifice nipples between the pipe line and switches/sensors.

J. Apply pipe labeling during installation process and not after installation is completed. Size of legend letters shall be in accordance with ANSI A13.1.

K. Pipe compressor intake to a source of clean ambient air as indicated in NFPA 99, as applicable.

L. After initial leakage testing is completed, allow piping to remain pressurized with testing gas until testing agency performs final tests.

M. Penetrations: Fire Stopping: Where pipes pass through fire partitions, fire walls, smoke partitions, or floors, install a fire stop that provides an effective barrier against the spread of fire, smoke and gases as specified in Section 07250, FIRESTOPPING. Completely fill and seal clearances between raceways and openings with the fire stopping material.

N. TESTS: Blowdown, and high and low pressure leakage tests as required by NFPA 99.

3.2 INSTALLATION - VACUUM SYSTEM

A. All equipment to be installed in accordance with manufacturer's and Owner requirements.

B. Cut pipe square, with burrs removed and install with minimum obstructions to air flow. Use long-radius fittings for turns and wye type for branches.

C. Slope horizontal piping not less than 1:100 (0.125 inches per foot) toward the vacuum producers.

D. All fittings shall be long-radius bend types for turns and wye types for branching. For small bore piping for which long-radius bends are not available, two 45-degree bends shall be substituted for 90-degree turning.

E. All risers to all HVE inlet locations shall be 20mm (0.75-inch) nominal pipe size. Risers shall connect to truck lines whose nominal pipe sizes shall be determined by internal cross-sectional area required.

F. The cross-sectional area of all trunk lines shall be graduated, increasing toward the vacuum source. The cross-sectional area at any point along the trunk line shall equate to the sum of the riser cross-sectional areas connected prior to that point. Individual trunk lines shall terminate with connection to the manifold of the separators.

I. Startup shall be by factory representative.

H. Pipe Leakage Test: Exhaust complete piping system to a vacuum of not less than 8-inch mercury gage after the pipe line is dried out initially. Vacuum shall not decrease by more than 0.4-inch mercury gage in one hour. If the vacuum does not hold, repair the leaks and retest.

I. Demonstrate that the system performs as specified.

END OF SECTION
8-21-26

SECTION 23 0414 - MOTOR STARTERS

PART 1 MANUFACTURER

1.01 Manufacturer

A. Approved Manufacturer: Franklin Controls, General Electric, or prior approved equal.

1.02 Submittals

Manufacturer shall provide copies of the following documents:

A. Product data sheets on specified products.

B. Shop drawings for specified product.

C. Wiring Schematics for specified products.

PART 2 PRODUCTS

2.01 Section Includes:

A. Enclosed FVNR combination single phase motor starter with electronic overload relay

B. Enclosed FVNR non-combination motor starters with electronic overload relay

C. Enclosed FVNR combination motor starters with electronic overload relay

2.02 References

The starters referenced in this section are designed and manufactured to the following standards unless otherwise noted:

A. ANSI/NFPA -70, National Electric Code
B. UL 508, and UL508A Industrial Control Equipment
C. NEMA ICS-2, 2000
D. IEC 60947-5, 60947-4, 60947-3

2.03 System Description

A. Single Phase Starter: Starters for 115VAC single phase motors less than 1 HP shall be capable of both manual and automatic operation. Refer to Section 2.03.1 for single phase starter requirements.

B. Magnetic Starters: Starters for 3-phase motors shall be magnetic starters. Refer to Section 2.03.2 for magnetic starter requirements.

C. Combination Starters: Provide combination magnetic starters for all motors requiring branch circuit protection or a line-of-sight disconnect. Refer to Section 2.03.3 for combination magnetic starter requirements.

D. Enclosures: NEMA/UL Type 1 for indoor applications, NEMA or UL Type 3R for outdoor applications

2.03.1 Enclosed Full Voltage Non-Reversing (FVNR) Single Phase Starter

A. Single Phase Motor Starter Control: The single phase motor starter shall consist of a manually operated quick-make toggle mechanism lockable in the “Off” position which shall also function as the motor disconnect. Additionally, the starter shall provide thermal overload protection, run status pilot light and fault pilot light. The starter must include the capability to operate in both manual and automatic control modes. In automatic mode, the starter shall have the capability to integrate with a building automation system by providing terminals for run input, run status output and fault output. All control terminals shall be integrated in the starter. At a minimum, each single phase starter shall include an interposing run relay and current sensing status output relay. Single phase motor starter shall be in a surface mount enclosure.

B. Approved manufacturer: Franklin Controls, model BAS-1P or approved equal.

2.03.2 Enclosed Full Voltage Non-Reversing (FVNR) Non-Combination Starter

A. Magnetic Motor Starters shall be enclosed in a general purpose electrical enclosure with the appropriate environmental rating.

B. Starters shall consist of a horsepower rated magnetic contactor with a minimum of 2NO and 2NC auxiliary contacts and solid state electronic overload relay.

C. Overload relay shall protect all three phases with a wide range 1-40 amp current setting and trip class to allow field adjustment for specific motor FLA. Interchangeable heater elements are not acceptable.

D. Overload relay shall incorporate SmartStart Technology, or the following protective functions:

   a. Out of calibration protection (if the FLA on the overload is set outside acceptable range, overload will trip to indicate fault event)

   b. Stall protection

   c. Max time to start

   d. Locked Rotor

   e. Phase Unbalance

   f. Phase loss

   g. Cycle Fault

E. Starter shall be field selectable for manual or auto reset to restore normal operation after a trip or fault condition. Manual pushbutton shall be accessible without removing or opening cover on starter.

F. In the event of a power failure, starter shall restart in last mode by default. Starter shall also be capable of restart with 10 second delay, or restart in “off” mode.

G. All starters must be provided with a universal power supply capable of a 208 to 600 volt input range. The power supply must accept the available line voltage and the control voltage shall not exceed 24V.

H. Installed accessories shall include Hand-Off-Auto operation pushbutton keypad. Include LED pilot light indicators for Hand, Off, Auto, Run and Overload conditions.

I. When remotely controlled by an automation system, the starter shall include remote run terminals which accept both a voltage input signal and a contact closure. The voltage run input shall accept both AC and DC signals from 12-250V to allow direct connection of the transistorized automation signal to the starter.

J. Starter must contain an integral current sensor with NO contact which closes to indicate motor run status as well as a NO contact which closes when an overload trip condition occurs.

K. In applications where the motor is interlocked with a 24VDC damper or valve, the actuator control must reside within the starter enclosure. The starter must provide a voltage output to operate the actuator to open the damper or valve without closing the motor circuit. The starter will only close the motor circuit and start the motor after it has received a contact closure from a limit or end switch confirming the damper or valve position.

L. The starter shall include a dedicated voltage input for Fireman’s Override operation. When activated, the starter run the motor in any mode (Hand, Off or Auto) regardless of other inputs or lack of inputs either manual or auto. The purpose of the Fireman’s Override input is to act as a smoke purge function. Fireman’s Override has priority over the Emergency Shutdown input.

M. If the starter is controlled by a fire alarm or life safety system, the starter shall include an Emergency Shutdown input which will disable the starter from operating in either Hand or Auto mode regardless of other inputs either manual or auto.

N. Manufacturer shall provide and install tags with engraved white lettering to designate equipment served

2.03.3 Enclosed Full Voltage Non-Reversing (FVNR) Combination Starter

A. Enclosed combination starters shall include all of the magnetic starter requirements in addition to a disconnecting method. All disconnects shall include a lock-out mechanism when in the off position.

B. Motor circuit protectors (MCP) shall be provided as the acceptable form of disconnecting means. The MCP shall be a UL listed 508 current limiting manual motor starter with magnetic trip elements only. The MCP shall carry a UL 508F rating (up to 100A frame size) which

provides for coordinated short circuit rating for use with the motor contactor and provides a minimum interrupting rating of 30,000 AIC for the combination starter.

2.04 PROVIDE OPTIONAL FEATURES, AS REQUIRED, TO MEET DESIGN PERFORMANCE ACCORDING TO THE FOLLOWING REQUIREMENTS.

A. Must provide over/under voltage and phase monitoring capability. Monitor shall be field adjustable for both over and under voltage levels and a delay time before returning to normal operation after a trip.

B. Starter must measure and display output current on the front cover. If necessary, install digital or analog ammeter.

C. The starter shall provide the capability to monitor and calculate power consumption (kWh) of the motor load. Each starter shall display the calculated kW and kWh. Additionally, provide either a pulse output (kWh) or 4-20mA analog signal (kW) to the automation system to monitor the power consumption.

D. Starter must be capable of communicating over BACnet MS/TP. At a minimum, reported points shall include starter mode, terminal input status, run/fault status, voltage, current, power factor, kW and kWh.

2.05 Quality Assurance

A. Manufacturer shall provide a five year warranty on the complete starter assembly.

B. The starter assembly shall be UL listed under UL 508A.

END OF SECTION

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SECTION 23 0503 - PIPING FOR HVAC SYSTEM

PART I GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division I Specification Sections, apply to this section.

1.2 SUMMARY:

A. Work Included:

1. Chilled Water Piping
2. Makeup Water Piping
3. Misc. Piping as noted within.

1.3 DEFINITIONS:

A. HVAC Water Piping: Refers to chilled water piping, heating hot water piping, makeup water piping, etc., this does NOT apply to Steam & Steam Condensate Piping.

1.4 SUBMITTALS:

A. General: All submittals shall comply with the requirements of Division 200100- General Provisions.

B. Product Data: Data shall be submitted on the following items:

1. Manufacturer's notarized certificates of conformance to specified standards for pipe, fittings, and flanges.

C. Certificates: provide copies of certificates for the following:

1. Welder's Qualifications.

1.5 QUALITY ASSURANCE

A. Standards:

1. American Standards Institute (ANSI):
   a. Standard B16.1, Cast Iron Pipe Flanges and Flanged Fittings, 25, 125, and 800 pound.
   b. Standard B16.3, Malleable Iron Screwed Fittings, 150 and 300 pounds.
   c. Standard B16.5, Steel pipe Flanges, Flanges Valves and Fittings for Class 150, 300, 400, 600, 900, 1500, and 2500.
   d. ANSI B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
   e. Standard B16.21, Nonmetallic Flat gaskets for Pipe Flanges.
   f. Standard B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
   g. Standard B31.1, Power Piping and Addenda.
   h. Standard C606 - Standard for Grooved and Shouldered Joints.
2. American Society for Testing and Materials (ASTM):
   a. Standard A47, Ferretic Malleable Iron Castings.
   b. Standard A53, Pipe Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
   c. Standard A135, Electric Resistance Welded Steel Pipe.
   d. Standard A183, Carbon Steel Track Bolts and Nuts.
   e. Standard A234, Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
   f. Standard A307, Carbon Steel Externally Threaded Standard Fasteners.

g. Standard A312, Seamless and Welded Austenitic Stainless Steel Pipe.

h. Standard A351, Castings, Austentic-Ferretic for Pressure Containing Parts.

i. Standard ASTM A403, Wrought Austentic Stainless Steel Piping Fittings.

j. Standard ASTM A513, Electro-Resistance Welded Carbon and Alloy Steel Mechanical Tubing.

k. Standard A536, Ductile Iron Castings.

l. Standard A743, Castings, Iron-Chromium, Iron-chromium-Nickel, and Nickel Base Corrosion Resistant for General Applications.

m. Standard B88, Specification for Seamless Copper Water Tube.

n. Standard B280, Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

B. Qualifications of Welders

1. All welders employed for the work shall be qualified under the requirements of ANSI B31.9.0, Section 127.5.

2. Evidence of Welder's qualifications shall be submitted to the engineer before any welds are made.

C. Qualifications of manufacturers

1. 2-1/2" and larger pipe & fittings, imported pipe is acceptable, Chinese & Taiwanese pipe and fittings are not acceptable. All 2" pipe & fittings (T&C) and smaller to be domestic, no exception, manufacturers to be Wheatland Tube & Textube. All copper piping to be a product of the United States of America. Manufacturer's of copper pipe to be Cerro, Reading, & Mueller. Contractor to provide submittals of pipe as noted within this specification.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS (SEE PIPE & FITTINGS SCHEDULE)

SERVICE	PIPE MATERIAL TYPE
Chilled Water	1, 2, 16
Cold Water Make-up	8
Pump Drains	8
Condensate Drains	8
Relief Valve Discharge	15

SERVICE	PIPE MATERIAL TYPE
Chemical feed for Chilled Water Systems	1, 8
Miscellaneous Drains (Not Listed Above)	8

PIPE AND FITTING SCHEDULE

MATL TYPE	PIPE SIZE	PIPE TYPE	FITTING TYPE
1	2" & smaller	ASTM A53, Sch 40 Black Steel, Screwed End	ANSI B16.3 Class 150 Black Malleable Iron, Screwed
2.	2-1/2" thru	ASTM A53, Sch 40	ASTM A234, Standard Wt. Butt

	10" Incl.	Black Steel, Butt Welded	Welding Type
3	12" & Larger	ASTM A53, Std. Wt. Black Steel, Seamless	ASTM A234, Standard Wt. Butt Welding Type
4	2" & Smaller	ASTM A53, Sch 80 Black Steel, Screwed	ANSI B16.3, Class 300 Black Malleable Iron Screwed
5	2-1/2" thru 14" Incl.	ASTM A53, Sch 80 Black Steel, Butt Welded	ASTM A234, Extra Strong Butt Welding Type
6	2-1/2" and Under	ASTM A53, Sch 40 Galv. Steel, Screwed	ANSI B16.3, Class 150 Galv. Malleable Iron, Screwed
7	All Sizes	ASTM A312, Sch 40 Type 316 Stainless Steel	ASTM A403, Class 150 Type 316 Stainless Steel, Screwed
8	All Sizes	ASTM B88, Type "L" Hard-Drawn Copper	ANSI B16.22, Wrought Copper Solder Joint
9	All Sizes	ASTM B280, Type ACR Rigid Drawn Tempered Tube	ANSI B16.22, Wrought Copper Silver Brazed Joint
10	2" & Smaller	ASTM A53, Grade B, Std. Wt. Black Steel Butt Welded	ANSI B16.3, Class 150 Black Malleable Iron, Screwed
11	2-1/2" & Larger	ASTM A53, Grade B, Std. Wt. Black Steel Butt Welded	ASTM A234, Std. Wt. Butt Welding Type
12	2" to 6"	ASTM B88, Type Hard Drawn Copper, Grooved	ANSI B16.22 or ANSI B16.18 Wrought Copper or Bronze Sand Casting, Grooved
13	All Sizes	ASTM A53, Std. Wt. Black Steel, Seam- less, Cut or Roll Grooved End	ASTM A536 or ASTM A234, Ductile Iron or Steel, Grooved
14	All Sizes	ASTM A53, Sch Black Steel, Seam- less Roll Grooved End	ASTM A234 or ASTM A536, Ductile Iron or Steel, Grooved
15.	All Sizes	ASTM B88, Type "L" Hard-Drawn Copper	ANSI B16.22, Wrought Copper Silver Brazed Joint
16.	2" & Smaller	ASTM B88, Type"L" Hard-Drawn Copper	ANSI B16.22, Wrought Copper Silver Brazed Joint

2.2 FLANGES

A. Flanges shall be faced true and provided with 1/16" ring type gasket conforming to ANSI B16.21. Flanges will have raised or flat face to mate with adjacent flanges or valves, fittings and equipment.

1. Flanges in threaded pipe lines shall be 125 or 250 lbs. cast iron screwed flanges conforming to ANsi B16.1.
2. Flanges in welded pipe lines shall be 150 or 300 lbs. steel slip-on type welding flanges conforming to ANSI B16.5.
3. Flange bolts shall be carbon steel, all threaded type, and nuts shall be carbon steel hexagon type. Steel for bolts and nuts shall conform to ASTM A 307, Grade A for use with steel flanges and Grade B for use with cast iron flanges.
4. Flange class shall be selected to match valve or equipment

connection requirements.

B. Unions in steel pipe shall be 150 lbs. malleable iron type, screwed, Fed. Spec. WW-U- 531E. Unions in copper tubing shall be wrought or cast bronze, Fed. Spec. WW-U-516C, solder and joints.

1. Unions provided between copper and ferrous pipe connections shall be the insulated type separate dissimilar metal connections in piping systems and prevent galvanic corrosion. Temperature rating shall be equal to or exceed the maximum temperature of respective system in which the union is installed.

2.3 GROOVED COUPLINGS

A. Not used.

2.4 ASPHALT MASTIC

A. Asphalt mastic for underground piping shall be: Foster 60-25
Insul-Coustic IC-320
Lison-Oil Co. Seal Kote

PART 3 EXECUTION

3.1 PIPE INSTALLATION

A. Pipes shall have burrs removed by reaming.

B. Changes in direction of piping shall be made with fittings.

C. Changes in pipe sizes in horizontal pipelines shall be made with eccentric reducing couplings, except reducing tees and reducing elbows will be allowed for connections for pressure gauges and gauge cocks, for thermometers and test wells, and for pipe mounted insertion-type temperature control devices.

1. In chilled water & heating hot water lines , eccentric reducing couplings shall be installed with the bottom of the pipe remaining at the same elevation.

2. Reducing tees, reducing elbows, and concentric reducing couplings will be allowed for changing pipe sizes in vertical risers, except in pump suction lines eccentric reducing couplings only will be allowed.

D. Above ground hot water and chilled water horizontal supply and return lines shall be installed level.

E. Not used.

F. Open ends of pipe lines shall be plugged during installation to keep dirt and foreign material out of the system.

G. All elbows 2-1/2" and larger at pump suction connections shall be the long radius type.

H. Not used.

I. Not used.

J. Branch lines for chilled water & heating hot water piping shall take off from top of mains using swing joints.

K. Not used.

L. Special Cleaning: Contractor shall be responsible for cleaning and purging all lines (chilled water, etc.) prior to system start up. Contractor shall provide a temporary purge pump and strainers with required connections (including valves), field located to provide continuous loop, to lines to remove all debris, slag, etc. from lines. This shall be done on both new under ground lines and above ground lines. Cleaning may be done in sections. Once cleaning is complete, contractor to provide and test random number of samples (minimum of 5 for both underground and above ground) to verify water is free of debris down to 500 microns. Provide proof of cleaning to architect/engineer on contractor’s company letterhead.

3.2 PIPE JOINTS

A. Screw joints for Steel Pipe: After cutting and before threading, pipe shall be reamed and shall have burrs removed. Screw joints shall be made with tapered threads. Screw joints shall be made up with graphite and oil applied to male threads only. Caulking of threaded joints to stop or prevent leaks will not be permitted.

B. Welded joints shall be fusion welded. Changes in direction of piping shall be made with welded fittings only. Mitering or notching pipe to form elbows and tees will not be permitted.

1. Branch take-offs at 90-degrees from mains shall be made with welding tee fittings, except where main size is larger than 2 inches factory fabricated forged steel shaped fittings may be used in lieu of welding tees if the main is two pipe sizes or more larger than the branch takeoff; shaped fittings shall be weldolets for branch sizes 2-1/2" and larger, and threadolets for branch sizes 2" and smaller.

2. Branch take-offs at 45-degrees to mains shall be made with factory fabricated latrolets.

3. Defective welds shall be removed and replaced at no additional cost to the owner. Repairing of defective welds by adding new material over the defects or by peening will not be permitted.

C. Copper tubing shall be cut square and burrs shall be removed. Both inside and outside of tubing shall be cleaned with steel wool before joining.

1. Joints in copper tubing for water service shall be made with a non-corrosive paste flux and solid string lead free solder composed of 95% tin and 5% antimony. 50- 50 solder will not be permitted.

2. Joints in copper tubing for refrigerant piping shall be silver brazed with silver solder having a melting point in excess of 1000-degrees F.

D. Grooved mechanical pipe joints: Grooved mechanical pipe joints not used.

END OF SECTION

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SECTION 23 0514 - VARIABLE FREQUENCY DRIVE

PART 1 GENERAL

1.1 DESCRIPTION

A. This specification is to cover a complete Adjustable Frequency motor Drive (AFD) consisting of a pulse width modulated (PWM) inverter designed for use on a standard NEMA Design B induction motor.

B. The drive manufacturer shall supply the drive and all necessary controls as herein specified. The manufacturer shall have been engaged in the production of this type of equipment for a minimum of twenty years.

1.2 QUALITY ASSURANCE

A. Referenced Standards:

1. Institute of Electrical and Electronic Engineers (IEEE)
    a) Standard 519-1992, IEEE Guide for Harmonic Content and Control.
2. Underwriters laboratories
    a) UL508C
3. National Electrical Manufacturer's Association (NEMA)
    a) ICS 7.0, AC Adjustable Speed Drives
4. IEC 16800 Parts 1 and 2

B. Qualifications:

1. AFDs and options shall be UL listed as a complete assembly. AFD's that require the customer to supply external fuses for the AFD to be UL listed are not acceptable. The base AFD shall be UL listed for 100 KAIC without the need for input fuses.
2. CE Mark – The AFD shall conform to the European Union ElectroMagnetic Compatibility directive, a requirement for CE marking. The AFD shall meet product standard EN 61800-3 for the First Environment restricted level.
3. Acceptable Manufactures
    a) ABB ACH Series, Honeywell or prior approved equal.
    b) Engineer approved within 2 weeks of bid. Approval does not relieve supplier of specification requirements.
    c) AFDs that are manufactured by a third party and "brand labeled" shall not be acceptable.
4. The AFD manufacturer shall have available a comprehensive, HVAC Drive Computer Based Training (CBT) product. The CBT product shall include detailed, interactive sections covering AFD unpacking, proper mechanical and electrical installation, and programming. The CBT product shall allow the user to provide just-in-time training to new personnel or refresher training for maintenance and repair personnel on the user's site. The CBT product shall be repeatable, precise and shall include record keeping capability. The CBT product shall record answers to simulations and tests by student ID. The CBT product must be professionally produced and have interactive sections, student tests, and include video clips of proper wiring and installation.

1.03 SUBMITTALS

A. Submittals shall include the following information:

1. Outline dimensions, conduit entry locations and weight.
2. Customer connection and power wiring diagrams.

3. Complete technical product description include a complete list of options provided
4. Compliance to IEEE 519 – harmonic analysis for particular jobsite including total harmonic voltage distortion and total harmonic current distortion (TDD).
    a. The AFD manufacturer shall provide calculations; specific to this installation, showing total harmonic voltage distortion is less than 5%. Input line filters shall be sized and provided as required by the AFD manufacturer to ensure compliance with IEEE standard 519. All AFD's shall include a minimum of 5% impedance reactors, no exceptions.

PART 2 – PRODUCTS

2.01 ADJUSTABLE FREQUENCY DRIVES

A. The AFD package as specified herein shall be enclosed in a UL Listed Type 12 (dust tight) & Type 3R (for exterior installations) enclosure, completely assembled and tested by the manufacturer in an ISO9001 facility. The AFD tolerated voltage window shall allow the AFD to operate from a line of +30% nominal, and -35% nominal voltage as a minimum.

1. Total Harmonic Distortion (THD) compliance to IEEE 519:
    a. The Drive Manufacturer shall provide calculations showing total harmonic current distortion and total harmonic voltage distortion is less than 5%, both with no individual harmonic greater than 3%, at the drive input terminals. Calculations at the transformer are not acceptable. This requirement may be met by VFD's that use Matrix conversion technology. 18-Pulse input VFD's will be accepted in lieu of Matrix conversion technology. VFD's employing the use of 6-Pulse, Passive Filters, 12-Pulse, or "LCL" filter schemes will be rejected. Additional equipment required to meet this performance will be the responsibility of the contractor with no additional cost to the owner.
2. Environmental operating conditions: 0 to 40°C continuous. AFD's that can operate at 40° C intermittently (during a 24 hour period) are not acceptable and must be oversized. Altitude 0 to 3300 feet above sea level, less than 95% humidity, non-condensing.
3. Enclosure shall be rated UL type 12 and shall be UL listed as a plenum rated AFD. AFD's without these ratings are not acceptable.

B. All AFDs shall have the following standard features:

1. All AFDs shall have the same customer interface, including digital display, and keypad, regardless of horsepower rating. The keypad shall be removable, capable of remote mounting and allow for uploading and downloading of parameter settings as an aid for start-up of multiple AFDs.
2. The keypad shall include Hand-Off-Auto selections and manual speed control. The drive shall incorporate "bumpless transfer" of speed reference when switching between "Hand" and "Auto" modes. There shall be fault reset and "Help" buttons on the keypad. The Help button shall include "on-line" assistance for programming and troubleshooting.
3. There shall be a built-in time clock in the AFD keypad. The clock shall have a battery back up with 10 years minimum life span. The clock shall be used to date and time stamp faults and record operating parameters at the time of fault. If the battery fails, the AFD shall automatically revert to hours of operation since initial power up. The clock shall also be programmable to control start/stop functions, constant speeds, PID parameter sets and output relays. The AFD shall have a digital input that allows an override to the time clock (when in the off mode) for a programmable time frame. There shall be

four (4) separate, independent timer functions that have both weekday and weekend settings.

4. The AFD's shall utilize pre-programmed application macro's specifically designed to facilitate start-up. The Application Macros shall provide one command to reprogram all parameters and customer interfaces for a particular application to reduce programming time. The AFD shall have two user macros to allow the end-user to create and save custom settings.
5. The AFD shall have cooling fans that are designed for easy replacement. The fans shall be designed for replacement without requiring removing the AFD from the wall or removal of circuit boards. The AFD cooling fans shall operate only when required. To extend the fan and bearing operating life, operating temperature will be monitored and used to cycle the fans on and off as required.
6. The AFD shall be capable of starting into a coasting load (forward or reverse) up to full speed and accelerate or decelerate to setpoint without safety tripping or component damage (flying start).
7. The AFD shall have the ability to automatically restart after an over-current, over-voltage, under-voltage, or loss of input signal protective trip. The number of restart attempts, trial time, and time between attempts shall be programmable.
8. The overload rating of the drive shall be 110% of its normal duty current rating for 1 minute every 10 minutes, 130% overload for 2 seconds. The minimum FLA rating shall meet or exceed the values in the NEC/UL table 430-150 for 4-pole motors.
9. The AFD shall have an integral 5% impedance line reactors to reduce the harmonics to the power line and to add protection from AC line transients. The 5% impedance may be from dual (positive and negative DC bus) reactors, or 5% AC line reactors. AFD's with only one DC reactor shall add AC line reactors.
10. The input current rating of the AFD shall be no more than 3% greater than the output current rating. AFD's with higher input current ratings require the upstream wiring, protection devices and source transformers to be oversized per NEC 430-2.
11. The AFD shall include a coordinated AC transient protection system consisting of 4-120 joule rated MOV's (phase to phase and phase to ground), a capacitor clamp, and 5% impedance reactors.
12. The AFD shall be capable of sensing a loss of load (broken belt / broken coupling) and signal the loss of load condition. The drive shall be programmable to signal this condition via a keypad warning, relay output and/or over the serial communications bus. Relay outputs shall include programmable time delays that will allow for drive acceleration from zero speed without signaling a false underload condition.
13. If the input reference (4-20mA or 2-10V) is lost, the AFD shall give the user the option of either (1) stopping and displaying a fault, (2) running at a programmable preset speed, (3) hold the AFD speed based on the last good reference received, or (4) cause a warning to be issued, as selected by the user. The drive shall be programmable to signal this condition via a keypad warning, relay output and/or over the serial communication bus.
14. The AFD shall have programmable "Sleep" and "Wake up" functions to allow the drive to be started and stopped from the level of a process feedback signal.

C. All AFDs to have the following adjustments:

1. Three (3) programmable critical frequency lockout ranges to prevent the AFD from operating the load continuously at an unstable speed.
2. Two (2) PID Setpoint controllers shall be standard in the drive, allowing pressure or flow signals to be connected to the AFD, using the microprocessor in the AFD for the closed loop control. The AFD shall have 250 ma of 24 VDC auxiliary power and be capable of loop powering a transmitter supplied by others. The PID setpoint shall be adjustable from the AFD keypad, analog inputs, or over the communications bus. There shall be two parameter sets for the first PID that allow the sets to be switched via a digital input, serial communications or from the keypad for night setback, summer/winter setpoints, etc. There shall be an independent, second PID loop that can utilize the second analog input and modulate one of the analog outputs to maintain setpoint of an independent process (ie. valves, dampers, etc.). All setpoints, process variables, etc. to be accessible from the serial communication network. The setpoints shall be set in Engineering units and not require a percentage of the transducer input.
3. Two (2) programmable analog inputs shall accept current or voltage signals.
4. Two (2) programmable analog outputs (0-20ma or 4-20 ma). The outputs may be programmed to output proportional to Frequency, Motor Speed, Output Voltage, Output Current, Motor Torque, Motor Power (kW), DC Bus voltage, Active Reference, and other data.
5. Six (6) programmable digital inputs for maximum flexibility in interfacing with external devices, typically programmed as follows:

   There shall be a run permissive circuit for damper or valve control. Regardless of the source of a run command (keypad, input contact closure, time-clock control, or serial communications) the AFD shall provide a dry contact closure that will signal the damper to open (AFD motor does not operate). When the damper is fully open, a normally open dry contact (end-switch) shall close. The closed end-switch is wired to an AFD digital input and allows AFD motor operation. Two separate safety interlock inputs shall be provided. When either safety is opened, the motor shall be commanded to coast to stop, and the damper shall be commanded to close. The keypad shall display “start enable 1 (or 2) missing”. The safety status shall also be transmitted over the serial communications bus. All digital inputs shall be programmable to initiate upon an application or removal of 24VDC.
6. Three (3) programmable digital Form-C relay outputs. The relays shall include programmable on and off delay times and adjustable hysteresis. Default settings shall be for run, not faulted (fail safe), and run permissive. The relays shall be rated for maximum switching current 8 amps at 24 VDC and 0.4 A at 250 VAC; Maximum voltage 300 VDC and 250 VAC; continuous current rating 2 amps RMS. Outputs shall be true form C type contacts; open collector outputs are not acceptable.
7. Seven (7) programmable preset speeds.
8. Two independently adjustable accel and decel ramps with 1 – 1800 seconds adjustable time ramps.
9. The AFD shall include a motor flux optimization circuit that will automatically reduce applied motor voltage to the motor to optimize energy consumption and audible motor noise.
10. The AFD shall include a carrier frequency control circuit that reduces the carrier frequency based on actual AFD temperature that allows the highest carrier frequency without derating the AFD or operating at high carrier

frequency only at low speeds.

11. The AFD shall include password protection against parameter changes.

D. The Keypad shall include a backlit LCD display. The display shall be in complete English words for programming and fault diagnostics (alpha-numeric codes are not acceptable). The keypad shall utilize the following assistants:

1. Start-up assistants.
2. Parameter assistants
3. Maintenance assistant
4. Troubleshooting assistant

E. All applicable operating values shall be capable of being displayed in engineering (user) units. A minimum of three operating values from the list below shall be capable of being displayed at all times. The display shall be in complete English words (alpha-numeric codes are not acceptable):

Output Frequency

Motor Speed (RPM, %, or Engineering units)

Motor Current

Calculated Motor Torque

Calculated Motor Power (kW)

DC Bus Voltage

Output Voltage

F. The AFD shall include a fireman's override input. Upon receipt of a contact closure from the fireman's control station, the AFD shall operate at an adjustable preset speed. The mode shall override all other inputs (analog/digital, serial communication, and all keypad commands) and force the motor to run at the adjustable, preset speed. "Override Mode" shall be displayed on the keypad. Upon removal of the override signal, the AFD shall resume normal operation.

G. Serial Communications

1. The AFD shall have an RS-485 port as standard. The standard protocols shall be BACnet, Modbus, Johnson Controls N2 bus, and Siemens Building Technologies FLN. Optional protocols for LonWorks, Profibus, Ethernet, and DeviceNet shall be available. Each individual drive shall have the protocol in the base AFD. The use of third party gateways and multiplexers is not acceptable. All protocols shall be "certified" by the governing authority. Use of non-certified protocols is not allowed.
2. The BACnet connection shall be an RS485, MSTP interface operating at 9.6, 19.2, 38.4, or 76.8 Kbps. The connection shall be tested by the BACnet Testing Labs (BTL) and be BTL Listed. The BACnet interface shall conform to the BACnet standard device type of an Applications Specific Controller (B-ASC). The interface shall support all BIBBs defined by the BACnet standard profile for a B-ASC including, but not limited to:
   a. Data Sharing – Read Property – B.
   b. Data Sharing – Write Property – B.
   c. Device Management – Dynamic Device Binding (Who-Is; I-AM).
   d. Device Management – Dynamic Object Binding (Who-Has; I-Have).
   e. Device Management – Communication Control – B.
   f. If additional hardware is required to obtain the BACnet interface, the AFD manufacturer shall supply one BACnet gateway per drive. Multiple AFDs sharing one gateway shall not be acceptable.

3. Serial communication capabilities shall include, but not be limited to; run-stop control, speed set adjustment, proportional/integral/derivative PID control adjustments, current limit, accel/decel time adjustments, and lock and unlock the keypad. The drive shall have the capability of allowing the DDC to monitor feedback such as process variable feedback, output speed / frequency, current (in amps), % torque, power (kW), kilowatt hours (resettable), operating hours (resettable), and drive temperature. The DDC shall also be capable of monitoring the AFD relay output status, digital input status, and all analog input and analog output values. All diagnostic warning and fault information shall be transmitted over the serial communications bus. Remote AFD fault reset shall be possible. The following additional status indications and settings shall be transmitted over the serial communications bus – keypad "Hand" or "Auto" selected, bypass selected, the ability to change the PID setpoint, and the ability to force the unit to bypass (if bypass is specified). The DDC system shall also be able to monitor if the motor is running in the AFD mode or bypass mode (if bypass is specified) over serial communications. A minimum of 15 field parameters shall be capable of being monitored.
4. The AFD shall allow the DDC to control the drive's digital and analog outputs via the serial interface. This control shall be independent of any AFD function. For example, the analog outputs may be used for modulating chilled water valves or cooling tower bypass valves. The drive's digital (relay) outputs may be used to actuate a damper, open a valve or control any other device that requires a maintained contact for operation. In addition, all of the drive's digital and analog inputs shall be capable of being monitored by the DDC system.
5. The AFD shall include an independent PID loop for customer use. The independent PID loop may be used for cooling tower bypass value control, chilled water value control, etc. Both the AFD control PID loop and the independent PID loop shall continue functioning even if the serial communications connection is lost. The AFD shall keep the last good set-point command and last good DO & AO commands in memory in the event the serial communications connection is lost.

H. EMI / RFI filters. All AFD's shall include EMI/RFI filters. The onboard filters shall allow the AFD assemble to be CE Marked and the AFD shall meet product standard EN 61800-3 for the First Environment restricted level.

I. All AFD's through 50HP shall be protected from input and output power mis-wiring. The AFD shall sense this condition and display an alarm on the keypad.

J. OPTIONAL FEATURES – Optional features to be furnished and mounted by the drive manufacturer. All optional features shall be UL Listed by the drive manufacturer as a complete assembly and carry a UL508 label.

1. A complete factory wired and tested bypass system consisting of an output contactor and bypass contactor. Overload protection and shall be provided in both drive and bypass modes.
2. Door interlocked, padlockable circuit breaker that will disconnect all input power from the drive and all internally mounted options.
3. Fused AFD only disconnect (service switch). Fast acting fuses exclusive to the AFD – fast acting fuses allow the AFD to disconnect from the line prior to clearing upstream branch circuit protection, maintaining bypass capability. Bypass designs, which have no such fuses, or that incorporate fuses common to both the AFD and the bypass will not be accepted. Three contactor bypass schemes are not acceptable.
4. The drive / bypass shall provide single-phase motor protection in both the AFD and bypass modes.

5. The following operators shall be provided:
    a. Bypass Hand-Off-Auto
    b. Drive mode selector
    c. Bypass mode selector
    d. Bypass fault reset
6. The following indicating lights (LED type) shall be provided. A test mode or push to test feature shall be provided.
    a. Power-on (Ready)
    b. Run enable (safeties) open
    c. Drive mode select damper opening
    d. Bypass mode selected
    e. Drive running
    f. Bypass running
    g. Drive fault
    h. Bypass fault
    i. Bypass H-O-A mode
    j. Automatic transfer to bypass selected
    k. Safety open
    l. Damper opening
    m. Damper end-switch made
7. The following relay (form C) outputs from the bypass shall be provided:
    a. System started
    b. System running
    c. Bypass override enabled
    d. Drive fault
    e. Bypass fault (motor overload or underload (broken belt))
    f. Bypass H-O-A position
8. The digital inputs for the system shall accept 24V or 115VAC (selectable). The bypass shall incorporate internally sourced power supply and not require an external control power source.
9. Customer Interlock Terminal Strip – provide a separate terminal strip for connection of freeze, fire, smoke contacts, and external start command. All external safety interlocks shall remain fully functional whether the system is in Hand, Auto, or Bypass modes (not functional in Fireman's Override 2). The remote start/stop contact shall operate in AFD and bypass modes.
10. Dedicated digital input that will transfer motor from AFD mode to bypass mode upon dry contact closure for fireman's override. Two modes of operation are required.
    a. One mode forces the motor to bypass operation and overrides both the AFD and bypass H-O-A switches and forces the motor to operate across the line (test mode). The system will only respond to the digital inputs and motor protections.
    b. The second fireman's override mode remains as above, but will also defeat the overload and single-phase protection for bypass and ignore all keypad and digital inputs to the system (run until destruction).

11. The AFD shall include a “run permissive circuit” that will provide a normally open contact whenever a run command is provided (local or remote start command in AFD or bypass mode). The AFD system (AFD or bypass) shall not operate the motor until it receives a dry contact closure from a damper or valve end-switch. When the AFD system safety interlock (fire detector, freezestat, high static pressure switch, etc) opens, the motor shall coast to a stop and the run permissive contact shall open, closing the damper or valve.
12. Class 20 or 30 (selectable) electronic motor overload protection shall be included.
13. There shall be an internal switch to select manual or automatic bypass.
14. There shall be an adjustable current sensing circuit for the bypass to provide loss of load indication (broken belt) when in the bypass mode.

PART 3 – EXECUTION

3.01 INSTALLATION: In accordance with the general conditions, contractor is responsible for dividing the work among the subcontractors and suppliers and for delineating the work to be performed by specific trades. The following are suggestions as to how the work may be divided. This is not a complete list of all the work:

A. Installation shall be the responsibility of the electrical contractor. The contractor shall install the drive in accordance with the recommendations of the AFD manufacturer as outlined in the installation manual.

B. Power wiring shall be completed by the electrical contractor. The contractor shall complete all wiring in accordance with the recommendations of the AFD manufacturer as outlined in the installation manual.

3.02 START-UP

A. Certified factory start-up shall be provided for each drive by a factory authorized service center. A certified start-up form shall be filled out for each drive with a copy provided to the owner, and a copy kept on file at the manufacturer.

3.03 PRODUCT SUPPORT

A. Factory trained application engineering and service personnel that are thoroughly familiar with the AFD products offered shall be locally available at both the specifying and installation locations. A 24/365 technical support line shall be available on a toll-free line.

B. A computer based training CD or 8-hour professionally generated video (DVD format) shall be provided to the owner at the time of project closeout. The training shall include installation, programming and operation of the AFD, bypass and serial communication. Provide copy in O&M manuals.

3.04 WARRANTY

A. Warranty shall be 24 months from the date of substantial completion. The warranty shall include all parts, labor, travel time and expenses. There shall be 365/24 support available via a toll free phone number.

3.05 SCHEDULE

A. Provide VFD’s for all pumps, air handling units, and as noted on drawings & schedules.

B. Provide shaft grounding rings for all motors that are to be controlled by variable frequency drives.

END OF SECTION

8-21-26

SECTION 23 0523 - VALVES FOR HVAC SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division I Specification Sections, apply to this section.

1.2 SUMMARY

A. Work Included:

1. Valves for Chilled Water System
2. Valves for Makeup Water
3. Miscellaneous Valves

1.3 SUBMITTALS

A. General: All submittals shall comply with the requirements of Division 200100- General Provisions.

B. Product Data: Data shall be submitted on the following items:

1. Valves

1.4 QUALITY ASSURANCE

A. Standards:

1. American Society for Testing and Materials (ASTM):
   a. Standard A536, Ductile Iron Castings.
   b. Standard A126, Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
   c. Standard A197, Specification for Cupola Malleable Iron.
   d. Standard B61, Specification for Steam or Valve Bronze Castings.
   e. Standard B62, Specification for Composition Bronze or ounce Meatal Castings.
   d. Standard B162, Specification for Nickel plate, Sheet, and Strip.
   f. Standard B584, Specification for Copper Alloy Sand Casting for General Application.
2. American society of mechanical Engineers (ASME):
   a. Boiler and Pressure Vessel Code, Section 1, Rules for construction of Power Boilers.

PART 2 - PRODUCTS

2.1 GENERAL

A. Valves shall have name or trademark of manufacturer and working pressure cast or stamped on valve body.

B. Gate Valves, globe valves, and swing check valves shall be the product of a single manufacturer.

C. All valves requiring packing shall be designed and constructed to allow repacking under pressure.

D. Valve discs shall be the manufacturer's standard material for the service in which the valve is used unless otherwise indicated under the individual type valve specification.

E. Malleable iron hand wheels shall conform to ASTM A197.

2.2 GATE VALVES

A. Type GV1 - Valves 2" and smaller shall be class 125 rising stem type. Body and bonnet shall be ASTM B62 cast bronze with threaded ends, inside screwed bonnet, solid

wedge disc, brass packing gland, teflon impregnated packing, malleable iron handwheel. Valves shall be:

Kitz #24

B. Type GV2 - Valves 2" and smaller shall be class 150 rising stem type. Body and bonnet shall be ASTM B62 cast bronze with threaded ends, inside screwed bonnet, solid wedge disc, brass packing gland, teflon impregnated packing, malleable iron handwheel. Valves shall be:

Kitz #25, #42T

C. Type GV3 - Valves 2" and smaller shall be class 200 rising stem type. Body and bonnet shall be ASTM B61 cast bronze with threaded ends, union bonnet bonnet, solid wedge disc, brass packing gland, teflon impregnated packing, malleable iron handwheel. Valves shall be:

Kitz #37

D. Type GV4 - Valves 2-1/2" through 16" shall be class 125 outside screw and yoke rising stem type. Body and bonnet shall be ASTM A126 cast bronze with flanged ends, bronze trim, solid wedge disc, two piece packing gland, teflon impregnated packing, malleable iron handwheel. Valves shall be:

Kitz #72

E. Type GV5 - Valves 2-1/2" through 12" shall be class 250 outside screw and yoke rising stem type. Body and bonnet shall be ASTM A126 cast bronze with flanged ends, bronze trim, solid wedge disc, two piece packing gland, teflon impregnated packing, malleable iron handwheel. Valves shall be:

Kitz

2.3 BUTTERFLY VALVES

A. Type BF1 - Lug Style Gear Operated Butterfly Valves shall be acceptable (250 PSI, ductile iron body, extended neck, molded seat liner, bi-directional, Kitz or Nibco).

2.4 BALL VALVES

A. Type BL1 - Valves 2" and smaller shall be class 600 PSIG WOG, two piece, quarter turn type. Body shall be ASTM B584 cast bronze with threaded ends, conventional port, chrome plated brass ball, replaceable teflon seats, brass packing gland, steel lever handle and vinyl handle cover. Valves shall be:

Kitz #68

B. Type BL2 - Valves 2" and smaller shall be class 400 PSIG WOG, three piece, quarter turn type. Body shall be ASTM B62 bronze with threaded ends, full port, chrome plated brass ball, replaceable teflon seats, brass packing gland, steel lever handle and vinyl handle cover. Valves shall be:

Kitz #62

2.5 GLOBE VALVES

A. Type GB1 - Valves 2" and smaller shall be class 125 rising stem type. Body and bonnet shall be ASTM B62 cast bronze with threaded ends, inside screwed bonnet, solid wedge disc, brass packing gland, teflon impregnated packing, malleable iron handwheel. Valves shall be:

Kitz #11

B. Type GB2 - Valves 2" and smaller shall be class 150 rising stem type. Body and bonnet shall be ASTM B62 cast bronze with threaded ends, inside screwed bonnet, solid wedge disc, brass packing gland, teflon impregnated packing, malleable iron handwheel. Valves shall be:

Kitz #9

C. Type GB3 - Valves 2" and smaller shall be class 200 rising stem type. Body and bonnet shall be ASTM B61 cast bronze with threaded ends, union bonnet bonnet, solid wedge disc, brass packing gland, teflon impregnated packing, malleable iron handwheel.

Valves shall be:

Kitz #17

D. Type GB4 - Valves 2-1/2" through 16" shall be class 125 outside screw and yoke rising stem type. Body and bonnet shall be ASTM A126 cast bronze with flanged ends, bronze trim, solid wedge disc, two piece packing gland, teflon impregnated packing, malleable iron handwheel. Valves shall be:

Kitz #76

E. Type GB5 - Valves 2-1/2" through 8" shall be class 250 outside screw and yoke rising stem type. Body and bonnet shall be ASTM A126 cast bronze with flanged ends, bronze trim, solid wedge disc, two piece packing gland, teflon impregnated packing, malleable iron handwheel. Valves shall be:

Crane Grinnel
Hammond
Lunkenheimer
Milwaukee
Nibco

2.6 PLUG VALVES

A. Type PV1 - Valves 2" and smaller shall be class 175 WOG lubricated short pattern type. Body shall be ASTM A126 cast iron with threaded ends, teflon coated full port steel plug, and wrench operator. Valves shall be:

Powell Rockwell
Walworth

B. Type PV2 - Valves 2-1/2" through 4" shall be class 175 WOG lubricated short pattern type. Body shall be ASTM A126 cast iron with threaded ends, teflon coated full port steel plug, and wrench operator. Valves shall be:

Powell
Rockwell
Walworth

C. Type PV3 - Valves 6" through 12" shall be class 200 WOG lubricated short pattern type. Body shall be ASTM A126 cast iron with flanged ends, teflon coated full port steel plug, wrench operator. Valves shall be:

Powell Rockwell
Walworth

D. Type PV4 - Valves 3" through 12" shall be class 175 WOG lubricated short pattern type. Body shall be ASTM A126 cast iron with grooved ends, teflon coated ductile iron plug, wrench operator. Plug port shall be minimum 81% free opening. Valves shall be:

Victaulic

2.7 METERED BALANCING VALVES

A. Type MB1 - Valves 4" and smaller shall be 175 psif WOG combination balancing and shut-off type. Valve body shall be bronze ASTM B62 with threaded ends, bronze ball or plug disc, bronze trim, integral meter connection taps with shut-off cocks, and calibrated nameplate and flow indicator. Error of floe indicator and meter reading shall be maximum of 2% of full scale. Valves shall be:

Bell & gossett	Circuit Setter
Illinios	6000 Series
Sarco	Balanced Master
Taco	Circuit Setter

B. Meter kits shall be provide for all makeup water lines (closed loop systems, cooling towers, etc.) and shall be of the digital pulse type meter type and shall be compatible to Building Energy Management System

2.8 CHECK VALVES

A. Type CV1 - Valves 2" and smaller shall be class 125 horizontal swing type. Body and cap shall be ASTM B62 cast bronze with threaded ends, inside screw cap, and bronze disc. Valves shall be:

Kitz #04

B. Type CV2 - Valves 2" and smaller shall be class 150 horizontal swing type. Body and cap shall be ASTM B62 cast bronze with threaded ends, inside screw cap, and bronze disc. Valves shall be:

Kitz #29

C. Type CV3 - Valves 2" and smaller shall be class 200 Y-pattern swing type. Body and cap shall be ASTM B61 cast bronze with threaded ends, inside screw cap, and bronze disc. Valves shall be:

Kitz #19

D. Type CV4 - Valves 2-1/2" thru 4" shall be class 125 horizontal swing type. Body and cap shall be ASTM B126 cast iron with flanged ends, bolted cap, and bronze or cast iron disc. Valves shall be:

Kitz #78

E. Type CV5 - Valves 2-1/2" thru 12" shall be class 250 horizontal swing type. Body and cap shall be ASTM B126 cast iron with flanged ends, bolted cap, and bronze or cast iron disc. Valves shall be:

Crane Grinnell
Hammond
Lunkenheimer
MIlwaukee
Nibco

F. Type CV6 - Valves 3" to 24" shall be class 125 silent globe type. Body shall be ASTM A48 cast iron with flanged ends, Bronze trim, and stainless steel spring. Valve design shall provide an open area in the body equal to not less than 110% of the corresponding pipe area. Valve shall be:

APCO CPV

Grinnell
Kelflex
Metraflex
Nibco

G. Type CV7 - Valves 2-1/2" through 12" shall be 300 psig silent globe butterfly type. body shall be ASTM A536 ductile iron, ASTM A220 pearlitic malleable iron, or ASTM A47 malleable iron with grooved ends, bronze alloy, ductile iron or stainless steel disc, stainless steel spring, stainless steel hinge pin, and EPDM o-ring seals. Valves shall be:

Grinnell
Victaulic

2.9 MISCELLANEOUS VALVES

A. Hose end drain valves shall be class 125 angle type. Body and bonnet shall be cast bronze with threaded inlet, hose end outlet, inside screw, solid wedge disc, and malleable iron handwheel. Valve shall be:

Nibco

2.10 APPROVED MANUFACTURERS

A. Crane, Grinnel, Milliken, Hammond, Milwaukee, Nibco, Kitz, Demco, Keystone, Victaulic, Powell, Rockwell, Walworth, Illinois, Bell & Gossett, Sarco, Taco, APCO, CPV, Kelflex, Metraflex.

PART 3 - EXECUTION

3.1 VALVE SERVICE

A. Valve Types specified hereinbefore shall be used on the systems and services as outlined below and shown on the drawings.

B. Valves 2" and smaller:

SYSTEM	SHUT-OFF SERVICE	BALANCING SERVICE	CHECK SERVIC
CHILLED WATER	BL1	GB1, PV1	CV1
MAKE-UP WATER	BL1	GB1	CV1

C. Valves 2-1/2" and larger:

SYSTEM	SHUT-OFF SERVICE	BALANCING SERVICE	CHECK SERVIC
CHILLED WATER	BF1	GB4 PV3	CV4
MAKE-UP WATER	GV4	GB4	CV4

3.2 INSTALLATION

A. All valves in horizontal lines shall be installed with the stem horizontal or above. Valve handwheels shall be oriented when installed to provide accessibility for operations.

B. Flanged gate valves shall be installed between ASA 150 lb. raised-face steel slip-on weld flanges.

C. non-slam check valves shall be installed between ASA 150 lb. flat face steel slip-on weld flanges.

D. All valves 2-1/2" and larger to have flanged connections. All valves 2" and smaller to have threaded connections.

E. Where indicated on the drawings or valve located over 8" A.F.F., valves shall be provided with chain operator and valve shall include manufacturer's standard cast iron chain wheel with roller guides and with link chains with connecting ends; chain length shall be such that the bottom of the chain loop is 5'0" above finished floor on the building.

F. Contractor shall provide T-wrench operator for valves located in pits over 3'0" in depth

G. Provide three (3) wrenches for each size plug valve.

H. Provide isolation valves on supply & return lines of all pieces of mechanical equipment, branch piping, etc.

END OF SECTION

8-21-26

SECTION 23 0590 - CONTRACTOR COORDINATION WITH TESTING, ADJUSTING & BALANCING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.2 SUMMARY

A. Perform all Work required to prepare the building HVAC systems for testing, adjusting, and balancing (TAB) Work indicated by the Contract Documents, including the following:

1. Preparation of air systems for testing, adjusting and balancing.
2. Preparation of hydronic and steam systems for testing, adjusting and balancing.
3. Providing materials and labor to assist TAB Firm in meeting testing, adjusting and balancing requirements.

B. Testing, adjusting and balancing of the air conditioning systems and related ancillary equipment will be performed by a technically qualified TAB Firm. The preparation for and corrections necessary for the testing, adjusting and balancing of these systems, as described herein, are the responsibility of this Contractor.

C. Make any changes or replacements to the sheaves, belts, dampers and valves required for correct balance as advised by the TAB Firm, at no additional cost to the Owner.

1.3 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. AABC: National Standards for Testing and Balancing Heating, Ventilating and Air Conditioning Systems.
2. AABC: Testing and Balancing Procedures.
3. ASHRAE HVAC Applications Chapter 37: Testing, Adjusting and Balancing.
4. ANSI/ASHRAE Standard 111: Practices for Measurement, Testing, Adjusting and Balancing of Buildings, Heating, Ventilation, Air Conditioning and Refrigeration Systems.

1.4 QUALITY ASSURANCE

A. Provide and coordinate the services of qualified, responsible Subcontractors, suppliers and personnel as required to correct, repair, and/or replace any and all deficient items or conditions found during the course of this project, including during the testing, adjusting and balancing period.

B. In order that systems may be properly tested, adjusted, and balanced, the Contractor shall operate systems at Contractor’s expense for the length of time necessary to properly verify the systems’ completion and readiness for TAB.

C. Project Contract completion schedules shall allow for sufficient time to permit the completion of TAB services prior to Owner occupancy. Allow adequate time for the testing and balancing activities during the construction period and prior to Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL

A. None used.

PART 3 - EXECUTION

3.1 PREPARATION

A. Contractor shall be responsible to prepare the building heating, ventilating, and air conditioning systems ready for TAB when scheduled.

B. Operational readiness requires that construction status of the building will permit the closing of doors, windows, ceilings installed, etc., to obtain simulated or projected operating conditions.

C. Notification of System Readiness:

1. Upon completion of the system installation Work, the Contractor shall notify the Owner and TAB Firm in writing, certifying that the Work has been accomplished and that the air conditioning systems are in operational readiness for testing, adjusting, and balancing.

2. TAB Firm shall notify the Contractor of TAB Firm's readiness for balancing.

3. Should the TAB Firm be notified as described above, and the TAB Work commenced and the systems are found NOT to be in readiness or a dispute occurs as to the readiness of the systems, the Contractor shall request an inspection be made by a duly appointed representative of the Owner, Architect, TAB Firm and the Contractor. This inspection will establish to the satisfaction of the represented parties whether or not the systems meet the basic requirements for TAB services. Should the inspection reveal the TAB services notification to have been premature, all cost of the inspection and wasted Work accomplished by the TAB Firm shall be the responsibility of the Contractor.

3.2 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's published recommendations.

C. Allow sufficient time for the TAB Firm to perform TAB Firm's Work within the Project schedule. Complete installation Work by system or floor, whichever is the most efficient for scheduling. Develop the Project schedule in close coordination with the TAB Firm.

D. The Drawings and Specifications indicate valves, dampers and miscellaneous adjustment devices for the purpose of adjustment to obtain optimum operating conditions. Install these devices in a manner that will leave the devices accessible and readily able to be adjusted. Immediately correct any malfunction encountered that the TAB Firm reports so that the balancing Work can proceed with minimal delay.

E. Contractor shall promptly correct deficiencies of materials and workmanship identified as delaying completion of TAB Work.

3.3 SYSTEMS VERIFICATION

A. Air Distribution Systems:

1. Verify installation for conformity to the Contract Documents. All supply, return, and exhaust ducts shall be terminated and pressure tested for leakage as required by the Contract Documents.

2. All volume, smoke and fire/smoke dampers are properly located and functional. Dampers serving requirements of minimum and maximum outside, return, and relief air shall provide tight closure and full opening, smooth and free operation.

3. All supply, return, exhaust and transfer grilles, registers, diffusers and terminal devices are installed and airflow at each device shall be verified.

4. Air handling systems, units and associated apparatus, such as heating and cooling coils, filter sections, access doors, etc., shall be sealed or blanked-off to eliminate excessive uncontrolled bypass or leakage of air.

5. All fans (supply, return and exhaust) operating and verified for freedom from vibration, with proper fan rotation and belt tension. Heater elements in motor starters are of proper size and rating. Record motor amperage and voltage on each phase at Start-up and running, and verify they do not exceed nameplate ratings.

6. All single and/or double duct variable and constant volume terminal units ("mixing boxes") shall be installed and functional (i.e. controls functioning).

7. Duct systems and air handling units and coils are clean and free of debris.

8. Air systems are pressure independent and can be tested by floor, riser, system, etc. but once the all systems are installed, the total flows and system tracking will require final testing, adjusting and balancing.

B. Water Circulating Systems:

1. Check and verify pump alignment and rotation.
2. Open all valves to their full open position, close bypass stop valves. Set mixing valves to full-flow through systems components. After the system is flushed and checked for proper operation, remove and clean all strainers. Repeat the operation until circulating water is clean.
3. Record the amperage of each pump motor on each phase and voltage after reaching rated speed. Readings shall not exceed nameplate rating.
4. Verify that the electrical heater elements are of the proper size and rating.
5. All water circulating systems shall be full and free of air. Expansion tanks shall be set for proper water level and all air vents shall be installed at high points of systems and operating freely. Systems shall be cleaned and flushed. Chemicals shall be added to closed systems to treat piping and inhibit corrosion.
6. Check and set operating temperatures and other parameters of the heat exchangers and control devices to the design requirements.
7. Installation and system verification of steam, condenser water, hot water, and chilled water systems must be 100 percent complete prior to balancing.

C. Building Automation System (BAS):

1. Verify that all control components are installed in accordance with the Contract Documents and that all control components are functional, including all electrical interlocks, damper sequences, air and water resets, fire and freeze stats, high and low temperature thermostats, safeties, etc.
2. Verify that all controlling instruments are calibrated and set for design operating conditions with the exception of room thermostats or sensors, which shall be calibrated at the completion of TAB services with cooperation between the TAB Firm and BAS Provider.
3. BAS Provider shall thoroughly check all controls, sensors, operators, sequences, etc. before notifying the TAB Firm that the building automation system is operational. The BAS Provider shall provide technical support, including technicians and necessary computers, to the TAB Firm for a complete check of these systems.
4. BAS Provider shall assist the Contractor with functional performance testing and point-to-point testing back to the main graphics.
5. BAS Provider, if requested by Owner, shall set-up controls on sample fan powered terminal units at TAB Firm’s office.

END OF SECTION

8-21-26

SECTION 23 0593 - TESTING AND BALANCING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. All division 23 specification sections, drawings, and general provisions of the contract apply to work of this section, as do other documents referred to in this section.

1.2 SCOPE OF WORK

A. The **CONTRACTOR** shall obtain the services of an independent Test and Balance (TAB) Company which specializes in the testing and balancing of heating, ventilating and air conditioning (HVAC) systems to test, adjust and balance all HVAC systems in the building(s). *The project shall not be accepted until approved Testing and Balancing Report has been submitted and approved.*

B. The work included in this section consists of furnishing labor, instruments, and tools required in testing, adjusting and balancing the HVAC systems, as described in these specifications or shown on accompanying drawings. Services shall include checking equipment performance, taking the specified measurements, and recording and reporting the results. The testing, adjusting and balancing agency shall act as a reporting agency; that is, list and report each piece of equipment as to identification number, manufacturer, model number, serial number, proper location, specified performance, and report actual performance of all equipment as found during testing. The report is intended to be used during the life of the building as a ready reference indicating original conditions, equipment components, etc.

C. Representatives of the Test and Balance Company shall visit the job site at 60% and 90% completion of installation of the HVAC equipment, piping and ductwork to review the installation. After each site visit, the Test and Balance Company shall report to the Architect any items that are not installed properly, are missing from the installation or items that are required to enable him to perform the testing and balancing of the HVAC systems as per normal standard practice. After review, the Architect shall instruct the Contractor to implement the recommendations at no additional cost to the Owner if these items were specified in the original scope of the project.

D. Upon completion of the HVAC system installation, the Test and Balance Company shall perform all required testing and balancing with the full cooperation of the Contractor and his Sub-contractors. The Contractor shall make changes and/or adjustments to the HVAC system components that are required by the Test and Balance Company to accomplish proper balancing. The TAB agency shall not supply or install any materials or balancing devices such as pulleys, drives, belts, etc. All of this work is by the Contractor and shall be performed at no additional cost to the Owner.

E. The test and balance report shall be submitted to the Architect for review by his Mechanical Engineer. If the Mechanical Engineer agrees with the report, he shall sign it and return it to the Architect. If he does not concur with the report, he shall meet with the Test and Balance Company to determine what needs to be done to obtain a properly balanced system.

F. After the Mechanical Engineer signs the testing and balancing report, the Test and Balance Company shall supply four (4) copies of the final and complete report to the Architect for inclusion in the Operation and Maintenance Manuals.

1. Report to in format of sample report located at the end of this specification section. For all items that are not applicable the contractor shall note as “NOT

APPLICABLE".

G. The items requiring testing, adjusting, and balancing include (but are not restricted to) the following:

AIR SYSTEMS:

Supply Fan

AHU

Exhaust Fans

Zone branch and main ducts

Diffusers, Registers, Grilles and Dampers

Coils (Air Temperatures)

Valves

Vibration Isolators

HYDRONIC SYSTEMS:

Pumps

System Mains and Branches

Chillers

Coils

Control Valves

H. The Contractor will provide the services of a qualified test and balance contractor. The qualifications of the TAB contracting firm shall be submitted, along with the specific qualifications of the lead site technician who will remain on site during all TAB work, within 30 days of notice to proceed. Recent projects shall be listed and described for both the company and the lead technician. Names and telephone numbers of the project contractors and facility managers will be provided.

I. The owner must approve in writing the qualifications of both the company and the lead technician.

J. At the time of final inspection, the TAB agency shall be required to recheck, in the presence of the owner's representative & mechanical engineer, specific and random elections of data, temperatures, air quantities, and air motion recorded in the certified report. Points and areas for recheck shall be selected by the owner's representative & mechanical engineer at time of recheck. Measurements and test procedures shall be the same as approved for the initial work for the certified report. Selections for recheck, specific plus random, shall not exceed 10% of the total number tabulated in the report.

1.3 DEFINITIONS, REFERENCES, STANDARDS

A. All work shall be in accordance with the latest edition of the Associated Air Balance Council (AABC) National Standards. If these contract document set forth more stringent requirements than the AABC National Standards, these contract documents shall prevail.

1.4 QUALIFICATIONS

A. Agency Qualifications: The TAB Agency shall be a current member of the AABC, NEBB certification alone not acceptable.

1.5 SUBMITTALS

A. Qualifications: The TAB agency shall submit a company resume listing personnel and project experience in air and hydronic system balancing and a copy of the agency's test and balance engineer (TBE) certificate.

B. Procedures and Agenda: The TAB agency shall submit the TAB procedures and agenda proposed to be used.

C. Sample Forms: The TAB agency shall submit sample forms, which shall include the minimum data required by the AABC National Standards.

1.6 TAB PREPARATION AND COORDINATION

A. Shop drawings, submittal data, up-to-date revisions, change orders, fan curves, pump curves and other data required for planning, preparation, and execution of the TAB work shall be provided when available and no later than 30 days prior to the start of TAB work.

B. System installation and equipment startup shall be complete prior to the TAB agency's being notified to begin, except that duct leak testing shall be done during construction.

C. The building control system (BCS) contractor shall provide and install the control system, including all temperature, pressure and humidity sensors. These shall be calibrated for accurate control. If applicable, the BCS contractor shall install all necessary computers and computer programs, and make these operational. Assistance shall be provided as required for reprogramming, coordination, and problem resolution.

D. All test points, balancing devices, identification tags, etc., shall be accessible and clear of insulation and other obstructions that would impede TAB procedures.

E. Qualified installation or startup personnel shall be readily available for the operation and adjustment of the systems. Assistance shall be provided as required for coordination and problem resolution.

F. If, upon commencing the work, the TAB contractor finds that the systems are not ready, or if a dispute occurs as to the readiness of the systems, the TAB contractor may request an inspection to be made by the Designer’s Mechanical Engineer. This inspection shall establish to the satisfaction of the represented parties whether or not the systems meet the basic requirements for testing and balancing. Items that are determined to be not ready for testing and balancing shall be completed by the Mechanical Contractor and placed in operational readiness before TAB services are again requested.

1.7 REPORTS

A. Final TAB Report - The TAB agency shall submit the final TAB report for review by the Architect. On plans provided, all outlets, devices, HVAC equipment, etc., shall be identified (including manufacturer, model number, serial number, motor manufacturer, HP, drive type, fan and motor sheaves and belt number), along with a numbering system corresponding to report unit identification. The TAB agency shall submit an AABC "National Project Performance Guaranty" assuring that the project systems were tested, adjusted and balanced in accordance with the project specifications and AABC National Standards.

B. Submit 4 copies of the Final TAB Report to the Architect for inclusion in the Operation and Maintenance Manuals.

PART 2 - INSTRUMENTATION

A. All instruments used for measurements shall be accurate and calibrated.

B. Calibration and maintenance of all instruments shall be in accordance with the requirements of AABC National Standards.

PART 3 - EXECUTION

3.1 GENERAL

A. The specified systems shall be reviewed and inspected for conformance to design documents. Testing, adjusting and balancing on each identified system shall be performed. The accuracy of measurements shall be in accordance with AABC National Standards. Adjustment tolerances shall be + or - 10% unless otherwise stated.

B. Equipment settings, including manual damper quadrant positions, valve indicators, fan speed control levers, and similar controls and devices shall be marked to show final settings.

C. All information necessary to complete a proper TAB project and report shall be per AABC standards unless otherwise noted. The descriptions of work required, as listed in this section, are a guide to the minimum information needed.

D. TAB contractor shall cut insulation, ductwork and piping for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. Upon completion, patch insulation, ductwork and housings using materials identical to those removed. Seal insulation to reestablish integrity of the vapor barrier.

E. TAB work shall include additional inspection and adjustment of components during the season following the initial balance to include re-balance of any items influenced by seasonal changes or as directed by the Owner.

3.2 AIR SYSTEMS

A. The TAB agency shall verify that all ductwork, splitters, extractors, dampers, grilles, registers, and diffusers have been installed per design, are functional and set full open. Any leakage in the ductwork shall be repaired prior to the test. The TAB agency shall perform the following TAB procedures in accordance with the AABC National Standards:

<u>For supply fans:</u>

1. Fan speeds - Test and adjust fan RPM to achieve design CFM requirements.

   *Prior to replacing pulley's & sheaves at supply fan, TAB contractor to measure total air flow of supply fan with respective variable speed drive (VFD) set @ 30Hz. TAB contractor to dial up on VFD until total specified total air flow is achieved. Provide frequency of VFD at maximum air flow on TAB report.

2. Current and Voltage - Test and record motor voltage and amperage, and compare data with the nameplate limits to ensure fan motor is not in or above the service factor.

3. Pitot-Tube Traverse - Perform a Pitot-tube traverse of main supply and return ducts, as applicable to obtain total CFM. If a Pitot-tube traverse is not practical, an explanation of why a traverse was not made must appear on the appropriate data sheet.

4. Outside Air - Test and adjust the outside air on applicable equipment using a Pitot-tube traverse. If a traverse is not practical, an explanation of why

a traverse was not made must appear on the appropriate data sheet. If a traverse is not practical use the mixed- air temperature method if the inside and outside temperature difference is at least 20 degrees Fahrenheit or use the difference between Pitot-tube traverses of the supply and return air ducts.

5. Static Pressure - Test and record system static pressure, including the static pressure profile of each supply fan.

For exhaust fans:

1. Fan speeds - test and adjust fan RPM to achieve design CFM requirements.

2. Current and Voltage - Test and record motor voltage and amperage, and compare data with the nameplate limits to ensure motor is not in or above the service factor.

3. Pitot-Tube Traverse - Perform a Pitot-tube traverse of main exhaust ducts to obtain total CFM. If a Pitot-tube traverse is not practical, an explanation of why a traverse was not made must appear on the appropriate data sheet.

4. Static Pressure - Test and record system static pressure, including the static pressure profile of each exhaust fan.

For zone, branch and main ducts:

1. Adjust ducts to within design CFM requirements. As applicable, at least one zone balancing damper shall be completely open. Multi- diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.

For diffusers, registers and grilles:

1. Tolerances - Test, adjust, and balance each diffuser, grille, and register to within 10% of design requirements. Minimize drafts. Include required CFM, initial test CFM and final CFM.

2. Identification - Identify the type, location, and size of each grille, diffuser, and register. This information shall be recorded on air outlet data sheets.

For coils:

1. Air Temperature - Once air flows are set to acceptable limits, take wet bulb and dry bulb air temperatures on the entering and leaving side of each cooling coil. Dry-bulb temperature shall be taken on the entering and leaving side of each heating coil.

3.3 HYDRONIC SYSTEMS

A. The TAB agency shall, as applicable, verify that all hydronic equipment, piping, and coils have been filled and purged; that strainers have been cleaned; and that all balancing valves (except bypass valves) are set full open. Examine water in system and determine if it has been treated and cleaned. As applicable, it shall check air vents and expansion or compression tank for proper operation. The TAB agency shall perform the following testing and balancing functions in accordance with the AABC National Standards:

For pumps:

1. Test and adjust chilled water, hot water, and condenser water pumps to meet design GPM requirements. Check pump rotation and

verify impeller size. Check pumps for proper operation. Pumps shall be free of vibration and cavitation. Record appropriate gauge readings for final TDH and Block-Off/Dead head calculations. List pump N.P.S.H. (as applies).

2. Current and Voltage - Test and record motor voltage and amperage, and compare data with the nameplate limits to ensure pump motor is not in or above the service factor.

For system mains and branches:

1. Adjust water flow in pipes to within design GPM requirements. As applicable, at least one branch balancing valve shall be completely open.

For chillers:

1. Verify that chillers have been started by others and are in operation.

   Test and adjust chiller water flows to within 10% of design requirements by observing differential pressure gauge and setting balance valves.

2. Current and Voltage - Test and record motor voltage and amperage, and compare data with the nameplate limits to ensure compressor motor is not in or above the service factor.

3. Test and record entering and leaving temperature and pressure profiles of chillers.

For coils:

1. Tolerances - Test, adjust, and balance all chilled-water and hot- water coils within 10% of design requirements.

2. Verification - Verify the type, location, final pressure drop and GPM of each coil. This information shall be recorded on coil data sheets.

For control valves:

1. Check operation of automatic valves.

2. Test and record pressure drop and flow across control valves at full flow.

3.4 SOUND TESTING

A. The TAB agency shall conduct sound testing in the following areas per AABC National Standards and to the criteria listed, using sound meter with octave band analyzer:

TESTAREA	NUMBER OF LOCATIONS	ACCEPTABLE LEVEL
General Offices	6	30-35
Executive Offices	1	25-30
Computer/Equipment Rooms	2	40-45
Schools/Classrooms	3	25-30

B. All measurements are to be in accordance with AABC. Contractor shall utilize a sound meter with octave band analyzer.

C. Provide cut sheet of all sound measurement devices to mechanical engineer for approval.

3.5 ADDITIONAL TAB SERVICES

A. Verification of HVAC Controls:

The TAB agency shall be assisted by the building control systems contractor in verifying the operation and calibration of all HVAC and temperature control systems. The following tests shall be conducted:

1. Verify that all control components are installed in accordance with project requirements and are functional, including all electrical interlocks, damper sequences, air and water resets, fire and freeze stats, and other safety devices.

2. Verify that all controlling instruments are calibrated and set for design operating conditions.

B. Temperature Testing:

To verify system control and operation, a series of three temperature tests shall be taken at approximately two hour intervals in each separately controlled zone. The resulting temperatures shall not vary more than two degrees Fahrenheit from the thermostat or control set point during the tests. Outside temperature and humidity shall also be recorded during the testing periods.

C. TAB Report Verification:

At the time of final inspection, the TAB agency may be required to recheck, in the presence of the owner's representative, specific and random selections of data, air quantities, and air motion recorded in the certified report. Points and areas for recheck shall be selected by the owner's representative. Measurements and test procedures shall be the same as approved for the initial work for the certified report. Selections for recheck, specific plus random, will not exceed 10% of the total number tabulated in the report.

D. Job Site Inspections:

During construction, the TAB agency shall inspect the installation of pipe systems, sheet metal work, temperature controls, and other component parts of the HVAC systems. Inspections shall be conducted a minimum of two times. (Typically, these are performed when 60% of the total system is installed and again when 90% of the total system is installed, prior to insulation of the duct and piping). The TAB agency shall submit a written report of each inspection to the Architect.

E. Seasonal Rebalancing:

This TAB contractor shall figure in bid rebalancing HVAC system during peak seasonal conditions (summer & winter) in order to provide design team with HVAC information from peak design conditions. This work shall be completed within the one (1) year warranty period.

F. Duct Leakage Testing:

The installing contractor shall isolate and seal sections of ductwork for testing. The pressurization fan and test apparatus shall be connected to the test section and the test performed. The test pressures required and the amount of duct to be tested shall be described by the engineer in the appropriate duct classification section. All testing shall be based on one test per section.

G. Building/Zone Pressurization:

The TAB agency shall test and adjust building/zone pressurization by setting the design flows to meet the required flow direction and pressure differential. For positive pressure areas, it shall set the supply air to design flow, and gradually reduce the exhaust air

rate to obtain the required flow or pressure difference. For negative pressure areas, it shall set the supply air to design flow, and gradually increase the exhaust air rate to obtain the required flow or pressure difference.

H. Air Leakage Rate Testing:

The entire facility (All Buildings) shall be tested for air leakage rate by fan pressurization (Blower Door Test). The air leakage test shall be in accordance with ASTM E779 (Current Edition).

3.4 INDOOR AIR QUALITY VERIFICATION

A. The Tab agency shall take measurements at minimum outside air. It shall measure temperature and humidity uniformity throughout the space, check filter installation for proper fit, seal, and operation, and verify condensate drain operation. The TAB agency shall note any water damage or obvious contamination sources from inside or outside.

B. The TAB agency shall conduct the following air sampling tests using TWA limits shown in ASHRAE Standard 62.1-2013, Table B-1 (the test shall be performed on the exterior of the building as well as throughout the interior of the building as to establish comparative data between the indoor & outdoor IAQ):

1. Carbon dioxide
2. Carbon monoxide
3. Formaldehyde
4. Lead
5. Nitrogen dioxide
6. Ozone
7. Radon
8. Sulfur Dioxide
9. Particles

C. The TAB agency shall prepare a short report showing the results and location of each test, a summary of the HVAC operating conditions, and a listing of any discrepancies.

3.5 VIBRATION TESTING

A. The TAB agency shall conduct vibration testing on the following equipment per AABC National Standards. Test deflection in mils and velocity in inches per second shall be measured and the results compared to requirements in equipment specification sections.

EQUIPMENT:

Air Handling Units

Fans

Pumps

Chillers

END OF SECTION

8-21-26

TEST AND BALANCE ANALYSIS REPORT

FOR

JOB _____

_____

CONTRACTOR _____

ARCHITECT _____ ENGINEER _____

C_x AGENT _____ PJ# _____

CERTIFICATION:

AIR DISTRIBUTION SYSTEM HAS BEEN COMPLETELY BALANCED AS PER REQUIREMENTS OF SPECIFICATIONS AND RESULTS FOR TESTS HEREIN LISTED.

CERTIFICATION NO. _____

BY _____

DATE _____ APPROVED _____

AIR UNIT TEST SHEET

JOB NAME: _____ DATE _____

_____

SYSTEM _____

SPECIFICATIONS:

FAN: CFM _____ TSP _____ ESP _____ RPM _____ BHP _____ O.A. CFM _____

COOLING MBH _____ GPM _____ WATER ON _____ OFF _____

AIR ON DB/WB _____ OFF DB/WB _____ ΔTH _____

HEATING MBH _____ GPM _____ WATER ON _____ OFF _____

AIR ON DB _____ OFF DB _____

_____ MBH _____ GPM _____ WATER ON _____ OFF _____

AIR ON DB/WB _____ OFF DB/WB _____

_____

TEST DATA:

UNIT _____ SIZE _____ SERIAL _____

MOTOR _____ HP _____ RPM _____ VOLTAGE _____ FLA _____

TEST VOLTAGE _____ CORRECTED FLA _____ MISC. _____

STARTER / HEATER SIZE _____ RATING _____ RUNNING AMPS _____

FAN: CFM _____ TSP _____ ESP _____ RPM _____ O.A. CFM _____

COIL:	AIR ON	AIR OFF	Δ		WATER ON	OFF	ΔT	MBH
COOLING				ΔTH				
HEATING				ΔT				
				ΔT				

FLOW METER: MODEL/SIZE DESIGN READING TEST READING GPM

COOLING _____

HEATING _____

_____

_____

MTR. PULLEY = _____ FAN SUCTION = _____

FAN PULLEY = _____ FAN DISCHARGE = _____

BELTS = _____ TOTAL STATIC = _____

AIR MOVING EQUIPMENT TEST SHEET

JOB NAME: _____ DATE: _____

_____

	UNIT #		UNIT #		UNIT #		UNIT #	
LOCATION								
MANUFACTURER								
MODEL NO.								
SA SIZE/FPM								
OPERATING COND.	SPECIFIED	ACTUAL	SPECIFIED	ACTUAL	SPECIFIED	ACTUAL	SPECIFIED	ACTUAL
TOTAL C.F.M.								
RETURN AIR C.F.M.								
O.S.A. C.F.M.								
EXT. STATIC PRESS.								
SUCTION PRESSURE								
DISCHARGE PRESS.								
FAN SHEAVE								
MOTOR SHEAVE								
BELTS								
MOTOR MANUF.								
SIZE HP								
VOLTAGE								
PHASE								
RPM MOTOR								
	RATED	RUNNING	RATED	RUNNING	RATED	RUNNING	RATED	RUNNING
AMPERAGE								
RPM FAN								
COOL MBH								
HEAT MBH								

DUCT TRAVERSE SHEET
ZONE TOTALS

JOB NAME: _____ DATE: _____

ZONE NO.	DUCT SIZE	EFFECTIVE AREA	REQUIRED VELOCITY	ACTUAL TEST VELOCITY	REQUIRED CFM	ACTUAL TEST CFM	

VAV BOX TEST SHEET

JOB NAME _____ DATE _____

SYSTEM _____

BOX NO.	SIZE	ROOM NUMBER	ADDRESS	DESIGN MIN. C.F.M.	DESIGN MAX. C.F.M.	MULTIPLIER	FINAL MIN. C.F.M.	FINAL MAX. C.F.M.

VAV BOX AT MAX. CFM
TEST SHEET

JOB NAME: _____ DATE: _____

BOX NO.	ACTUAL AIRFLOW	DAMPER %					

AIR QUANTITY EACH INLET/OUTLET

JOB NAME: _____ DATE: _____

SYSTEM _____

AREA SERVED	OPENING		K FACTOR	REQUIRED		PRELIMINARY				FINAL	
	NO.	SIZE		VEL	CFM	VEL	CFM	VEL	CFM	VEL	CFM

FAN TEST SHEET

JOB NAME: _____ DATE: _____

	FAN #	FAN #	FAN #	FAN #
SPECIFIED				
Total CFM				
Fan RPM				
Total S.P.				
Motor H.P.				
TEST				
Manufacturer				
Model #				
Serial #				
Size				
Motor Mfg.				
Motor HP				
Motor RPM				
Motor Volts				
Motor F.L.A.				
Run Amps.				
Heaters Size/Rtg.				
Line Voltage				
Total CFM				
Fan RPM				
Total S.P.				

Notes _____

ERV TEST SHEET

JOB NAME: _____ DATE: _____

_____

	OSA FAN	WHEEL	EXH. FAN	WHEEL
SPECIFIED				
Total CFM				
Fan RPM				
Total S.P.				
Motor H.P.				

TEST				
Manufacturer				
Model #				
Serial #				
Size				
Motor Mfg.		DES. TEMPS.		DES. TEMPS.
Motor HP		EDB =		EDB =
Motor RPM		EWB =		EWB =
Motor Volts		LDB =		LDB =
Motor F.L.A.		LWB =		LWB =

Run Amps.		ACT. TEMPS.		ACT. TEMPS.
Heaters Size/Rtg		EDB =		EDB =
Line Voltage		EWB =		EWB =
Total CFM		LDB =		LDB =
Fan RPM		LWB =		LWB =
Total S.P.				

Notes _____

_____

_____

ELECTRIC RE-HEAT COIL
TEST SHEET

JOB NAME: _____ DATE: _____

BOX NO.	DESIGN CFM	DESIGN AMPS	DESIGN KW	ACTUAL CFM	ACTUAL AMPS	ACTUAL KW	MBH
DESIGN VOLTS =							
ACTUAL VOLTS =							

HOT WATER RE-HEAT COIL
TEST SHEET

JOB NAME: _____ DATE: _____

BOX NO.	DESIGN CFM	DESIGN EWT	DESIGN EAT	ACTUAL CFM	ACTUAL EWT	ACTUAL EAT	ACTUAL LAT

PUMP TABULATION TEST SHEET

JOB NAME: _____ DATE: _____

_____

	PUMP #		PUMP #		PUMP #		PUMP #	
SPECIFIED								
GPM								
HEAD								
HP								
TEST								
MANUFACTURER								
MODEL								
SIZE								
SERIAL								
MOTOR MFG.								
HP								
RPM								
VOLTS								
LINE VOLTS								
F.L. AMPS								
TEST AMPS								
HEATER								
IMPELLER SIZE								
	NO FLOW	FINAL	NO FLOW	FINAL	NO FLOW	FINAL	NO FLOW	FINAL
DISCHARGE LBS.								
SUCTION LBS.								
DIFFERENTIAL								
HEAD IN FEET								
GPM								

AIR COOLED CHILLER DATA

JOB NAME: _____ DATE: _____

UNIT NUMBER		
MANUFACTURER		
CAPACITY		
MODEL NUMBER		
SERIAL NUMBER		
EVAPORATOR	DESIGN	ACTUAL
EWT		
LWT		
P.D. FT.		
GPM		
CONDENSER	DESIGN	ACTUAL
EAT		
LAT		
ELECTRICAL	DESIGN	ACTUAL
VOLTAGE		
AMPERAGE		

REMARKS:

UNIT NUMBER		
MANUFACTURER		
CAPACITY		
MODEL NUMBER		
SERIAL NUMBER		
EVAPORATOR	DESIGN	ACTUAL
EWT		
LWT		
P.D. FT.		
GPM		
CONDENSER	DESIGN	ACTUAL
EAT		
LAT		
ELECTRICAL	DESIGN	ACTUAL
VOLTAGE		
AMPERAGE		

REMARKS:

WATER COOLED CHILLER DATA

JOB NAME: _____ DATE: _____

UNIT NUMBER	
MANUFACTURER	
CAPACITY	
MODEL NUMBER	
SERIAL NUMBER	

EVAPORATOR	DESIGN	ACTUAL
EWT		
LWT		
P.D. FT.		
GPM		

CONDENSER	DESIGN	ACTUAL
EWT		
LWT		
P.D. FT.		
GPM		

ELECTRICAL	DESIGN	ACTUAL
VOLTAGE		
AMPERAGE		

REMARKS: _____

UNIT NUMBER	
MANUFACTURER	
CAPACITY	
MODEL NUMBER	
SERIAL NUMBER	

EVAPORATOR	DESIGN	ACTUAL
EWT		
LWT		
P.D. FT.		
GPM		

CONDENSER	DESIGN	ACTUAL
EWT		
LWT		
P.D. FT.		
GPM		

ELECTRICAL	DESIGN	ACTUAL
VOLTAGE		
AMPERAGE		

REMARKS: _____

COOLING TOWER DATA

JOB NAME: _____ DATE: _____

UNIT NUMBER		
MANUFACTURER		
CAPACITY		
MODEL NUMBER		
SERIAL NUMBER		
PERFORMANCE	DESIGN	ACTUAL
AMBIENT AIR DB		
AIR EWB		
AIR LWB		
GPM		
EWT		
LWT		
MOTOR	DESIGN	ACTUAL
MANUFACTURER		
HORSEPOWER		
RPM		
VOLTAGE		
PHASES		
AMPERAGE		
HEATER AMPS		
HEATER VOLTS		
HEATER KW		

REMARKS: _____

UNIT NUMBER		
MANUFACTURER		
CAPACITY		
MODEL NUMBER		
SERIAL NUMBER		
PERFORMANCE	DESIGN	ACTUAL
AMBIENT AIR DB		
AIR EWB		
AIR LWB		
GPM		
EWT		
LWT		
MOTOR	DESIGN	ACTUAL
MANUFACTURER		
HORSEPOWER		
RPM		
VOLTAGE		
PHASES		
AMPERAGE		
HEATER AMPS		
HEATER VOLTS		
HEATER KW		

REMARKS: _____

AIR COOLED CONDENSING UNIT DATA

JOB NAME: _____ DATE: _____

UNIT NUMBER		
MANUFACTURER		
CAPACITY		
MODEL NUMBER		
SERIAL NUMBER		
CONDENSER	DESIGN	ACTUAL
EAT		
LAT		
ELECTRICAL	DESIGN	ACTUAL
VOLTAGE		
AMPERAGE		

UNIT NUMBER		
MANUFACTURER		
CAPACITY		
MODEL NUMBER		
SERIAL NUMBER		
CONDENSER	DESIGN	ACTUAL
EAT		
LAT		
ELECTRICAL	DESIGN	ACTUAL
VOLTAGE		
AMPERAGE		

UNIT NUMBER		
MANUFACTURER		
CAPACITY		
MODEL NUMBER		
SERIAL NUMBER		
CONDENSER	DESIGN	ACTUAL
EAT		
LAT		
ELECTRICAL	DESIGN	ACTUAL
VOLTAGE		
AMPERAGE		

UNIT NUMBER		
MANUFACTURER		
CAPACITY		
MODEL NUMBER		
SERIAL NUMBER		
CONDENSER	DESIGN	ACTUAL
EAT		
LAT		
ELECTRICAL	DESIGN	ACTUAL
VOLTAGE		
AMPERAGE		

REMARKS: _____

HOT WATER BOILER DATA

JOB NAME: _____ DATE: _____

UNIT NUMBER		
MANUFACTURER		
CAPACITY		
MODEL NUMBER		
SERIAL NUMBER		
SECONDARY HW	DESIGN	ACTUAL
EWT		
LWT		
P.D. FT.		
GPM		
CNTL. SET. PT.		

UNIT NUMBER		
MANUFACTURER		
CAPACITY		
MODEL NUMBER		
SERIAL NUMBER		
SECONDARY HW	DESIGN	ACTUAL
EWT		
LWT		
P.D. FT.		
GPM		
CNTL. SET. PT.		

UNIT NUMBER		
MANUFACTURER		
CAPACITY		
MODEL NUMBER		
SERIAL NUMBER		
SECONDARY HW	DESIGN	ACTUAL
EWT		
LWT		
P.D. FT.		
GPM		
CNTL. SET. PT.		

UNIT NUMBER		
MANUFACTURER		
CAPACITY		
MODEL NUMBER		
SERIAL NUMBER		
SECONDARY HW	DESIGN	ACTUAL
EWT		
LWT		
P.D. FT.		
GPM		
CNTL. SET. PT.		

REMARKS: _____

LETTERHEAD

FUME HOOD TEST SHEET

JOB NAME: _____ DATE: _____

_____

ROOM NO. _____ HOOD NO. _____ HOOD SIZE _____ AVERAGE FACE VELOCITY _____

FULL OPEN HEIGHT

ROOM NO. _____ HOOD NO. _____ HOOD SIZE _____ AVERAGE FACE VELOCITY _____

OPERATIONAL HEIGHT

AIR CHANGE PER HOUR
TEST SHEET

DATE TESTED: _____

JOB NAME: _____ EXPIRATION DATE: _____

_____

LOCATION

AREA CU. FT.

REQUIRED MIN. SUPPLY ACH

REQUIRED MIN. OUTSIDE AIR ACH

REQUIRED MIN. RA/EXH. ACH

REQUIRED MIN. SUPPLY CFM

REQUIRED MIN. OUTSIDE AIR CFM

REQUIRED MIN. RA/EXH. CFM

ACTUAL SUPPLY QUANTITY CFM

ACTUAL OUTSIDE AIR QUANTITY CFM

ACTUAL RA/EXH. QUANTITY CFM

ACTUAL SUPPLY ACH

ACTUAL OUTSIDE AIR ACH

ACTUAL RA/EXH. AIR ACH

ROOM PRESSURE

NOTE: _____

_____

_____

DUCT PRESSURE TEST CERTIFICATION

JOB NAME _____

_____

DATE TESTED _____

DUCT SYSTEM ID _____

DESIGN CFM _____

OPERATING PRESSURE _____

TEST REQUIREMENTS _____

_____

_____

TEST RESULTS _____

_____

_____

CFM LEAKAGE _____

COMMENTS _____

_____

_____

APPROVED BY _____

ELECTRIC RE-HEAT COIL
TEST SHEET

JOB NAME: _____ DATE: _____

BOX NO.	DESIGN CFM	DESIGN BTUH	DESIGN KW	ACTUAL CFM	ACTUAL EAT/LAT	ACTUAL BTUH	ACTUAL KW
NOTE: 1.0 KW = 3413 BTUH							

AHU
TEMPERATURE/PRESSURE PROFILE

JOB NAME: _____ DATE: _____

Testing & Balancing Agency: _____

DESCRIPTION	POINT		STATIC PRESSURE		DB	WB	

SPACE TEMPERATURE/HUMIDITY
TEST SHEET

JOB NAME: _____ DATE: _____

LOCATION	TEMP. SETPOINT	SPACE DB	SPACE WB	SPACE RH	OSA DB	OSA WB	TIME

CHILL WATER COIL
AIR DATA TEST SHEET

JOB NAME: _____ DATE: _____

UNIT NO.	CFM	EDB/EWB	LDB/LWB	ΔTH	MBH	NOTES	
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL

CHILL WATER COIL
WATER DATA TEST SHEET

JOB NAME: _____ DATE: _____

UNIT NO.	MBH	EWT	LWT	ΔTW	WPD	GPM	
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL

HOT WATER COIL
AIR DATA TEST SHEET

JOB NAME: _____ DATE: _____

UNIT NO.	CFM	EAT	LAT	ΔTA	MBH	NOTES	
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL

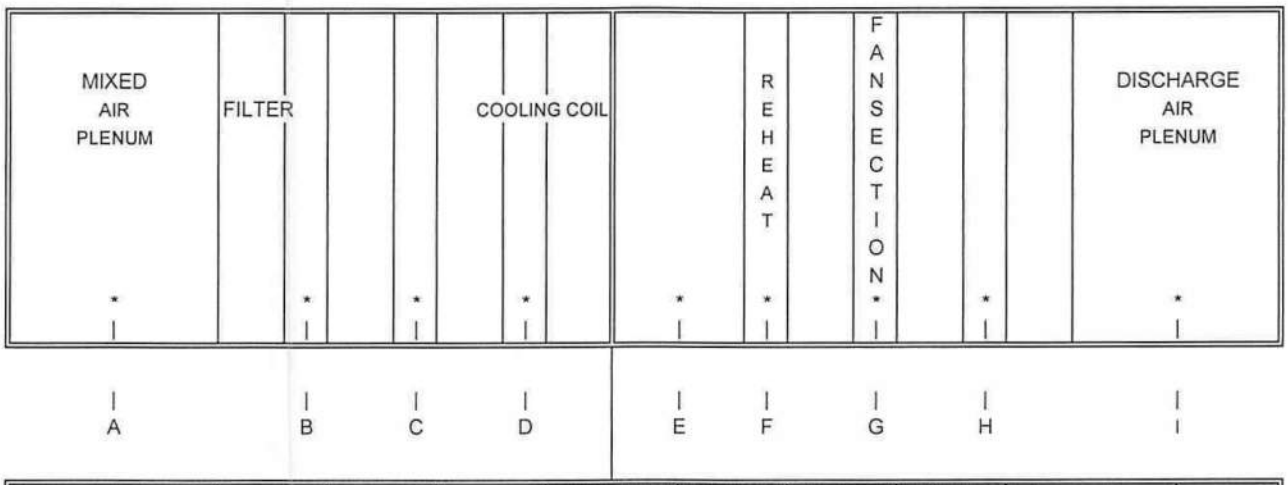
HOT WATER COIL
WATER DATA TEST SHEET

JOB NAME: _____ DATE: _____

UNIT NO.	MBH	EWT	LWT	ΔTW	WPD	GPM	
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL

STATIC PRESSURE PROFILE
TEST SHEET

JOB NAME: _____ DATE: _____



UNIT	A	B	C	D	E	F	G	H	I

FAN COIL UNIT
TEST SHEET
COOLING

JOB NAME: _____ DATE: _____

Testing & Balancing Agency: _____

UNIT NO.	ROOM NO.	DESIGN CFM	DESIGN MBH	ACTUAL CFM	ACTUAL EDB/EWB	ACTUAL LDB/LWB	ACTUAL MBH

FAN COIL UNIT
TEST SHEET
HEATING

JOB NAME: _____ DATE: _____

Testing & Balancing Agency: _____

UNIT NO.	DESIGN MBH	DESIGN EAT	DESIGN LAT	ACTUAL CFM	ACTUAL EAT	ACTUAL LAT	ACTUAL MBH

BLOWER DOOR TEST

DATE: _____

JOB NAME:	
CITY/STATE:	

BLOWER DOOR MODEL	FAN MODEL	NUMBER OF FANS	RING

LOCATION			
REFERENCE			
TEST NUMBER			
RELATIONSHIP			
DESIGN Δp	INCHES H_2O	PASCALS	1 Pa (N/m2) = 0.0040186 Inch of
FINAL CFM			
FINAL Δp INCHES H20 /PASCALS	INCHES H_2O	PASCALS	1 Pa (N/m2) = 0.0040186 Inch of

TESTED BY:

NOTES:

SECTION 23 0700 - DUCTWORK INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Ductwork insulation.

B. Duct Liner.

C. Insulation jackets.

1.02 RELATED SECTIONS

A. Section 23 31 00 - Metal Ductwork.

1.03 REFERENCES

A. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

B. ASTM C518 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

C. ASTM C553 - Mineral Fiber Blanket and Felt Insulation.

D. ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.

E. ASTM E84 - Surface Burning Characteristics of Building Materials.

F. ASTM E96 - Water Vapor Transmission of Materials

G. NFPA 255 - Surface Burning Characteristics of Building Materials.

H. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

I. UL 723 - Surface Burning Characteristics of Building Materials.

1.04 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide product description, list of materials and thickness for each service, and locations.

C. Manufacturer’s Installation Instructions: Indicate procedures which ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALITY ASSURANCE

A. Materials: Flame spread/smoke developed rating of 25/50 in accordance with NFPA 25.

1.06 QUALIFICATIONS

A. Applicator: Company specializing in performing the work of this section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01600.

B. Deliver materials to site in original factory packaging, labeled with manufacturer’s density and thickness.

C. Store insulation in original wrapping and protect from weather and construction traffic.

D. Protect insulation against dirt, water, chemical, and mechanical damage.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 GLASS FIBER, FLEXIBLE

A. Insulation: ASTM C553; flexible, noncombustible blanket.

1. ‘K’ (“ksi”) value: ASTM C518, 0.29 at 75 degrees F.
2. Maximum service temperature: 250 degrees F.
3. Maximum moisture absorption: 0.20 percent by volume.

4. Density: 0.75 lb/cu ft.

B. Vapor Barrier Jacket
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
   2. Moisture vapor transmission: ASTM E96; 0.04 perm.
   3. Secure with pressure sensitive tape.

C. Vapor Barrier Tape
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

D. Tie Wire: Annealed steel, 16 gage.

2.02 GLASS FIBER, RIGID

A. Insulation: ASTM C612; rigid, noncombustible blanket.
   1. 'K' value: ASTM C518, 0.29 at 75 degrees F.
   2. Maximum service temperature: 250 degrees F.
   3. Maximum moisture absorption: 0.20 percent by volume.
   4. Density: 1.5 lb/cu ft.

B. Vapor Barrier Jacket
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
   2. Moisture vapor transmission: ASTM E96; 0.04 perm.
   3. Secure with pressure sensitive tape.

C. Vapor Barrier Tape
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

2.03 GLASS FIBER DUCT LINER, FLEXIBLE

A. Insulation: ASTM C553; flexible, noncombustible blanket.
   1. 'K' value: ASTM C518, 0.28 at 75 degrees F.
   2. Maximum service temperature: 250 degrees F.
   3. Density: 1.5 lb/cu ft.
   4. Maximum Velocity on Coated Air Side: 4,000 ft/min.

B. Adhesive
   1. Waterproof fire-retardant type.

C. Liner Fastener
   1. Galvanized steel, impact applied with integral head.

2.04 GLASS FIBER DUCT LINER, RIGID

A. Insulation: ASTM C518, 0.23 at 75 degree F.
   1. 'K' value: ASTM C518, 0.23 at 75 degrees F.
   2. Maximum service temperature: 250 degrees F.
   3. Density: 3.0 lb/cu ft.
   4. Maximum Velocity on Coated Air Side: 4,000 ft/min.

B. Adhesive
   1. Waterproof fire-retardant type.

C. Linear Fasteners
   1. Galvanized steel, self-adhesive pad with press on head.

2.05 FIRED RATED GLASS FIBER DUCT, FLEXIBLE

A. Insulation: ASTM C518, 0.23 at 75 degree F.
   1. 'K' value: ASTM C518, 0.23 at 75 degrees F.
   2. Flammability (ASTM E 84 / UL 723)

Foil: Flame spread 5, Smoke developed 5

Blanket: Flame Spread 0, Smoke developed 0

3. Insulation, strict accordance with manufacturer's recommendations.

B. Manufacturer: "Fyrewrap", 3M Fire master "Fast Wrap".

2.06 DUCTWORK JACKET (Exterior or in ventilated spaces)

A. Contractor to provide specialty rubberized bitumen membrane designed specifically to be installed over insulation on ductwork subject to ambient conditions. The membrane is 'peel and stick', self-healing if punctured, UV stable, and will expand and contract with the mechanical system. The membrane has excellent emissivity and sound attenuation properties.

1. Total product thickness of 0.60"
2. Water Vapor Transmission (grains/hr-ft2) of 0.0022
3. Upper Temperature Limit of 160 degrees (F).
4. Sound Transmission Coefficient of 0.18
5. Permeance of 0.0053

B. Manufacturer: "Alumaguard" as manufactured by Polyguard. Provide "Alumaguard lite" on bottom of ductwork as to eliminate the need to pin through the Alumaguard on the bottom of the ductwork.

2.07 AIR HANDLING UNIT ROOMS

A. Finish and install over entire areas of walls/doors/ceiling of air handling rooms/elevator equipment rooms 2" thick acoustical type fiberglass hullboard insulation 3# density, applied over Stick-Klips 12" on center. Stick-Klips shall be applied to wall with Construction Adhesive. Acoustical material shall be applied over Stick-Klips with duct linear adhesive spotted between pins. Joints to be sealed with fiberglass lagging tape.

B. Manufacturer:

1. Nautica IMO PFG Acoustic Board as manufactured by RB, LLC.

2.08 APPROVED MANUFACTURERS

A. John Manville, Knauf, Owens Corning

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that ductwork has been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign materials removed, and dry.

3.02 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Insulated ductwork conveying air below ambient temperature:

1. Provide insulation with vapor barrier jackets.
2. Finish with tape and vapor barrier jackets.
3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connection, and expansion joints.

C. Insulated ductwork conveying air above ambient temperature.

1. Provide with or without standard vapor barrier jacket.
2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

D. External Duct Insulation Application

1. Secure insulation with vapor barrier tape and seal jacket joints with vapor barrier adhesive or tape to match jacket.
2. Secure insulation without vapor barrier with adhesive tape.

3. Install without sag or underside of ductwork. Use adhesive & mechanical fasteners to prevent sagging. Lift ductwork off trapeze hangers and insert spacers.
4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
6. In mechanical rooms - use rigid glass fiber insulation with duct jacket in lieu of flexible (rectangular ducts only).
7. All external insulation to be installed utilizing adhesive & mechanically pinned fasteners.

E. Duct and Plenum Liner Application:
1. Adhere insulation with adhesive for 100 percent coverage.
2. Secure insulation with mechanical liner fasteners. Refer to SMACNA Standards for spacing.
3. Seal and smooth joints.
4. Seal liner surface penetrations with adhesive.
5. Duct dimensions are metal to metal dimension.

F. Walk-in Plenum Application:
1. Adhere insulation on interior surface of plenum with adhesive for 100 percent coverage. Secure insulation with mechanical fasteners. Seal and smooth joints. Do not use nail-type fasteners.
2. Continue insulation with vapor barrier throughout penetrations. Vinyl backing to go against wall, raw insulation to be exposed.

3.03 TOLERANCE

A. Substituted insulation materials shall provide thermal resistance with 10 percent at normal conditions, as materials indicated.

3.04 FLEXIBLE GLASS FIBER DUCTWORK INSULATION SCHEDULE

LOCATION	THICKNESS (inch)	FINISH
1. Round/oval Supply, Return, Fresh air, & exhaust ductwork	3"	Foil Faced
2. Tops of Diffuser	3"	Foil Faced
3. Rectangular fresh air & Exhaust Air Ductwork	3"	Foil Faced
4. Rectangular Supply & Return Air Ductwork (Low pressure)	1.5"	Foil Faced
5. Rectangular Supply Air Ductwork upstream VAV Box (medium-high pressure)	3"	Foil Faced

.

3.05 GLASS FIBER DUCT LINER

LOCATION	*THICKNESS (Inch)*
1. Rectangular Return air Duct & rectangular supply duct (Low Pressure)	1"
2. Return air transfer assembly ducts And sleeves	1”

Note: 1. All other ductwork to be externally insulated.

3.06 DUCTWORK JACKET SCHEDULE

LOCATION	*THICKNESS (mil)*	*FINISH*
1. Rectangular & Round Outside air, Exhaust, Supply & Return Ductwork	60	Aluminized

Note: 1. Install as per manufacturers recommendations.

2. Provide on all ductwork that are exposed to ambient conditions.

3. Provide on all externally insulated ductwork located in mechanical attics/mezzanines/rooms/closets (Rooms with air handlers).

3.07 RIGID GLASS FIBER DUCTWORK INSULATION SCHEDULE

LOCATION	*THICKNESS (inch)*	*FINISH*
1. Air Handling Room Walls	2"	Perforated

3.08 FIRE RATED GLASS FIBER, FLEXIBLE

LOCATION	THICKNESS (inch)	FINISH

1. Not used.

3.09 MINERAL WOOL, FLEXIBLE

1. Not used.

END OF SECTION

8-21-26

SECTION 23 0800 - OPERATING AND MAINTENANCE INSTRUCTIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Refer to individual Division 20, 21, 22 and 23 sections for additional equipment specific Operations and Maintenance Manual requirements.

1.02 SUMMARY

A. This Section includes preparing and furnishing an operating and maintenance manual for mechanical equipment.

1.03 DESCRIPTION

A. Compile an Operating and Maintenance Manual:

1. For all building mechanical systems and major equipment items.
2. Including, but not necessarily limited to:
    a. Installing company's name, address, telephone number and name of job supervisor.
    b. Maintenance and operating booklets (as supplied by the equipment Manufacturer) for each item or representative type item installed.
    c. Valve tag schedule. Contractor to provide a set of plans shows valve schedule & valve location on plans (full size set, 24"x36 plans). Plans to have valve type, manufacturer and model #. Also provide replacement part contact information for each valve.
    d. A complete set of Shop Drawings.
    e. Temperature control drawings.
    f. Equipment information forms for each equipment piece.
3. Each equipment information form includes all applicable items of the following:
    a. Type of unit.
    b. Manufacturer's name.
    c. Equipment service area.
    d. Filter Information:
        1) Filter change period.
        2) Type of filter.
        3) Size of filter and number.
    e. Motor and Drive Information:
        1) Belt type and quantity.
        2) Belt size.
        3) HP.
        4) Voltage.
        5) Phase.
    f. Lubrication Information:
        1) Recommended service interval.
        2) Lubricant application points.
        3) Recommended lubricant type.
    g. Recommended cleaning procedures and intervals.

B. Prepare Information Packets:

1. Attach to each major piece of equipment in a string tie envelope labeled with the equipment's designation in large print.

2. Information Required:
    a. A copy of the equipment information form as defined above.
    b. A temperature control written operation sequence.
    c. A maintenance checklist form with equipment identification information and listing all relevant maintenance procedures in a column format to accommodate date entries.

1.04 SUBMITTALS

A. Three copies of Operating and Maintenance Manual.

PART 2 PRODUCTS

A. Not used.

PART 3 EXECUTION

A. Not used.

END OF SECTION

8-21-26

SECTION 23 08 10 - MECHANICAL SYSTEMS COMMISSIONING

PART 1 – GENERAL

1.1 DESCRIPTION

A. The commissioning agent shall be a subcontractor to the contractor. See qualifications within section below. As a convenience to the contractor the following is a list of local commissioning agents.

1. CxA Services, West Congress Street, Suite 101, Lafayette, Louisiana. Contact Paul Harris. Office number (337)-237-5396 ext 2.

2. Thompson Building Energy Solutions, LLC, Baton Rouge, Louisiana. Contact John Thompson. Office number (225)-490-9583.

B. Commissioning requires the participation of Division 23 to ensure that all mechanical systems are operating in a manner consistent with the Contract Documents.

C. The mechanical contractor shall contract with a certified commissioning agent. Commissioning agent shall comply with section 1.2 CxA Qualifications.

D. Abbreviations. The following are common abbreviations used in the *Specifications* and in the *Commissioning Plan.* Definitions are found in Section 230800, Part 1.6.

A/E-	Architect and design engineers	FT-	Functional performance test
CxA-	Commissioning Authority	GC-	General contractor (prime)
CC-	Controls contractor	MC-	Mechanical contractor
CM-	Construction Manager (the Owner's representative)	PC-	Prefunctional checklist
Cx-	Commissioning	PM-	Project manager
Cx Plan-	Commissioning Plan document	Subs-	Subcontractors to General
EC-	Electrical contractor	TAB-	Test and balance contractor

1.2 CxA QUALIFICATIONS

A. The commissioning agent shall have a certification in good standing with AEE, NEBB or AABC.

B. Commissioning agent shall have experience in the commissioning of a minimum of 5 project similar to this project is equipment and size.

C. Commissioning agent shall not be owned by the contractor or the design team associated with the project.

1.3 RESPONSIBILITIES

A. Mechanical, Controls and TAB Contractors. The commissioning responsibilities applicable to each of the mechanical, controls and TAB contractors of Division 23 are as follows (all references apply to commissioned equipment only):

Construction and Acceptance Phases

1. Attend a commissioning scoping meeting and other meetings necessary to facilitate the Cx process.

2. Contractors shall provide the CxA with normal cut sheets and shop drawing submittals of commissioned equipment.

3. Provide additional requested documentation, prior to normal O&M manual submittals, to the CxA for development of start-up and functional testing procedures.

   a. Typically this will include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any owner-contracted tests, fan and pump curves, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force

clearly identified. In addition, the installation, start-up and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning Agent.

b. The Commissioning Agent may request further documentation necessary for the commissioning process.

c. This data request may be made prior to normal submittals.

4. Provide a copy of the O&M manuals and submittals of commissioned equipment, through normal channels, to the CxA for review and approval.
5. Contractors shall assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
6. Provide limited assistance to the CxA in preparing the specific functional performance test procedures. Subs shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.
7. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the prefunctional checklists from the CxA for all commissioned equipment. Submit to CxA for review and approval prior to startup.
8. During the startup and initial checkout process, execute the mechanical-related portions of the prefunctional checklists for all commissioned equipment.
9. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CxA.
10. Address current A/E punch list items before functional testing. Air and water TAB shall be completed with discrepancies and problems remedied before functional testing of the respective air related systems.
11. Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
12. Correct deficiencies (differences between specified and observed performance) as interpreted by the CxA, CM and A/E and retest the equipment.
13. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
14. During construction, maintain as-built red-line drawings for all drawings and final CAD as-builts for contractor-generated coordination drawings. Update after completion of commissioning (excluding deferred testing).
15. Provide training of the Owner's operating staff using expert qualified personnel, as specified.
16. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

Warranty Period

1. Execute seasonal or deferred functional performance testing, witnessed by the CxA, according to the specifications.
2. Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

B. Mechanical Contractor. The responsibilities of the HVAC mechanical contractor, during construction and acceptance phases in addition to those listed in (A) are:

1. Provide startup for all HVAC equipment, except for the building automation control system.
2. Assist and cooperate with the TAB contractor and CxA by:

a. Putting all HVAC equipment and systems into operation and continuing the operation during each working day of TAB and commissioning, as required.

b. Including cost of sheaves and belts that may be required by TAB.

c. Providing test holes in ducts and plenums where directed by TAB to allow air measurements and air balancing. Providing an approved plug.

d. Providing temperature and pressure taps according to the Construction Documents for TAB and commissioning testing.

3. Prepare a preliminary schedule for Division 23 pipe and duct system testing, flushing and cleaning, equipment start-up and TAB start and completion for use by the CxA. Update the schedule as appropriate.

4. Notify the PM or CxA depending on protocol, when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and TAB will occur. Be responsible to notify the PM or CxA, ahead of time, when commissioning activities not yet performed or not yet scheduled will delay construction. Be proactive in seeing that commissioning processes are executed and that the CxA has the scheduling information needed to efficiently execute the commissioning process.

C. Controls Contractor. The commissioning responsibilities of the controls contractor, during construction and acceptance phases in addition to those listed in (A) are:

1. Sequences of Operation Submittals. The Controls Contractor's submittals of control drawings shall include complete detailed sequences of operation for each piece of equipment, regardless of the completeness and clarity of the sequences in the specifications. They shall include:

a. An overview narrative of the system (1 or 2 paragraphs) generally describing its purpose, components and function.

b. All interactions and interlocks with other systems.

c. Detailed delineation of control between any packaged controls and the building automation system, listing what points the BAS monitors only and what BAS points are control points and are adjustable.

d. Written sequences of control for packaged controlled equipment. (Equipment manufacturers' stock sequences may be included, but will generally require additional narrative).

e. Start-up sequences.

f. Warm-up mode sequences.

g. Normal operating mode sequences.

h. Unoccupied mode sequences.

i. Shutdown sequences.

j. Capacity control sequences and equipment staging.

k. Temperature and pressure control: setbacks, setups, resets, etc.

l. Detailed sequences for all control strategies, e.g., economizer control, optimum start/stop, staging, optimization, demand limiting, etc.

m. Sequences for all alarms and emergency shut downs.

n. Initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.

o. Schedules, if known.

p. To facilitate referencing in testing procedures, all sequences shall be written in small statements, each with a number for reference. For a given system, numbers will not repeat for different sequence sections, unless the sections are numbered.

2. Control Drawings Submittal

a. The control drawings shall have a key to all abbreviations.

b. The control drawings shall contain graphic schematic depictions of the systems and each component.

c. The schematics will include the system and component layout of any equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.

d. Provide a full points list with at least the following included for each point:

1) Controlled system

2) Point abbreviation

3) Point description

4) Display unit

5) Control point or setpoint (Yes / No)

6) Monitoring point (Yes / No)

7) Intermediate point (Yes / No)

8) Calculated point (Yes / No)

Key:

Point Description: DB temp, airflow, etc.

Control or Setpoint: Point that controls equipment and can have its setpoint changed (OSA, SAT, etc.)

Intermediate Point: Point whose value is used to make a calculation which then controls equipment (space temperatures that are averaged to a virtual point to control reset).

Monitoring Point: Point that does not control or contribute to the control of equipment, but is used for operation, maintenance, or performance verification.

Calculated Point: "Virtual" point generated from calculations of other point values.

The Controls Contractor shall keep the CxA informed of all changes to this list during programming and setup.

3. An updated as-built version of the control drawings and sequences of operation shall be included in the final controls O&M manual submittal.

4. Assist and cooperate with the TAB contractor in the following manner:

a. Meet with the TAB contractor prior to beginning TAB and review the TAB plan to determine the capabilities of the control system toward completing TAB. Provide the TAB any needed unique instruments for setting terminal unit boxes and instruct TAB in their use (handheld control system interface for use around the building during TAB, etc.).

b. For a given area, have all required prefunctional checklists, calibrations, startup and selected functional tests of the system completed and approved by the CxA prior to TAB.

c. Provide a qualified technician to operate the controls to assist the TAB contractor in performing TAB, or provide sufficient training for TAB to operate the system without assistance.

5. Assist and cooperate with the CxA in the following manner:

a. Using a skilled technician who is familiar with this building, execute the functional testing of the controls system as specified for the controls contractor. Assist in the functional testing of all equipment specified. Provide two-way radios during the testing.

b. Execute all control system trend logs specified.

D. TAB Contractor. The duties of the TAB contractor, in addition to those listed in (A) are:

1. Six weeks prior to starting TAB, submit to the PM the qualifications of the site technician for the project, including the name of the contractors and facility managers of recent projects the

technician on which was lead. The Owner will approve the site technician's qualifications for this project.

2. Submit the outline of the TAB plan and approach for each system and component to the CxA, PM and the controls contractor six weeks prior to starting the TAB. This plan will be developed after the TAB has some familiarity with the control system.
3. The submitted plan will include:
    a. Certification that the TAB contractor has reviewed the construction documents and the systems with the design engineers and contractors to sufficiently understand the design intent for each system.
    b. An explanation of the intended use of the building control system. The controls contractor will comment on feasibility of the plan.
    c. All field checkout sheets and logs to be used that list each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
    d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
    e. Final test report forms to be used.
    f. Detailed step-by-step procedures for TAB work for each system and issue: terminal flow calibration (for each terminal type), diffuser proportioning, branch / submain proportioning, total flow calculations, rechecking, diversity issues, expected problems and solutions, etc. Criteria for using air flow straighteners or relocating flow stations and sensors will be discussed. Provide the analogous explanations for the water side.
    g. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
    h. Details of how *total* flow will be determined (Air: sum of terminal flows via BAS calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations. Water: pump curves, circuit setter, flow station, ultrasonic, etc.).
    i. The identification and types of measurement instruments to be used and their most recent calibration date.
    j. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and provide methods to verify this.
    k. Confirmation that TAB understands the outside air ventilation criteria under all conditions.
    l. Details of whether and how minimum outside air cfm will be verified and set, and for what level (total building, zone, etc.).
    m. Details of how building static and exhaust fan / relief damper capacity will be checked.
    n. Proposed selection points for sound measurements and sound measurement methods.
    o. Details of methods for making any specified coil or other system plant capacity measurements.
    p. Details of any TAB work to be done in phases (by floor, etc.), or of areas to be built out later.
    q. Details regarding specified deferred or seasonal TAB work.
    r. Details of any specified false loading of systems to complete TAB work.
    s. Details of all exhaust fan balancing and capacity verifications, including any required room pressure differentials.
    t. Details of any required interstitial cavity differential pressure measurements and calculations.

u. Plan for hand-written field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).

v. Plan for formal progress reports (scope and frequency).

w. Plan for formal deficiency reports (scope, frequency and distribution).

4. A running log of events and issues shall be kept by the TAB field technicians. Submit hand-written reports of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests to the CxA and PM at least twice a week.

5. Communicate in writing to the controls contractor all setpoint and parameter changes made or problems and discrepancies identified during TAB which affect the control system setup and operation.

6. Provide a draft TAB report within two weeks of completion. A copy will be provided to the CxA. The report will contain a full explanation of the methodology, assumptions and the results in a clear format with designations of all uncommon abbreviations and column headings. The report should follow the latest and most rigorous reporting recommendations by AABC, NEBB or ASHRAE Standard 111.

7. Provide the CxA with any requested data, gathered, but not shown on the draft reports.

8. Provide a final TAB report for the CxA with details, as in the draft.

9. Conduct functional performance tests and checks on the original TAB as specified for TAB.

1.3 RELATED WORK

A. Refer to Division 23.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Division 23 shall provide all test equipment necessary to fulfill the testing requirements of this Division. Commissioning agent does not supply any test equipment or perform any testing. All testing will be done by the mechanical contractor.

PART 3 - EXECUTION

3.1 SUBMITTALS

A. Division 23 shall provide submittal documentation relative to commissioning as required in this Section Part 1.

3.2 STARTUP

A. The HVAC mechanical and controls contractors shall follow the start-up and initial checkout procedures listed in the Responsibilities list in this section. Division 23 has start-up responsibility and is required to complete systems and sub-systems so they are fully functional, meeting the design objectives of the Contract Documents. The commissioning procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility partially to the commissioning agent or Owner.

B. Functional testing is intended to begin upon completion of a system. Functional testing may proceed prior to the completion of systems or sub-systems at the discretion of the CxA and PM. Beginning system testing before full completion does not relieve the Contractor from fully completing the system, including all prefunctional checklists as soon as possible.

3.3 TAB

A. Refer to the TAB responsibilities in Part 1.2 above.

3.4 FUNCTIONAL PERFORMANCE TESTS

A. All HVAC systems shall be commissioned.

3.5 OPERATION AND MAINTENANCE (O&M) MANUALS

A. The following O&M manual requirements do not replace O&M manual documentation requirements elsewhere in these specifications.

B. Division 23 shall compile and prepare documentation for all equipment and systems covered in Division 23 and deliver this documentation to the GC for inclusion in the O&M manuals, according to the specifications, prior to the training of owner personnel.

C. The CxA shall receive a copy of the O&M manuals for review.

D. Special Control System O&M Manual Requirements. In addition to documentation that may be specified elsewhere, the controls contractor shall compile and organize at minimum the following data on the control system in labeled 3-ring binders with indexed tabs.

1. Three copies of the controls training manuals in a separate manual from the O&M manuals.
2. Operation and Maintenance Manuals containing:
    a. Specific instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. These instructions shall be step-by-step. Indexes and clear tables of contents shall be included. The detailed technical manual for programming and customizing control loops and algorithms shall be included.
    b. Full as-built set of control drawings (refer to Submittal section above for details).
    c. Full as-built sequence of operations for each piece of equipment.
    d. Full points list. In addition to the updated points list required in the original submittals (Part 1 of this section), a listing of all rooms shall be provided with the following information for each room:
        1) Floor
        2) Room number
        3) Room name
        4) Air handler unit ID
        5) Reference drawing number
    e. Full print out of all schedules and set points after testing and acceptance of the system.
    f. Full as-built print out of software program.
    g. Electronic copy on disk of the entire program for this facility.
    h. Marking of all system sensors and thermostats on the as-built floor plan and mechanical drawings with their control system designations.
    i. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.
    j. Control equipment component submittals, parts lists, etc.
    k. Warranty requirements.
    l. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).
3. The manual shall be organized and subdivided with permanently labeled tabs for each of the following data in the given order:
    a. Sequences of operation
    b. Control drawings
    c. Points lists
    d. Controller / module data
    e. Thermostats and timers
    f. Sensors and DP switches
    g. Valves and valve actuators
    h. Dampers and damper actuators
    i. Program setups (software program printouts)

4. Field checkout sheets and trend logs should be provided to the CxA for inclusion in the Commissioning Record Book.

E. Special TAB Documentation Requirements. The TAB will compile and submit the following with other documentation that may be specified elsewhere in the *Specifications.*

1. Final report containing an explanation of the methodology, assumptions, test conditions and the results in a clear format with designations of all uncommon abbreviations and column headings.
2. The TAB shall mark on the drawings where all traverse and other critical measurements were taken and cross reference the location in the TAB report.

F. Review and Approvals. Review of the commissioning related sections of the O&M manuals shall be made by the A/E and by the CxA.

3.6. TRAINING OF OWNER PERSONNEL

A. The GC shall be responsible for training coordination and scheduling and ultimately to ensure that training is completed.

B. The CxA shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment.

C. Mechanical Contractor. The mechanical contractor shall have the following training responsibilities:

1. Provide the CxA with a training plan two weeks before the planned training.
2. Provide designated Owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of HVAC equipment including, but not limited to air conditioning units, air handling units, fans, fan coil units, controls and water treatment systems, etc.
3. Training shall normally start with classroom sessions followed by hands-on training on each piece of equipment, which shall illustrate the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.
4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer’s representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment are required. More than one party may be required to execute the training.
6. The controls contractor shall attend sessions other than the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.
7. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
8. Training shall include:
    a. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.
    b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.
    c. Discussion of relevant health and safety issues and concerns.
    d. Discussion of warranties and guarantees.
    e. Common troubleshooting problems and solutions.

f. Explanatory information included in the O&M manuals and the location of all plans and manuals in the facility.

g. Discussion of any peculiarities of equipment installation or operation.

h. Classroom sessions shall include the use of overhead projections, slides, video/audio-taped material as might be appropriate.

9. Hands-on training shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and preventative maintenance for all pieces of equipment.

10. The mechanical contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls, not *controlled* by the central control system.

11. Training shall occur after functional testing is complete, unless approved otherwise by the Project Manager.

12. Duration of training as necessary to properly train owner's staff.

D. Controls Contractor. The controls contractor shall have the following training responsibilities:

1. Provide the CxA with a training plan four weeks before the planned training.

2. The controls contractor shall provide designated Owner personnel training on the control system in this facility. The intent is to clearly and completely instruct the Owner on all the capabilities of the control system.

3. Training manuals. The standard operating manual for the system and any special training manuals will be provided for each trainee, with three extra copies left for the O&M manuals. In addition, copies of the system technical manual will be demonstrated during training and three copies submitted with the O&M manuals. Manuals shall include detailed description of the subject matter for each session. The manuals will cover all control sequences and have a definitions section that fully describes all relevant words used in the manuals *and* in all software displays. Manuals will be approved by the CxA. Copies of audiovisuals shall be delivered to the Owner.

4. The trainings will be tailored to the needs and skill-level of the trainees.

5. The trainers will be knowledgeable on the system and its use in buildings. For the on-site sessions, the most qualified trainer(s) will be used. The Owner shall approve the instructor prior to scheduling the training.

6. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.

7. The controls contractor shall attend sessions other than the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.

E. TAB - The TAB contractor shall have the following training responsibilities:

1. TAB shall meet for ___20____ hours with facility staff after completion of TAB and instruct them on the following:

a) Go over the final TAB report, explaining the layout and meanings of each data type.

b) Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.

c) Identify and discuss any duct runs, diffusers, coils and fans that are close to or are not meeting their design capacity.

d) Discuss any temporary settings and steps to finalize them for any areas that are not finished.

e) Other salient information that may be useful for facility operations, relative to TAB.

3.8. DEFERRED TESTING

A. Shall be scheduled on an as needed basis.

3.9 WRITTEN WORK PRODUCTS

A. Written work products of Contractors will consist of the start-up and initial checkout plan and the filled out start-up, initial checkout and prefunctional checklists.

B. Written work products for Commissioning Agent shall be commissioning summary report including completed checklist, issues log and summary of commissioning activities.

END OF SECTION

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SECTION 23 09 00 - BUILDING AND AUTOMATIC TEMPERATURE CONTROLS

PART 4 SEQUENCES OF OPERATIONS

GENERAL

A. Provide a complete and operational temperature control and building automation system based on the following points and sequence of operation. The system shall be complete as to sequences and standard control practices. The determined point list is the minimum number of points that are to be provided. If additional points are required to meet the sequence of operation, they will be required.

B. Point List:
The following points as defined for each piece of equipment are designated as follows:

Binary Out (BO) - Defined as any two-state output (start/stop) (enable/disable), etc.
Binary In (BI) - Defined as any two-state input (alarm, status), etc.
Analog In (AI) - Defined as any variable input (temperature) (position), etc.
Analog Out (AO) - Defined as any electrical variable output. 0–20mA, 4–20mA and 0–10VDC are the only acceptable analog outputs. The driver for analog outputs must come from both hardware and software resident in the controllers. Transducers will not be acceptable under any circumstance.

4.01 CONSTANT AIR HANDLING UNITS

A. Occupied Mode:

1. Constant Volume Air handling units shall be controlled by the local DDC panel. Unit shall be started by local DDC panel through a HOA switch mounted on the front of the Variable speed Drive. The Current sensing relay located inside VFD shall indicate run status, and shall set automatic controls in operation.
2. Space Control: The chilled water valve and hot water valve will modulate to maintain the zone temp setpoint. The VFD will be controlled as well to maximize fan speed in conjunction with zone control. A humidity sensor located in the return air shall transmit humidity changes to the DDC panel. Provided that return air humidity does not exceed high limit set point (initially set at 55%). If the relative humidity in the space rises above setpoint, the Cooling will be staged to maintain the dehumidification setpoint (adj.) and the hot water valve will open to maintain temperature setpoint. The temperature and humidity set points shall be adjustable through the Building Management control system. Contractor to provide additional temperature sensor in return air ductwork (prior to return air mixing with outside air) & programming for the option of the EMS operator to control the respective air handling system based on return air temperature in lieu of temperature sensed at the respective thermostat, typical all constant volume air handling units (rooftop air handling units to have sensors accessible from the rooftop unit access doors).
3. Space Relative Humidity Reset: Supply air temperature shall be dynamically reset between a maximum and minimum set point to prevent the highest monitored space relative humidity from exceeding the maximum space humidity setpoint. Thermostat to be able to monitor temperature & humidity.
4. Zone Relative Humidity Override: When the air handling unit supply air temperature set point is being controlled by the return air relative humidity reset, or by the space relative humidity reset described above, an override command shall be issued to reduce the terminal box humidification output.
5. A morning warm-up cycle will be provided for this unit as follow. The return air sensor shall transmit temperature changes to the DDC panel. The DDC controller shall close the outside air damper, and lockout the exhaust fans, and operate Via local Thermostat control until the unit return air temperature reaches its setpoint (ADJ.), terminating the

morning warm-up cycle. The morning warm-up cycle shall be a separate control routine occurring prior to normal occupied mode of operation.

6. Zone temperature sensors shall be provided with adjustable software high and low set point limits to provide building occupants with a 3 degree F (adjustable) range on either side of the main set point at the sensor location.

B. Unoccupied Mode:

1. A space temperature limit control will be used during unoccupied mode. If space temperature falls below 65 degrees (ADJ.) the air unit shall operate the same as described in the morning warm-up cycle. If space temperature rises above 85 degrees (ADJ.), the air unit shall operate same as described for normal occupied mode, except the outside air damper shall remain closed and exhaust fans shall remain de-energized. This mode of operation shall continue until space temperature is within the 65 degree to 85 degree limit (adjustable).

2. Stopping the units supply fan shall automatically de-energize the control system. All water valves shall go to the closed (bypass) position, outside air dampers shall close. The supply fan control signal will modulated to minimum speed in preparation for unit restart.

C. Outside Air Control:

1. Outside air damper control (IAQ): upon startup the outside air damper will open to a minimum position. A CO2 sensor mounted in the return air duct will transmit carbon dioxide levels to the DDC panel. If the return air carbon dioxide level exceeds the indoor air quality setpoint (800ppm adj.), the damper will modulate open to allow more outside air in (this value shall not exceed the maximum CFM specified within the construction documents). If mixed air temperature drops to 48 degrees (adjustable), the outside air dampers will close reducing flow rate to maintain proper low limit. Provide outside air flow monitor in fresh air duct at each unit. Outside air flow rate shall not exceed 100% of the scheduled rate, nor shall be reduced below minimum setpoint of scheduled OA rate (during occupied mode).

D. Unit Shutdown:

1. Stopping the units supply fan shall automatically de-energize the control system. All water valves shall go to the closed (bypass) position, and outside air dampers shall close. The Air Handling Units fan control signal shall be reset to its minimum speed in preparation for unit restart.

E. Filter Monitoring: Contractor to provide filter monitoring, via differential pressure switch, at each filter bank within all air handling units. An alarm shall be annunciated at the operator workstation when filter DP switch rises above adjustable setpoint. Coordinate with filter manufacturer for exact setpoint for filter loading.

F. Air Purification:

1. The DDC system shall monitor the air purification system at each air handling unit and send alarm to operator. Refer to specification 233500 for Air Purification Devices.

G. EMERGENCY POWER OPERATION

1. In the event of a local power outage to the building, the emergency power generator will activate. The control system shall monitor generator status and upon positive status (signal from transfer switch) shall lockout all Air Handling Unit & Fan Systems (AHU, EF's) for a time period (adjustable).

2. After lockout (adjustable) the AHU's & EF's shall operate in the mode which the system was operating at the time of the loss of power (occupied or unoccupied).

3. The main network control panel and the respective equipment EMS panels shall be installed with a local UPS power supply to avoid any startup delays in transition from normal to emergency power. The control panels shall have a dedicated emergency generator power supplied by contractor. Contractor to coordinate with all subcontractors as to ensure a complete and working system.

H. Unit Safeties:

1. All of the safety devices are manual reset; the device that has been tripped must be manually reset before restarting the air handling unit. The air handling unit shall be shut down on detection of temperature high limit, temperature low limit, smoke detection, high duct static pressure, low return air duct static pressure or water in the auxiliary pan located under the air handling unit. The air handling unit shall be shut down upon detection of Natural Gas, Carbon Monoxide, & Nitrogen Dioxide, sensors to be located in the fresh air (outside air) duct to each air handling unit. If the fire alarm contact is triggered, the supply fan will be shutdown.
2. Motorized damper in fresh air duct to fully close (EMS alarm to notify operator) should mixed air temperature at unit reach 42 degrees (F, adj.). Dampers to open to setpoint when mixed air temperature rises above 42 degrees (F, adj.).
3. The DDC controller shall modulate the preheat hot water valve to maintain the preheat temperature setpoint (adj.), applicable where preheat heating hot water coil is scheduled.
4. When the unit is shutdown by either a stop command or system safety the unit will be set as follows:
    a. Supply fan will be off
    b. Supply fan VFD will be commanded to 0%
    c. Outside air damper will close
    d. Cooling Coil valve will close
    e. Heating Coil valve will close

4.02 CHILLER AND PUMPS

A. CHW SYSTEM OPERATION: The cooling system is enabled by the BMS by time of day schedule, outside air temperature enable set point of 65 degrees F (adjustable), unoccupied sequence, or by operator command.

B. Occupied Sequence:

1. The chilled water secondary pumps CWSP-1 and CWSP-2 will be operated in a primary /standby sequence (ADJ.). Anytime there is a cooling load, the lead pump VFD will be energized. The pump speed will be modulated to maintain differential pressure setpoint (ADJ.). As being sensed by a differential pressure transducer located 2/3 the longest pipe run. A current sensing relay and/or auxiliary contacts located in the pump motor VFD shall indicate run status. A pump status alarm shall occur when the pump is enabled and status is not obtained after one minute or if pump status is obtained and later lost. Should this occur, the next pump in the sequence will be enabled. Lead lag operation of these pumps will be determined by the total runtime of the pumps in the DDC controller.
2. The chillers will be staged on with their respective primary chilled water pumps in order to meet the facilities cooling requirements. ACC-1 and its respective chilled water pump (CWP-1) shall be the primary chiller and shall be operational 100% of the time when occupied. ACC-2 shall be the lag chiller. A common chilled water supply and return sensor shall be used to assess the facilities cooling demand. When ACC-1 cannot meet the facilities cooling demand and the chilled water return temperature exceeds the return temperature setpoint, ACC-2 and its respective pump (CWP-2) shall be energized. Lead / Lag of these two chillers is determined by the runtime in the DDC controller The Chillers shall be staged off after a minimum runtime has expired and the chilled water return temperature has dropped below the threshold for a minimum of thirty minutes (ADJ.).
3. If a chiller should fail to start, then the next chiller and its respective chilled water pump in the sequence shall be enabled. Chilled water temperature shall be maintained at 45 Degrees (ADJ.) supply water temperature by means of the Chiller controller, operating its chiller compressors to setpoint. A water flow switch in the chilled water piping at the chiller shall be installed to prevent operation of the chiller if water flow is lost or not proven. Chilled water pumps shall be started and stopped via their respective HOA switches. In the auto position, the pump shall be started and stopped by the DDC control panel. A current sensing relay located in the pump motor starter shall indicate run status. A pump status alarm shall occur when the system is enabled and water pump status is not

obtained after one minute or if pump status is obtained and later lost. Chiller status shall be provided to the local DDC panel Via Status contacts on the local chiller control panel. The chiller pump shall be hard wired interlocked with the chiller control panel.

C. Unoccupied Sequence:

1. During the unoccupied mode, the secondary pumps, chillers and their respective pumps shall be off, In the event that any of the air handlers call for cooling, the DDC controller shall energize one chilled water secondary pump and operate the lead chiller and its respective pump as per the occupied sequence.

D. Freeze Protection:

1. The chilled water pumps will be commanded "On" whenever the outdoor air temperature drops below the user adjustable freeze protection set point (40 F). The pumps will remain enabled until the outdoor air temperature rises approximately 3° F above the freeze protection set point. All Chillers will be locked out (disabled) whenever the freeze protection mode is set. All control set points, control parameters, and field input sensors (chiller amps, supply and return water temperatures, pump status, and etc.) will be mapped back into the Building Management System. All set points and parameters will be user adjustable from the operator workstation.
2. The secondary pumps will be started by the BMS through the respective VFD. The pump controller will operate the variable speed drive to maintain the proper water static pressure setpoint to achieve the desired water flow requirements.

E. PUMP OPERATION (CWSP-1,2): On a call for system operation, the DDC controller will start the lead pump. The lag pump will be started if the lead pump fails. Lead pump designation will be alternated every 10 days of accumulated runtime.

F. Chiller pumps to be hardwired interlocked with respective chiller in accordance with chiller manufacturer (provide only where chiller manufacturer requires this for freeze protection).

G. EMERGENCY POWER OPERATION

1. In the event of a local power outage to the building, the emergency power generator will activate. The control system shall monitor generator status and upon positive status (signal from transfer switch) shall lockout all chilled water pumps (CWP's & CWSP's) for a time period (adjustable). The control system shall monitor generator status and upon positive status (signal from transfer switch) shall lockout all air cooled chillers (ACC's) for a time period (adjustable).
2. After lockout (adjustable) the chilled water pumps (CWP's & CWSP's) shall operate in the mode which the system was operating at the time of the loss of power (occupied or unoccupied). After lockout (adj.) the air cooled chiller (ACC's) shall operate in the mode which the system was operating at the time of the loss of power (occupied or unoccupied; pending the demand for chilled water).
3. The main network control panel and the respective equipment EMS panels shall be installed with a local UPS power supply to avoid any startup delays in transition from normal to emergency power. The control panels shall have a dedicated emergency generator power supplied by contractor. Contractor to coordinate with all subcontractors as to ensure a complete and working system.

A. Chillers shall be directly connected to the BMS communications bus to allow for communications between each chiller and the DDC equipment. Chiller manufacturer shall furnish and install BMS communication card with the chillers. All control set points, control parameters, and field input sensors (chiller amps, supply and return water temperatures, pump status, etc.) will be mapped back into the Building Management System (BMS). All set points and parameters shall be user adjustable from the operator workstation.

The VFD will be directly connected to the FMS communications bus to allow for communications between the VFD and the DDC equipment. VFD manufacturer shall furnish and install FMS communication card with the VFD drives.

4.03 Not used.

4.05 DATA/ELEC./SERVER ROOM HVAC UNITS

A. The Data/Elec/Server/Sec.Eletronics Rooms shall be monitored by the BMS by means of space temperature and humidity sensors. In the event that the space temperature in the area that the unit serves rises above 80 degrees and/or humidity drops below 40%, an alarm shall be generated by the BMS at the operator workstation.

B. Wall temperature sensors shall monitor the room temperature 24 hours a day. Upon failure of the A/C unit, a temperature alarm shall be activated and reported to the control system operation workstation.

4.06 FAN COILS UNITS (HORIZONTAL & VERTICAL)

A. These units are constant volume, single zone units. These units consist of filter, chilled water cooling coil, hot water heating coil, automatic fully-modulating 2-way control valves and a fan. The fan coil units shall be controlled in groups of individuals as specified below. The DDC controller shall start stop the supply fan through a relay. Fan zone shall run continuously in the occupied mode. The BAS operator shall have the ability to schedule these operating times from the school PC and maintenance office PC. The thermostat (provided by the BAS subcontractor) shall sequence the hot water and chilled water valves (provide with unit) to maintain thermostat setting. The hot water valve and chilled water valve operation shall not overlap. Valves shall be fully modulating controlled by the room thermostat. Control valves shall be factory mounted in the fan coil unit. Thermostat shall be remote mounted.

4.07 MISCELLANEOUS

A. The control system shall monitor the Outside Air Temperature and provide this data for safety functions, sequencing functions, alarming and trending.

B. Make-Up Water Flow Meter: Provide Onicon F-3500 flow meter in the make-up water line of the chilled water system. Interconnect monitor with the building control system. Refer to typical detail.

C. The control system shall monitor the building's incoming power and provide instantaneous demand and usage data (kwh) for the current day, month to date and year to date. A building power monitor shall be furnished by the Controls Contractor but the wiring of the meter to the incoming power wiring shall be accomplished by the Electrical Contractor. Coordinate installation with Division 26 contractor.

D. EMS system to monitor emergency generator transfer switch & generator for determination of when system is in emergency mode.

E. Provide UPS battery backup for all controllers as to remain online during loss of power prior to emergency generator startup.

F. Coordinate with electrical contractor to provide rated contactor for enable/disable lighting circuits.

G. Not used.

H. Electrical Coordination with Building and Automatic Temperature Controls Prior to Bid: Given the nature of the evolving technology in the field of Building & Automatic Temperature Controls (and the differences between various manufacturers), various Temperature Control Devices have been specified at various voltages (120-1-60, 24V, etc., Refer to Specification 230900). It is the responsibility of the General Contractor, Electrical Contractor, Mechanical Contractor, & Temperature Controls contractor to coordinate prior to bid as to ensure all electrical provisions for all Temperature Control Devices are accounted for (material, equipment, conduit, breakers, wiring, devices, installation, labor, etc.) as to provide a complete and working Temperature Controls System. Should the Contractor (and subcontractors) fail to coordinate all electrical provisions prior to bid, then the cost to provide such electrical provisions shall be solely borne

by the Contractor (and subcontractors). No additional cost to be provided by the owner to the Contractor for failure to coordinate prior to bid.

I. At the operator workstations provide an icon (or icons) on each individual system graphic flow diagram that, with point and click navigation, shall display the following:

1. PDF text version of the sequences of operation for the specific system represented by the graphic flow diagram being displayed.
2. PDF version of the temperature control drawing and wiring diagram for the specific system represented by the graphic flow diagram being displayed.

4.09 FMS POINT LIST

(refer to sequence of operations for additional points for EMS system to monitor)

A. CONSTANT VOLUME AHU:			
	1	Return air temperature	AI
	2	Discharge air temperature	AI
	3	Mixed Air Temperature	AI
	4	Return air humidity	AI
	5	Fan Start/Stop	BO
	6	Fan status	BI
	7	Outside air damper control	AO
	8	Outside air damper position	AI
	9	Supply air static pressure transmitter	AI
	10	Supply air static pressure setpoint (adj)	AI
	11	AHU Fan speed control	AO
	12	Chilled Water Valve (fully modulating)	AO
	13		
	14	Return Air CO2 level	AI
	15	Return Air CO2 setpoint (adj)	AI
	16	Outside Air CFM	AI
	17	Return Air Control Damper	AO
	18	Mixed Air Temperature	AI
	19	Freezestat Low Limit Input	AI
	20	High Static Safety Limit	AI
	21	Filter Status	BI

	22	Supply Air Smoke Detector	BI
	23	Return Air Smoke Detector	BI
	24	Dehumidification Setpoint (adj)	AI
	25	Unoccupied heating and cooling set points (adj)	AI
	26	Discharge air temperature high reset limit (adj)	AI
	27	Discharge air temperature low reset limit (adj)	AI
	28	Outside air temperature high reset limit (adj)	AI
	29	Outside air temperature low reset limit (adj)	AI
	30	Discharge air temperature setpoint (adj)	AI
	31	Air Purification Device	
	32	Natural Gas, Carbon Monoxide, Nitrogen Dioxide sensors	
	33	Safeties (as mentioned within Sequence of Operations)	
	34		
	35		
	36	Space temperature minimum/maximum set points (Adj)	AI
B. CHILLER/PUMPS:			
	1.	Chiller enable/disable	BO
	2.	Chiller status	BI
	3.	CHW Plant outdoor air enable setpoint (adj)	AI
	4.	Pump start/stop (each pump)	BO
	5.	Pump status (each pump)	BI
	6.	CHW common supply temperature	AI
	7.	CHW common return temperature	AI
	8.	CHW Flow (GPM) (each chiller/pump)	AI
	9.	Pump VFD speed (each pump)	AO
	10.	CHW Loop Differential Pressure	AI
	11.	CHW Loop Differential Pressure Setpoint (adj)	AI
	12.	Outside Air Temperature	AI
	13.	Motorized control valves	AO

	14.	CHW supply temperature (each chiller)	AI
	15.	CHW return temperature (each chiller)	AI
	16.	CHW supply temperature setpoint (adj.)	AI
	17.	CHW return temperature setpoint (adj.)	AI
	18.	Pump VFD Start/Stop	BO
	19.	Chiller Interface (Chiller KW, Chilled Water Supply Temp Setpoint, Operating Hours, Chilled Water Supply Temp, Chilled Water Return Temp, EvaporatorRefrigerant Pressure, Condenser Refrigerant pressure, Compressor % load (2), Compressor Voltage (2), Compressor Amp (2), Chiller Status, Chilled Water Flow Status, etc.)	BACnet
	20.	Safeties	BI
	21.	CHW supply water temperature high reset limit (adj)	AI
	22.	CHW supply water temperature low reset limit (adj)	AI
	23.	Outside air temperature high reset limit (adj)	AI
	24.	Outside air temperature low reset limit (adj)	AI
	25.	Chiller Alarms	BI
	26.	Pump Alarms	BI
	27.	Chiller Differential Pressure Switch (each chiller)	
	28.	Chiller BACNet Interface Card (each chiller)	
	29.	Pump Motor VFD Interface (Run Status, Speed, Frequency, Motor Load, Motor kW, Motor kWh, Bypass Status, Faults, Alarms, Operating Hours, etc.)	BACnet
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	26.		
D. FAN COIL UNITS:			
	1.	Fan start/stop	
	2.	Chilled Water Valve	
	3.		
	4.	Space Temperature	
	5.	Discharge Air Temperature	
E. EXHAUST FANS:			
	1.	Exhaust Fan start/stop	BO
	2.	Exhaust Fan status	BI
F. MISC:			
	1.	Electrical Closet temperature (Wall Mounted)	AI

	2.	Electrical Closet humidity (Wall Mounted)	AI
	3.	Outside air temperature/humidity	AI
	4.	Water Meter @ Make-up water lines	AI
	5.	Building KW/KWH	AI
	6.	Lighting control circuits common areas enable/disable	BO
	7.	Lighting control circuits common areas status	BI
	8.	Lighting control circuits exterior enable/disable	BO
	9.	Lighting control circuits exterior status	BI
	10.	Schedule of all equipment	
	11.	Auxiliary Drain Pan Moisture Sensors	
	12.	Variable Frequency Drives The interface for Variable Frequency Drives shall be connected directly to the main FMS network trunk (via or BACNET communications) to monitor, display, trend and report all available parameters of the VFD, including (but not limited to): 1.Motor Speed RPM 2.Motor Frequency Hertz 3.Motor Current Amps 4.Motor Runtime 5.VFD Status 6.In Fault Condition 7.In Bypass	
	13.	Electric Unit Heater Status/Setpoint	
	14.	Domestic Water Heaters	
	15.	Schedule; All Equipment	
	16.	High water Level in Auxiliary Drain Pans	
	17.	Auxiliary Drain Pan Moisture Sensors	

END OF SECTION

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SECTION 23 2113 - PRE-INSULATED PIPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division I Specifications Sections, apply to this section.

1.02 SUMMARY

A. Extent of each type of underground Pre-insulated piping Systems is indicated on the drawings and by provisions of this section.

1.03 DESCRIPTION

A. Work Included:

1. Underground HVAC Water Piping.

1.04 SUBMITTALS

A. General: All submittals shall comply with the requirements of Division 1 Sections and Section 23 01 00 - General Provisions.

B. Product Data: Data shall be submitted for the following:

1. List of installations.
2. Piping System.
3. Installation Instructions.
4. Anchor and thrust block details.
5. Layout drawing.
6. Branch take-off details.
7. Floor and wall seals.
8. Valves.

C. Underground pre-insulated piping manufacturer shall provide shop drawings submittals based on plan drawings indicating and providing all required anchor points, thrust block locations, expansion loops, etc. for a complete installation. Plans shall be submitted to engineer for prior approval and Mechanical Contractor shall install piping based on these drawings.

1.05 QUALITY ASSURANCE

A. American Society for Testing and materials (ASTM):

1. Standard A-53, Pipe, Steel, Black and Hot Dipped Zinc Coated Welded and Seamless.
2. Standard A-234, piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and elevated temperature.
3. Standard B-88, Seamless Copper Water Tube.
4. Standard D-1784, Rigid Poly Vinyl Chloride (PVC) Compounds and Chlorinated Poly Vinyl Chloride (CPVC) Compounds.

PART 2 PRODUCTS

2.01 UNDERGROUND HVAC WATER PIPING SYSTEMS

A. All underground HVAC water piping with design temperatures up to 250(F) shall be XTRU-THERM as manufactured by PERMA-PIPE or prior approved equal (Thermal Piping Systems, Urecon, Thermacor approved equal). All straight sections, fittings, anchors and other accessories shall be factory fabricated, insulated, and jacketed. The piping system layout shall be analyzed by the piping system manufacturer to determine the stresses and displacements of the service pipe. The piping system design and manufacture shall be in strict conformance with ASME B31.1, latest edition. Installation of the piping system shall be in accordance with the manufacturer’s instructions. Factory trained field technical assistance shall be provided for critical periods of installation, unloading, field joint instruction and testing. Field insulated fitting will NOT be accepted.

B. The service pipe shall be standard weight ASTM A53 Gr. B ERW carbon steel. All joints shall be butt-welded for 2 1/2" and larger, and socket or butt-welded for 2" and smaller. Where possible, straight sections shall be supplied in 40-foot random lengths with piping exposed at each end for field joint fabrication. (All socket weld couplings shall be supplied by the installing contractor)

C. Elbows, tees, reducers, anchors, field joints, and end seals shall be designed and factory fabricated to prevent the ingress of moisture into the system.

D. The service pipe insulation shall be polyurethane foam with 2.0 Lbs./Ft.2 minimum density, 90% minimum closed cell content and initial thermal conductivity of 0.16 Btu in./Hr. FT2 OF. The insulation shall completely fill the annular space between the service pipe and jacket and shall be bonded to both. Systems using open cell insulation or a non- bonded design shall not be allowed. The insulation shall be provided to the minimum thickness specified below:

Pipe Size (in.)	*Minimum Insulation Thickness (in.) HVAC Water Piping*
1 to 8	2
10 to 12	2
14 to 36	2

E. The outer protective insulation jacket shall be seamless high-density polyethylene (HDPE) in accordance with ASTM D1248, type 3, Class C. PVC or tape materials are not allowed. The minimum thickness of the HDPE jacket shall be as follows:

Jacket OD (in.)	*Minimum Jacket Thickness (in.)*
OD < 12	0.125
12 < OD < 24	0.150
OD > 24	0.175

F. All fittings shall be factory prefabricated and pre-insulated. Straight tangent lengths shall be added to all ends so that all field joints are at straight sections of pipe. Elbow jackets shall be molded HDPE. Tee jackets shall be extrusion welded or butt fusion welded HDPE. Gluing, taping or hot air welding shall not be allowed.

G. No thin wall (Zeston Type Fittings) allowed.

H. The service pipe shall be hydrostatically tested to 150 psig or 1 1/2 times the design pressures whichever is greater. Insulation shall then be poured in place into the field joint area. All field-applied insulation shall be placed only in straight sections of pipe. Field insulation of fittings is not acceptable. The installer shall seal the field joint area with a heat shrinkable adhesive backed sleeve. Backfilling shall not begin until the heat shrink sleeve has cooled. All insulation and jacketing materials for the field joint shall be furnished by pre-insulated pipe manufacturer to ensure a complete and working system. Solvent welded sleeves will NOT be accepted.

I. A 6-inch layer of sand or fine gravel shall be placed and tamped in the trench to provide a uniform bedding for the pipe. The entire trench width shall be evenly backfilled with a similar material as the bedding in 6 inch compacted layers to a minimum height of 6 inches above the top of the insulated pipe. The remaining trench shall be evenly and continuously backfilled and compacted in uniform layers with suitable excavated soil.

2.02 OFFSETS DUE TO OBSTRUCTIONS

A. Contractor shall provide for eight (8) additional complete offsets for possible underground obstructions. One offset shall consist of four (4) 45-degree fittings. Offsets shall apply to all sizes of underground pre-insulated piping (HVAC Hydronic Piping) and conduits.

PART 3 EXECUTION

3.01 EXCAVATION, TRENCHING AND BACKFILLING

A. Refer Section 20 01 00 - General Provisions.

3.02 INSTALLATION

A. All materials shall be unloaded, stored and installed in accordance with the manufacturers recommendations to conform with the contract documents.

B. Where pre-insulated piping passes through metal sleeves in walls and floors, the insulations and jacketed system shall extend continuously through such sleeves.

C. Open end pipe shall be capped during installation to keep dirt and other foreign material out of system.

D. Expansion loops and bends shall be provided in accordance with the manufacturer's standard.

E. Welded joints shall be fusion welded. Changes in direction of piping shall be made with welded fittings. Mitering or notching to form elbows and tees shall not be permitted.

F. Joints between pipe sections and joints between conduit pipe and fittings shall be made in accordance with the manufacturer's written instructions. Joints shall include closure sleeve, insulation, and coatings or wrapping as applicable. Joint materials shall be the product of the system manufacturer and shall be the same product as specified for the system.

G. The vapor barrier jacket shall have the vapor barrier extended continuously across all joints.

H. Anchors and thrust blocks shall be installed in accordance with manufacturer's recommendations.

3.03 TESTING

A. Prior to closure of field joints, the carrier pipe shall be hydrostatically tested at 1-1/2 times the system operating pressure or 150 psig, whichever is greater, for a period of not less than 2 hours. No loss in pressure will be permitted. Any defective sections shall be replaced and any defected welds repaired. System shall be retested until systems are tight.

B. Materials, equipment, and labor required to test the system shall be the responsibility of the contractor.

3.04 CERTIFICATION

A. During the testing period, a factory representative of the system manufacturer shall be present to witness each test. If systems are tested in stages, the factory representative's presence shall be required at each stage.

B. Prior to backfilling, a factory representative shall review the installation for deficiencies. Any deficiencies found shall be corrected by the contractor. No backfilling shall occur until written certification of acceptance installation is provided by the manufacturer to the Architect.

C. Contractor to provide written report by factory representative and provide within O&M manuals.

END OF SECTION

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SECTION 23 2123 - HYDRONIC PUMPS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following categories of hydronic pumps for hydronic systems:

1. Vertical Inline Pumps.

1.03 SUBMITTALS

A. Product Data: Include certified performance curves and rated capacities; shipping, installed, and operating weights; furnished specialties; final impeller dimensions; and accessories for each type of product indicated. Indicate pump's operating point on curves.

B. Shop Drawings: Show pump layout and connections. Include Setting Drawings with templates for installing foundation and anchor bolts and other anchorages.

1. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.

C. Maintenance Data: For pumps to include in maintenance manuals specified in Division 1.

1.04 QUALITY ASSURANCE

A. UL Compliance: Fabricate and label pumps to comply with UL 778, "Motor-Operated Water Pumps," for construction requirements.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anti-corrosion compound after assembly and testing. Protect flanges, pipe openings, and nozzles with wooden flange covers or with screwed-in plugs.

B. Store pumps in dry location.

C. Retain protective covers for flanges and protective coatings during storage.

D. Protect bearings and couplings against damage from sand, grit, and other foreign matter.

E. Comply with pump manufacturer's written rigging instructions.

1.06 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."

1.07 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Mechanical Seals: One mechanical seal for each pump.

PART 2 PRODUCTS

2.01 GENERAL PUMP REQUIREMENTS

A. Pump Units: Factory assembled and tested.

B. Pump and Motor Selection:

1. Selection point shall be at or to the left of the Best Efficiency Point (BEP) for the impeller diameter selected.
2. The trimmed impeller diameter shall not exceed 85% of pump cutwater diameter.
3. Unless otherwise stated, the pump performance curve shall be constantly rising from the selection point to shut off head for the impeller diameter selected.

4. The motor shall be selected so that the nameplate horsepower is not overloaded more than 110% with an increase in flow of 125%. Motor shall be NEMA Design B with Class F insulation rated for 40 degrees C ambient temperature rise. The motor shall be designed and name plated for high efficiency service. The motor service factor shall be 115% of nameplate horsepower. Motor enclosure shall be standard T-frame, totally enclosed, fan-cooled
5. All pumps to have shaft grounding rings.

2.02 FLEXIBLE-COUPLED, END-SUCTION PUMPS (BASE MOUNTED)

1. Not used.

2.03 CLOSE-COUPLED, END-SUCTION PUMPS (BASE MOUNTED)

1. Not used.

2.04 VERTICAL IN-LINE PUMP (Below 10 H.P.)

A. Pumps shall be Taco Model KV, Patterson, or approved equal. The pumps shall be single stage end suction rear pull out design. The seal shall be serviceable without disturbing the piping connections. The capacities and characteristics shall be as called for in the plans/schedules.

1. Approved Manufacturers: Bell & Gossett series 80.

B. Pump casing shall be constructed of ASTM A48 class 30 cast iron. The pump casing/volute shall be rated for 250 psi working pressure for all jobs. The pump flanges shall be matched to suit the working pressure of the piping components on the job, with either ANSI Class 125 flanges or ANSI class 250 flanges. The pump casing shall be drilled and tapped for gauge ports on both the suction and discharge connections and for a drain port at the bottom of the casing. The casing shall have an additional tapping on the discharge connection to allow for the installation of a seal flush line. The pump cover shall be drilled and tapped to accommodate a seal flush line which can be connected to the corresponding tapping on the discharge connection, or to an external source to facilitate cooling and flushing of the seal faces.

C. All casings shall be flanged. Threaded casings not allowed unless extra unions and fittings are provided with that pump to allow servicing.

D. The pump shall have a factory installed vent/flush line to insure removal of trapped air from the casing and mechanical seal cooling. The vent/flush line shall run from the seal chamber to the pump discharge.

E. The impeller shall be ASTM B584-836/875 bronze and hydraulically balanced. The impeller shall be dynamically balanced to ANSI Grade G6.3 and shall be fitted to the shaft with a key. The impeller shall be cast by the hydraulically efficient lost foam technique to ensure repeatability of high quality.

F. The pump shall incorporate a dry shaft design to prevent the circulating fluid from contacting the shaft. The pump shaft shall be AISI 1045 carbon steel with field replaceable bronze SAE 660 shaft sleeve. In order to improve serviceability and reduce the cost of ownership the shaft sleeve must be slip on (press on not allowable) and must be easily replaced in the field.

G. The pump shall be fitted with a single mechanical seal, with EPT elastomers and Carbon/Ceramic faces, rated up to 250ºF. This seal must be capable of being flushed externally via a tapping in the pump cover adjacent to the seal cavity. The entire pump line shall use no more than three different sizes of seals.

H. The pump shall be close coupled to a NEMA standard JM frame motor.

I. In order to both simplify and reduce the total cost of ownership, the manufacturer shall standardize on no more than three sizes of mechanical seals throughout the entire range of the family of pumps. The manufacturer shall not use multiple part numbers for the same part.

J. All pumps shall be fitted with a discharge multi-purpose balancing valve or other means of providing system balance, isolation, and check feature for reverse flow. The valve shall be straight or angle pattern and shall be field convertible between the two. The valve shall be ductile iron and rated for 250 psi working pressure for all jobs. The valve flanges shall be matched to suit the working pressure of the piping components on the job; with either ANSI class125 psi flanges or ANSI class 250 flanges. The valve shall include the following components; non-slam check valve with spring-loaded bronze disc and seat, stainless steel stem, and calibrated adjustment permitting flow regulation. Valve shall be serviceable under full

system pressure. The valve shall be a Taco model MPV Plus Two multi-purpose valve Patterson or equivalent.

K. All pump suctions to be fitted with a multifunction inlet suction diffuser fitting equal to that as manufactured by Taco, Inc. The suction guide body and cover plate shall be ductile iron and be rated for 250 psi for all jobs. The guide flanges shall be matched to suit the working pressure of the piping components on the job; with either ANSI class 125 flanges or ANSI class 250 flanges. The suction guide shall include the following components; full length S.S. straightening vanes, permanent S.S. strainer, disposable 16 mesh bronze start up strainer, blow down ports, and metering ports. For those pumps where an inlet guide fitting is not installed, there should be five pipe diameters of straight undisturbed flow going into the pump suction. The fitting shall be a Taco model SD inlet suction elbow, Patterson or equivalent.

L. All pumps shall be fitted with one 4 ½" dial pressure gauge piped to the inlet and outlet pump flanges. The gauge is to be isolated from each flange via ¼" ball valve. This gauge is to be used to take the differential across the pump unless otherwise indicated.

2.05 VERTICAL IN-LINE PUMP (10 H.P. & Above)

A. Pumps shall be Taco Model KS, Patterson, or approved equal. The pumps shall be single stage end suction rear pull out design. The seal shall be serviceable without disturbing the piping connections. The capacities and characteristics shall be as called for in the plans/schedules.

1. Approved Manufacturers: Bell & Gossett series 80-SC.

B. Pump casing shall be constructed of ASTM A48 class 30 cast iron. The pump casing/volute shall be rated for 250 psi working pressure for all jobs. The pump flanges shall be matched to suit the working pressure of the piping components on the job, with either ANSI Class 125 flanges or ANSI class 250 flanges. The pump casing shall be drilled and tapped for gauge ports on both the suction and discharge connections and for a drain port at the bottom of the casing. The casing shall have an additional tapping on the discharge connection to allow for the installation of a seal flush line. The pump cover shall be drilled and tapped to accommodate a seal flush line which can be connected to the corresponding tapping on the discharge connection, or to an external source to facilitate cooling and flushing of the seal faces.

C All casings shall be flanged. Threaded casings not allowed unless extra unions and fittings are provided with that pump to allow servicing.

D. The pump shall have a factory installed vent/flush line to insure removal of trapped air from the casing and mechanical seal cooling. The vent/flush line shall run from the seal chamber to the pump discharge.

E. The impeller shall be ASTM B584-836/875 bronze and hydraulically balanced. The impeller shall be dynamically balanced to ANSI Grade G6.3 and shall be fitted to the shaft with a key. The impeller shall be cast by the hydraulically efficient lost foam technique to ensure repeatability of high quality.

F. The pump shall be manufactured with AISI 416 Stainless Steel shaft.

G. The pump shall be fitted with a single mechanical seal, with EPT elastomers and Carbon/Ceramic faces, rated up to 250ºF. This seal must be capable of being flushed externally via a tapping in the pump cover adjacent to the seal cavity. The entire pump line shall use no more than three different sizes of seals.

H. The pump shall be coupled via a high tensile aluminum split style coupling. The design must permit easy replacement of the mechanical shaft seal without removal of the motor. The motor mount must be designed to accept several different motor frame standards; CZ and HP.

I. In order to both simplify and reduce the total cost of ownership, the manufacturer shall standardize on no more than three sizes of mechanical seals throughout the entire range of the family of pumps. The manufacturer shall not use multiple part numbers for the same part.

J. All pumps shall be fitted with a discharge multi-purpose balancing valve or other means of providing system balance, isolation, and check feature for reverse flow. The valve shall be straight or angle pattern and shall be field convertible between the two. The valve shall be ductile iron and rated for 250 psi working pressure for all jobs. The valve flanges shall be matched to suit the working pressure of the piping components on the job; with either ANSI class 125 flanges or ANSI class 250 flanges. The valve shall include the following components; non-slam check valve with spring-loaded bronze disc and seat, stainless steel stem, and

calibrated adjustment permitting flow regulation. Valve shall be serviceable under full system pressure. The valve shall be a Taco model MPV Plus Two multi-purpose valve Patterson or equivalent.

K. All pump suctions to be fitted with a multifunction inlet suction diffuser fitting equal to that as manufactured by Taco, Inc. The suction guide body and cover plate shall be ductile iron and be rated for 250 psi for all jobs. The guide flanges shall be matched to suit the working pressure of the piping components on the job; with either ANSI class 125 flanges or ANSI class 250 flanges. The suction guide shall include the following components; full length S.S. straightening vanes, permanent S.S. strainer, disposable 16 mesh bronze start up strainer, blow down ports, and metering ports. For those pumps where an inlet guide fitting is not installed, there should be five pipe diameters of straight undisturbed flow going into the pump suction. The fitting shall be a Taco model SD inlet suction elbow, Patterson or equivalent.

L. All pumps shall be fitted with one 4 ½" dial pressure gauge piped to the inlet and outlet pump flanges. The gauge is to be isolated from each flange via ¼" ball valve. This gauge is to be used to take the differential across the pump unless otherwise indicated.

2.05 BASE MOUNTED PUMPS - HORIZONTAL SPLIT CASE

A. Not used.

PART 3 EXECUTION

3.01 PUMP INSTALLATION

A. Install pumps according to manufacturer's written instructions.

B. Install pumps to provide access for periodic maintenance, including removing motors, impellers, couplings, and accessories.

C. Support pumps and piping separately so piping is not supported by pumps.

D. Set base-mounted pumps on concrete foundation. Disconnect coupling halves before setting. Do not reconnect couplings until alignment operations have been completed.

1. Support pump baseplate on rectangular metal blocks and shims, or on metal wedges with small taper, at points near foundation bolts to provide a gap of between pump base and foundation for grouting.

2. Adjust metal supports or wedges until pump and driver shafts are level. Check coupling faces and suction and discharge flanges of pump to verify that they are level and plumb.

3.02 ALIGNMENT

A. Align pump and motor shafts and piping connections after setting them on foundations, after grout has been set and foundation bolts have been tightened, and after piping connections have been made.

B. Comply with pump and coupling manufacturers' written instructions.

C. Adjust pump and motor shafts for angular and offset alignment by methods specified in HI 1.1-1.5, "Centrifugal Pumps for Nomenclature, Definitions, Application and Operation."

D. After alignment is correct, tighten foundation bolts evenly but not too firmly. Completely fill baseplate with non-shrink, nonmetallic grout while metal blocks and shims or wedges are in place. After grout has cured, fully tighten foundation bolts.

3.03 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

C. Electrical power and control wiring and connections are specified in Division 26 Sections.

D. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.

3.04 COMMISSIONING

A. Verify that pumps are installed and connected according to the Contract Documents.

B. Verify that electrical wiring installation complies with manufacturer's written instructions and the Contract Documents.

C. Perform the following preventive maintenance operations and checks before starting:

1. Lubricate bearings.
2. Remove grease-lubricated bearing covers, flush bearings with kerosene, and clean thoroughly. Fill with new lubricant according to manufacturer's written instructions.
3. Disconnect coupling and check motor for proper rotation that matches direction marked on pump casing.
4. Verify that pumps are free to rotate by hand and that pumps for handling hot liquids are free to rotate with pumps hot and cold. Do not operate pumps if they are bound or drag, until cause of trouble is determined and corrected.
5. Check suction piping connections for tightness to avoid drawing air into pumps.
6. Clean strainers.
7. Verify that pump controls are correct for required application.

D. Starting procedure for pumps with shutoff power not exceeding safe motor power is as follows:

1. Prime pumps by opening suction valves and closing drains, and prepare pumps for operation.
2. Start motors.
3. Open discharge valves slowly.
4. Observe leakage from stuffing boxes and adjust sealing liquid valve for proper flow to ensure lubrication of packing. Let packing "run in" before reducing leakage through stuffing boxes; then tighten glands.
5. Check general mechanical operation of pumps and motors.
6. Close circulating line valves once there is sufficient flow through pumps to prevent overheating.

E. When pumps are to be started against closed check valves with discharge shutoff valves open, steps are the same, except open discharge valves before starting motors.

F. Refer to Division 23 Section "Testing, Adjusting, and Balancing" for detailed requirements for testing, adjusting, and balancing hydronic systems.

G. Contractor shall install pump in accordance with the manufacturer’s instructions. All base mounted pumps to be aligned upon receipt at jobsite, during installation, and after system fill. Contractor shall level and grout each pump according to the manufacturer recommendations to insure proper alignment prior to operation.

H. Pipe connections to pumps shall be made in such a manner so as not to exert any stress on pump housings. If necessary to meet this requirement, provide additional pipe supports and flex connectors.

I. Pumps shall NOT be run dry to check rotation.

J. Change start-up strainers to permanent strainer upon acceptance of the job. Provide a blowdown valve on each strainer and terminate with hose thread or extend blowdown line to nearest floor drain (interior installation) or catch basin (exterior installation).

K. All pump motors are to have shaft grounding rings.

3.05 GENERAL

A. All pumps shall be fitted with a discharge multi-purpose balancing valve or other means of providing system balance, isolation, and check feature for reverse flow. The valve shall be straight or angle pattern and shall be field convertible between the two. The valve shall be ductile iron and rated for 250 psi working pressure for all jobs. The valve flanges shall be matched to suit the working pressure of the piping components on the job; with either ANSI class125 psi flanges or ANSI class 250 flanges. The valve shall include the following components; non-slam check valve with spring-loaded bronze disc and seat, stainless steel stem, and calibrated adjustment permitting flow regulation. Valve shall be serviceable under full

system pressure. The valve shall be a Taco model MPV Plus Two multi-purpose valve Patterson or equivalent.

B. All pump suctions to be fitted with a multifunction inlet suction diffuser fitting equal to that as manufactured by Taco, Inc. The suction guide body and cover plate shall be ductile iron and be rated for 250 psi for all jobs. The guide flanges shall be matched to suit the working pressure of the piping components on the job; with either ANSI class 125 flanges or ANSI 250 flanges. The suction guide shall include the following components; full length S.S. straightening vanes, permanent S.S. strainer, disposable 16 mesh bronze start up strainer, blow down ports, and metering ports. For those pumps where an inlet guide fitting is not installed, there should be five pipe diameters of straight undisturbed flow going into the pump suction. The fitting shall be a Taco model SD inlet suction elbow or equivalent.

C. All pumps shall be fitted with one 4 ½" dial pressure gauge piped to the inlet and outlet pump flanges. The gauge is to be isolated from each flange via ¼" ball valve. This gauge is to be used to take the differential across the pump unless otherwise indicated.

END OF SECTION

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SECTION 23 2300 - REFRIGERANT PIPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

B. Related Sections include the following:
   1. Division 20 Section 20 05 29 "Hangers and Support Devices" for pipe supports and installation requirements.

1.3 SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for thermostatic expansion valves, solenoid valves, and pressure-regulating valves.

B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationship between piping and equipment.

C. Refrigerant piping indicated is schematic only. Manufacturer’s installation instructions shall take precedence over contract drawings where a conflict may occur. Size piping and design the actual piping layout in accordance with equipment manufacturers instructions and recommendations, including oil traps, double risers, solenoids and other specialties, and pipe and tube sizes, to ensure proper operation and compliance with warranties of connected equipment.

D. Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

A. Welding/Brazing: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX; "Welding and Brazing Qualifications."

B. ASHRAE Standard: Comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."

C. ASME Standard: Comply with ASME B31.5, "Refrigeration Piping."

D. UL Standard: Provide products complying with UL 207, "Refrigerant-Containing Components and Accessories, Non-electrical"; or UL 429, "Electrically Operated Valves."

1.5 COORDINATION

A. Coordinate layout and installation of refrigerant piping and suspension system components with other construction, including plumbing and electrical.

B. Coordinate pipe sleeve installations for penetrations in exterior walls.

PART 2 PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Refrigerant piping shall be run in Type "ACR" hard drawn copper tubing (ASTM B280 compliant) attached with wrought copper fittings, utilizing 1000-degree silver solder and a non-corrosive flux. Refrigerant piping shall be sized and installed in strict accordance with the air conditioning unit manufacturer's recommendations and directions and shall be submitted to the Engineer for prior approval before installation. Pressure drops shall not exceed the equivalent of 2-psi. Refrigerant piping system shall be evacuated, charged with refrigerant holding charge. The refrigerant lines to be tested with nitrogen to a test pressure of not less than 450 psi and proved before final charge of refrigerant. Compressor shall not be subject to the 450 psi pressure test.

2.2 VALVES

A. Provide valves as recommended by equipment manufacturer.

2.3 REFRIGERANT PIPING SPECIALITIES

A. Provide refrigerant piping specialties as recommended by manufacturer.

PART 3 EXECUTION

3.1 PIPING APPLICATIONS

A. Aboveground, within Building and Exterior: hard drawn-copper tubing.

3.2 VALVE APPLICATIONS

A. Install a full-sized, three-valve bypass around each dryer.

B. Install thermostatic expansion valves as close as possible to evaporator.

C. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.

3.3 SPECIALTY APPLICATIONS

A. Install moisture-liquid indicators in liquid lines between filter-dryers and thermostatic expansion valves and in liquid line to receiver.

B. Install permanent filter-dryers before each solenoid valve.

C. Install solenoid valves in liquid line of systems operating with single pump-out or pump-down compressor control.

D. Install receivers, sized to accommodate pump-down charge, on systems and larger and on systems with long piping runs.

3.4 PIPING INSTALLATION

A. Install refrigerant piping according to ASHRAE 15.

B. Install refrigerant piping as recommended by the HVAC equipment manufacturer. Include liquid line solenoid, sight glass, filter drier, and thermostatic expansion valve (TXV) with by-pass and check valve assembly around TXV to allow liquid flow from the indoor unit coil to the outdoor unit during the heating mode.

C. Basic piping installation requirements are specified in Division 23 Section 20 02 13 "Basic Piping”.

D. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

E. Arrange piping to allow inspection and service of compressor and other equipment. Install valves and specialties in accessible locations to allow for service and inspection.

F. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation. Use sleeves through walls or ceilings, sized to permit installation of full-thickness insulation.

G. Belowground, install copper tubing in protective conduit. Vent conduit outdoors.

H. Slope refrigerant piping as follows:
   1. Install horizontal suction lines with a uniform slope downward to compressor.
   2. Liquid lines may be installed level.

I. Manufacturers installation instructions shall supercede contract drawings where a conflict may occur. Notify Architect before proceeding if a conflict does occur.

J. Install unions to allow removal of solenoid valves, pressure-regulating valves, and expansion valves and at connections to compressors and evaporators.

K. When brazing, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion valve bulb.

L. Hanger, support, and anchor products are specified in Division 23 Section 20 05 29 "Hangers and Supports."

M. Install the following pipe attachments:
   1. Adjustable steel clevis hangers for individual horizontal runs less than long.
   2. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:

3.5 PIPE JOINT CONSTRUCTION

A. Braze joints according to Division 20 Section 20 02 13 "Basic Piping."

B. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide) during brazing to prevent scale formation.

3.6 FIELD QUALITY CONTROL

A. Test and inspect refrigerant piping according to ASME B31.5, Chapter VI.

B. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure.

3.7 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat requirements.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of the conditioned air to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
   1. Check compressor oil level above center of sight glass.
   2. Open compressor suction and discharge valves.
   3. Open refrigerant valves, except bypass valves that are used for other purposes.
   4. Check compressor-motor alignment, and lubricate motors and bearings.

3.8 CLEANING

A. Before installing copper tubing, clean tubing and fittings with trichloroethylene.

B. Replace core of filter-dryer after system has been adjusted and design flow rates and pressures are established.

3.9 SYSTEM CHARGING

A. Charge system using the following procedures:
   1. Install core in filter-dryer after leak test but before evacuation.
   2. Evacuate entire refrigerant system with a vacuum pump to a vacuum. If vacuum holds for 12 hours, system is ready for charging.
   3. Break vacuum with refrigerant gas, allowing pressure to build up.
   4. Charge system with a new filter-dryer core in charging line. Provide full-operating charge.
   5. Measure amount of refrigerant required for each system. Include on close out documents.

END OF SECTION
8-21-26

SECTION 23 250 - CHEMICAL WATER TREATMENT EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Chemical feeder equipment.

1.02 RELATED SECTIONS

A. Section 20 01 00: General Provisions

B. Section 20 02 13: Basic Piping

1.03 SUBMITTALS

A. Submit under provisions of Section 01340.

B. Shop Drawings: Indicate system schematic, equipment locations, and controls schematics, electrical characteristics and connection requirements.

C. Product Data: Provide chemical treatment materials, chemicals, and equipment including electrical characteristics and connection requirements.

D. Manufacturer's Installation Instructions: Indicate placement of equipment in systems, piping configuration, and connection requirements.

1.04 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 01700.

B. Operation and Maintenance Data: Include data on chemical feed pumps, agitators, and other equipment including spare parts lists, procedures, and treatment programs. Include step by step instructions on test procedures including target concentrations.

1.05 MAINTENANCE SERVICE

A. Furnish service and maintenance of treatment systems during construction period & initial system charge.

1.06 MAINTENANCE MATERIALS

A. Provide maintenance materials under provisions of 01700.

B. Provide sufficient chemicals for treatment and testing during construction period. Contractor to provide chemical treatment of HVAC Water System during use in construction period.

C. Chemicals to be approved by user agency & current chemical water treatment program.

PART 2 PRODUCTS

2.01 CLOSED SYSTEM CHEMICAL FEEDER (CHILLED WATER)

A. Feeder shall be complete with fill, drain, inlet, outlet and relief valves.

B. Feeder shall have air vent valve.

C. Feeder shall have 6 inch cast iron wide mouth fill funnel.

D. Feeders shall be of 175 psi construction with min. five (5) gallon capacity.

2.02 CONDENSER WATER CHEMICAL FEED SYSTEM

A. Not used.

2.03 CHEMICALS

A. Cleaners: Chemicals used for cleaning shall be selected for the removal of grease, dirt, mill scale, welding slag, and foreign material in the system.

B. All chemical feed equipment shall be furnished & installed by Mechanical Contractor. Contractor to provide chemical treatment of HVAC water during use in construction. At substantial completion, Owner to take responsibility of water treatment as part of their ongoing maintenance procedure.

C. Chemicals to be approved by user agency & current chemical water treatment program.

PART 3 EXECUTION

3.01 PREPARATION

A. Systems shall be operational, filled, started, and vented prior to cleaning. Use water meter to record capacity in each system. Provide system volume in close out documents.

B. Place terminal control valves in open position during cleaning.

C. Verify that electric power is available and of the correct characteristics.

3.02 CONDENSER WATER SYSTEMS (COOLING TOWERS)

A. Not used.

END OF SECTION

8-21-26

SECTION 23 3100 - METAL DUCTWORK

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification section, apply to this section.

B. Requirements of the following Division 20 Sections apply to this section:

1. Section 20 01 00 “General Provisions”

1.02 SUMMARY

A. This section includes rectangular, round, and flat-oval metal ducts and plenums for heating, ventilating, and air conditioning systems in pressure classes from minus 2 inches to plus 10 inches water gage.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Section 23 07 00 “Ductwork Insulation” for exterior duct and plenum insulation.
2. Section 23 33 00 “Duct Accessories” for flexible duct materials, dampers, duct-mounted access panels and doors, and turning vanes.
3. Section 23 37 00 “Air Outlets.”
4. Section 23 05 93 “Testing, Adjusting, and Balancing.”

1.03 DEFINITIONS

A. Sealing Requirements Definitions: For the purposes of duct systems sealing requirements specified in this Section, the following definitions apply:

1. Seams: A seam is defined as joining of two longitudinally (in the direction of airflow) oriented edges of duct surface material occurring between two joints. All other duct surface connections made on the perimeter are deemed to be joints.
2. Joints: Joints include girth joints; branch and sub-branch intersections; so-called duct collar tap-ins; louver and air terminal connections to ducts; access door and access panel frames and jambs; duct, plenum, and casing abutments to building structures,

1.04 SYSTEM PERFORMANCE REQUIREMENTS

A. The duct system design, as indicated, has been used to select and size air moving and distribution equipment and other components of the air system. Changes or alterations to the layout or configuration of the duct system must be specifically approved in writing. Accompany requests for layout modifications with calculations showing that the proposed layout will provide the original design results without increasing the system total pressure.

1.05 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data including details of construction relative to materials, dimensions of individual components, profiles, and finishes for the following items:

1. Duct Liner.
2. Sealing Materials.
3. Fire-Stopping Materials.
4. Construction Methods.

C. Shop drawings from duct fabrication shop, drawn to a scale not smaller than 1/4 inch equals 1 foot, on drawing sheets same size as the Contract Drawings, detailing:

1. Fabrication, assembly, and installation details, including plans, elevations, sections, details of components, and attachments to other work.
2. Duct layout, indicating pressure classifications and sizes in plan review. For exhaust ducts systems, indicate the classification of the materials handled as defined in this Section.
3. Fittings.
4. Reinforcing details and spacing.

5. Seam and joint construction details.
6. Penetrations through fire-rated and other partitions.
7. Terminal unit, coil, and humidifier installations.
8. Hangers and supports, including methods for building attachment, vibration isolation, and duct attachment.

D. Coordination drawings for ductwork at congested areas or areas of interference shall be prepared to totally describe proposed installation and routings in accordance with Division 20 01 00 General Provisions." show the following:
1. Coordination with ceiling suspension members.
2. Spatial coordination with other systems installed in the same space with the duct systems.
3. Coordination of ceiling- and wall-mounted access doors and panels required to provide access to dampers and other operating devices.
4. Coordination with ceiling-mounted lighting fixtures and air outlets and inlets.

E. Welding certificates including welding procedures specifications, welding procedure qualifications test records, and welders' qualifications test records complying with requirements specified in "Quality Assurance" below.

F. Record drawings including duct system routing, fittings details, reinforcing, support, and installed accessories and devices, in accordance with Division 20 01 00 - General Provisions.

1.06 QUALITY ASSURANCE

A. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code-Steel" for hangers and supports and AWS D9.1 "Sheet Metal Welding Code."

B. Qualify each welder in accordance with AWS qualification tests for welding processes involved. Certify that their qualification is current.

C. NFPA Compliance: Comply with the following NFPA Standards:
1. NFPA 90A: "Standard for the Installation of Air Conditioning and Ventilating Systems," except as indicated otherwise.
2. NFPA 96, "Standard for the Installation of Equipment for the Removal of Smoke and Grease Laden Vapors for Commercial Cooking Equipment," Chapter 3, "Duct System," for kitchen hood duct systems, except as indicated otherwise.
3. Perform tests specified in "Field Quality Control." Modify mock-up construction and perform additional tests as required to achieve specified minimum acceptable results.
4. Obtain approval of mock-ups before beginning final fabrication.
5. Retain and maintain mock-ups during construction in undistributed condition as a standard for judging completed unit of work.
6. Demolish and remove mock-ups from project site when directed.
7. Accepted mock-ups that form a part of the actual duct system may remain and become part of completed unit of work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver sealant and fire-stopping materials to site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.

B. Store and handle sealant fire-stopping materials in compliance with manufacturers' recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other cause.

C. Deliver and store stainless steel sheets with mill-applied adhesive protective paper, maintained through fabrication and installation.

PART 2 PRODUCTS

2.01 SHEET METAL MATERIALS

A. Sheet Metal, General: Provide sheet metal in thickness indicated, packaged and marked as specified in ASTM A 700.

B. Galvanized Sheet Steel: Lock-forming quality, ASTM A 653/A653M, A924/A924M. Provide mill phosphatized finish for exposed surfaces of ducts exposed to view.

C. Carbon Steel Sheets: ASTM A 366, cold-rolled sheets, commercial quality, with oiled, exposed matte finish.

D. Stainless Steel: ASTM A 480/A 480M, Type 316 & 304, and having a No. 2D finish for concealed ducts and No. 4 for exposed ducts.

E. Reinforcement Shapes and Plates: Unless otherwise indicated, provide galvanized steel reinforcing where installed on galvanized sheet metal ducts. For aluminum and stainless steel ducts provide reinforcing of compatible materials.

F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for 36-inch length or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

G. Aluminum Sheets: ASTM B 209, alloy 3003, temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

H. In general, the contract drawings are diagrammatic and are not intended to be scaled, nor indicate all details such as offsets, transitions, etc. for the fabrication/installation of work. It will be the responsibility of the contractor to completely coordinate with other trade systems, and all construction documents for the actual location and elevation of final install. The Mechanical Contractor means and methods of installation shall provide for operating efficiency, neatness of appearance, and ease of maintenance. Where information required to provide a complete working system is omitted or unclear, the contractor is responsible for requesting a clarification from the engineer prior to submission of bids. Bidding contractors must review all construction documents and be knowledgeable of all referenced codes and ordinances prior to submitting bids. The contractor should expect minor deviations from the contract documents and include additional labor & material for offsets and elbows including straight duct in his sheet metal bid. The sheet metal contractor should expect, and include in his bid, at least 5% in poundage (but not less than 5,000 pounds) of the total project poundage estimated. The contractor shall also include any required external insulation (material & labor) that may be required. All deviations shall be discussed and submitted to the engineer for approval. The contractors shall install his work in a manner so that interferences between the various trades are avoided. All deviations from sizes, locations, and from all other methods of the installation, shall be recorded.

   1. All uses of this allowance should be submitted to the mechanical engineer for record.
   2. All uses of this allowance are to be approved by the mechanical engineer prior to construction of ductwork.

2.02 DUCT INSULATION

A. Refer to specification 23 07 00 for Duct Insulation specification.

2.03 FIRE-STOPPING

A. Refer to Division 7 Section “Joint Sealers” for fire-stopping.

2.04 FIRE-STOPPING

A. Fire-Resistant Sealant: Provide two-part, foamed-in-place, fire-stopping silicone sealant formulated for use in through-penetration fire-stop system for filling openings around duct penetrations through walls and floors, having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E 814 by Underwriters Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.

B. Fire-Resistant Sealant: Provide one-part elastomeric sealant formulated for use in a through-penetration fire-stop system for filling openings around duct penetrations through walls and floors, having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E 814 by Underwriter’s Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.

C. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

D. Products: Subject to compliance with requirements, provide one of the following:

   1. “Dow Corning Fire Stop Foam”; Dow Corning Corp.

2. “Pensil 851"; General Electric Co.
3. “Dow Corning Fire Stop Sealant”; Dow Corning Corp.
4. “3M Fire Barrier Caulk CP-25"; Electrical Products Div./3M.
5. “RTV 7403"; General Electric Co.
6. “Fyre Putty”; Standard Oil Engineered Materials Co.

2.05 HANGERS AND SUPPORTS

A. Building Attachments: Concrete inserts, powder actuated fasteners, or structural steel fasteners appropriate for building materials. Do not use powder actuated fasteners for lightweight aggregate concretes or for slabs less than 4 inches thick.

B. Hangers: Galvanized sheet steel, or round, uncoated steel, threaded rod.
   1. Hangers Installed In Corrosive Atmospheres: Electro-galvanized, all-thread rod or hot-dipped-galvanized rods with threads painted after installation.
   2. Straps and Rod Sizes: Conform to Table 4-1 in SMACNA HVAC Duct Construction Standards, 1985 Edition, for sheet steel width and gage and steel rod diameters.

C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

D. Trapeze and Riser Supports: Steel shapes conforming to ASTM A 36.
   1. Where galvanized steel ducts are installed, provide hot-dipped-galvanized steel shapes and plates.
   2. For stainless steel ducts, provide stainless steel support materials.
   3. For aluminum ducts, provide aluminum support materials, except where materials are electrolytically separated from ductwork.

2.06 RECTANGULAR DUCT FABRICATION

A. General: Except as otherwise indicated, fabricate rectangular ducts with galvanized sheet steel, in accordance with SMACNA “HVAC Duct Construction Standards,” Tables 1-3 through 1-19, including their associated details. Conform to the requirements in the referenced standard for metal thickness, reinforcing types and intervals, tie rod applications, and joint types and intervals.
   1. Fabricate rectangular ducts in lengths appropriate to reinforced and rigidity class required for pressure classification.
   2. Provide materials that are free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.

B. Static Pressure Classifications: Except where otherwise indicated, construct duct systems to the following pressure classifications:
   1. Supply Ducts: 6 inches water gage. (4” downstream VAV boxes)
   2. Return Ducts: 4 inches water gage, negative pressure.
   3. Exhaust Ducts: 2 inches water gage, negative pressure.

C. Cross breaking or Cross Beading: Cross break or bead duct sides that are 19 inches and larger and are 20 gage or less, with more than 10 sq. ft. of un-braced panel area, as indicated in SMACNA “HVAC Duct Construction Standard,” Figure 1-4, unless they are lined or are externally insulated.

2.07 RECTANGULAR DUCT FITTINGS

A. Fabricate elbows, transitions, offsets, branch connections, and other duct construction in accordance with SMACNA “HVAC Metal Duct Construction Standard,” Current Edition, Figures 2-1 through 2-10.

2.08 ROUND DUCT FABRICATION

A. Round Ducts: Fabricate round supply ducts using seam types identified in SMACNA “HVAC Duct Construction Standards,” Most Current Edition, Figure 3-1, RL-1, RL-4, or RL-5. Seams Types RL-2 or RL-3 may be used if spot-welded on 1-inch intervals. Comply with SMACNA “HVAC Duct Construction Standards,” Table 3-2 for galvanized steel gages. Ductwork for low

pressure duct (downstream VAV boxes) work may be snap lock type with all joints to be hard cast and sealed.

B. Double-Wall (Insulated) Ducts (Perforated Inner Liner): Fabricate double-wall insulated ducts with an outer shell, insulation, and an inner liner as specified below. Dimensions indicated on internally insulated ducts are nominal inside dimensions.

1. Thermal Conductivity: 0.27 Btu/sq. Ft./deg F/inch thickness at 75 deg F mean temperature.
2. Outer Shell: Base outer s hell gage on actual outer shell dimensions. Provide outer shell lengths 2 inches longer than inner shell and insulation, and in gages specified above for single-wall duct.
3. Insulation: Unless otherwise indicated, provide 1-inch-thick fiber-glass insulation. Provide insulation ends where internally insulated duct connects to single-wall duct or non-insulated components. The insulation shall terminate the insulation and reduce the outer shell diameter to the inner liner diameter.
4. Perforated Inner Liner: Construct round and flat oval inner liners with perforated sheet metal of the gages listed below. For rectangular flat oval ducts, the diameter in the table below is the equivalent “basic round diameter.” Note, The first twenty five (25) feet of main duct from air handling unit (including branch ducts), inside layer shall be perforated double wall for sound reduction.
    a. 3 to 8 inches: 28 gage with standard spiral construction.
    b. 9 to 42 inches: 28 gage with single-rib spiral construction.
    c. 44 to 60 inches: 26 gage with single-rib spiral construction.
    d. 62 to 88 inches: 22 gage with standard spiral construction.
5. Maintain concentricity of liner to outer shell by mechanical means. Retain insulation from dislocation by mechanical means.

2.09 ROUND SUPPLY AND EXHAUST FITTINGS FABRICATION

A. 90-Degree Tees and Laterals and Conical Tees: Fabricate to conform to SMACNA “HVAC Duct Construction Standards,” Most Current Edition, Figures 3-4 and 3-5 and with metal thickness specified for longitudinal seam straight duct.

B. Diverging-Flow Fittings: Fabricate with a reduced entrance to branch taps with no excess material projecting from the body onto branch tap entrance.

C. Elbows: Fabricate in die-formed, gored, pleated, or mitered construction. Fabricate the bend radius of die-formed, gored, and pleated elbows 1.5 times the elbow diameter. Unless elbow construction type is indicated, provide elbows meeting the following requirements:

1. Mitered Elbows: Fabricate mitered elbows with welded construction in gages specified below.
    a. Mitered Elbows Radius and Number of Pieces: Unless otherwise indicated, construct elbow to comply with SMACNA “HVAC Duct Construction Standards,” Table 3-1.
    b. Round Mitered Elbows: Solid welded and with metal thickness listed below for pressure classes from minus 2 inches to plus 2 inches:
        1) 3 to 36 inches: 24 gage.
        2) 27 to 36 inches: 22 gage.
        3) 37 to 50 inches: 20 gage.
        4) 52 to 60 inches: 18 gage.
        5) 62 to 84 inches: 16 gage.
    c. Round Mitered Elbows: Solid welded and with metal thickness listed below for pressure classes from 2 inches to 10 inches:
        1) 3 to 14 inches: 24 gage.
        2) 15 to 26 inches: 22 gage.
        3) 27 to 50 inches: 20 gage.
        4) 52 to 60 inches: 18 gage.

5) 62 to 84 inches: 16 gage.

d. 90-Degree, 2-Piece, Mitered Elbows: Use only for supply systems, or exhaust systems for material handling classes A and B; and only where space restrictions do not permit the use of 1.5 bend radius elbows. Fabricate with a single-thickness turning vanes.

2. Round Elbows - 8 Inches and Smaller: Die-formed elbows for 45- and 90-degree elbows and pleated elbows for 30, 45, 60, and 90 degrees only. Fabricate nonstandard bend angle configurations of ½-inch-diameter (e.g. 3 ½ - and 4 ½ - inch) elbows with gored construction.

3. Round Elbows - 9 Through 14 Inches: Gored or pleated elbows for 30, 45, 60, and 90 degrees, except where space restrictions require a mitered elbow. Fabricate nonstandard bend angle configurations or ½ - inch-diameter (e.g. 9 ½ - and 10 ½ -inch) elbows with gored construction.

4. Round Elbows: Larger Than 14 Inches and All Flat Oval Elbows: Gored elbows, except where space restrictions require a mitered elbow.

5. Round Gored Elbows Gages: Same as for non-elbow fittings specified above.

6. Flat Oval Elbows Gages: Same as longitudinal seam flat oval duct.

7. Pleated Elbows Sizes Through 14 Inches and Pressures Through 10 Inches:

26 gage.

8. No adjustable type elbows allowed on high/medium pressure ductwork prior to installation of VAV Boxes, allowed on low pressure ductwork only (after VAV Boxes).

D. Double-Wall (Insulated) Fittings: Fabricate double-wall insulated fittings with an outer shell, insulation, and inner liner as specified below. Dimensions indicated on internally insulated ducts are nominal inside dimensions.

1. Thermal Conductivity: 0.27 Btu/sq. ft./deg F/inch thickness at 75 deg F mean temperature.

2. Outer Shell: Base outer shell gage on actual outer shell dimensions. Provide outer shell lengths 2 inches longer than inner shell and insulation. Gages for outer shell shall be same as for uninsulated fittings specified above.

3. Insulation: Unless otherwise indicated, provide 1-inch-thick fiber-glass insulation. Provide components. The insulation end shall terminate the insulation and reduce the outer shell diameter to the nominal single-wall size.

4. Perforated Inner Liner: Construct round and flat oval inner liners with perforated sheet metal of the gages listed below. For flat oval ducts, the diameter indicated in the table below is the “basic round diameter.”

a. 3 to 34 inches: 24 gage.

b. 35 to 58 inches: 22 gage.

c. 60 to 88 inches: 20 gage.

5. Maintain concentricity of liner to outer shell by mechanical means. Retain insulation from dislocation by mechanical means.

2.10 AUXILIARY DRAIN PAN

A. Auxiliary Drain Pans: Fabricate of min. 12 gauge galvanized steel turned up four (4) inches all around and extend six (6) inches beyond all sides of equipment. All joints and seems to be seamless construction. This is applicable for all auxiliary drain pans under air handling units, hot water heaters, etc.

1. Provide float switch in auxiliary drain line, unit to de-energize when float switch is tripped.

2. Pipe safety pans to nearest floor drain.

3. In air handling unit drain pan, provide ball valve in safety pan condensate drain line.

2.11 KITCHEN HOOD & DISHWASHER EXHAUST DUCT

A. Not used.

2.12 JOINT AND SEAM SEALANT

A. Joint and Seam Sealants, General: The term "sealant" is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.

1. All sealants shall be UL181A compliant.

B. All ductwork joints and seams to be sealed with joint and seam hardcast. Water Based Duct Sealant to be Versa-Grip 102 as manufactured by HardCast, Miracle Kingco D-619 Water Based Duct Sealant or prior approved equal.

1. All seams on exposed ductwork shall be neatly caulked with HardCast Iron-Grip 601 or prior approved equal. Contractor to seal one (1) duct joint/seam for aesthetic approval by architect prior to sealing entire duct system.

C. Flange Gaskets Joints: Butyl rubber or EPDM polymer with polyisobutylene plasticizer to be installed at joint connection and then sealed with joint and seam hardcast.

2.13 ALUMINUM DUCTWORK CONSTRUCTION

A. Not used.

2.14 DUCT LINER

A. Fibrous-Glass Liner: Comply with NFPA 90A or NFPA 90B and with NAIMA AH124.

1. Materials: ASTM C 1071; surfaces exposed to airstream shall be coated to prevent erosion of glass fibers.
   a. Thickness: 1 inch, 1.5lb.density
   b. Thermal Conductivity (k-Value): 0.26 at 75 deg F mean temperature.
   c. Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84.
   d. Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
   e. Mechanical Fasteners: Galvanized steel suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in duct.
      1) Tensile Strength: Indefinitely sustain a 50-lb- tensile, dead-load test perpendicular to duct wall.
      2) Fastener Pin Length: As required for thickness of insulation and without projecting more than 1/8 inch into airstream.
      3) Adhesive for Attaching Mechanical Fasteners: Comply with fire-hazard classification of duct liner system.

2.15 APPLICATION OF LINER IN RECTANGULAR DUCTS

A. Adhere a single layer of indicated thickness of duct liner with at least 100 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.

B. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.

C. Butt transverse joints without gaps and coat joint with adhesive.

D. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.

E. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and standard liner product dimensions make longitudinal joints necessary.

F. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.

G. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

1. Fan discharges.
2. Intervals of lined duct preceding unlined duct.
3. Upstream edges of transverse joints in ducts where air velocities are greater than 2500 fpm (12.7 m/s) or where indicated.

H. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.

1. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.
2. Applicable where perforated liner is specified on drawings.

I. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used; secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.16 COATINGS FOR EXTERIOR DUCTWORK

A. Not used.

2.17 NEGATIVE ISOLATION ROOM & NEGATIVE CORRIDOR DUCTWORK CONSTRUCTION

A. Not used.

2.18 ADDITIONAL STEEL SLEEVE FOR INSTALLATION OF SECURITY BARS

A. Not used.

2.19 UNTREATED OUTSIDE AIR INTAKE DUCTWORK CONSTRUCTION

A. Not used.

2.20 FUME HOOD EXHAUST DUCT

A. Not used.

2.21 ROOF MOUNTED EXHAUST DUCT

A. Not used.

PART 3 EXECUTION

3.1 DUCT INSTALLATION, GENERAL

A. Construct and install ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated. All ducts shall be galvanized steel (G90) unless otherwise noted.

B. Duct System Pressure Class: Construct and install each system for the specific duct pressure classification indicated.

Static-Pressure Classes: Unless otherwise indicated, construct ducts according to the following:

1. Supply Ducts: 6 inch wg. (4” downstream VAV boxes)
2. Return Ducts (Negative Pressure): 4 inch wg.
3. Exhaust Ducts (Negative Pressure): 2 inch wg.

C. Install ducts with the fewest possible joints.

D. Use fabricated fittings for all changes in directions, changes in size and shape, and connections.

E. Install couplings tight to duct wall surface with a minimum of projections into duct. Secure couplings with sheet metal screws. Install screws at intervals of 12 inches, with a minimum of 3 screws in each coupling.

F. Locate ducts, except as otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs. Install duct systems in shortest route that does not obstruct useable space or block access for servicing building and its equipment.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Provide clearance of 1 inch where furring is shown for enclosure or concealment of ducts, plus allowance for insulation thickness, if any.

I. Install insulated ducts with 1-inch clearance outside of insulation.

J. Conceal ducts from view in finished and occupied spaces by locating in mechanical shafts, hollow wall construction, or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown.

K. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.

L. Electrical Equipment Spaces: Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures.

M. Non-Fire-Rated Partition Penetrations: Where ducts pass interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gage as duct. Overlap opening on 4 sides by at least 1 ½ inches.

N Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire dampers, sleeves, and firestopping sealant. Fire and smoke dampers are specified in Division 23 Section "Duct Accessories." Firestopping materials and installation methods are specified in Division 7 Section "Through-Penetration Firestop Systems."

O. Install round and flat-oval ducts in lengths not less than 12 feet unless interrupted by fittings.

P. Seal all joints and seams. Apply sealant to male end connectors before insertion, and afterward to cover entire joint and sheet metal screws.

Q. Install ducts with hangers and braces designed to withstand, without damage to equipment, seismic force required by applicable building codes.

R. Protect duct interiors from the elements and foreign materials until building is enclosed. Follow SMACNA's "Duct Cleanliness for New Construction."

S. Paint interiors of metal ducts that do not have duct liner, for 24 inches upstream of registers and grilles. Apply one coat of flat, black, latex finish coat over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 9 painting Sections.

T. All sections of duct work (Supply, Return, Exhaust, Fresh Air) are to be supplied to project in maximum lengths of 4'-0" as to allow for ease of field modifications and rerouting of ductwork.

3.02 SEAM AND JOINT SEALING

A. General: Seal all duct seams and joints as follows:

B. Pressure Classifications Greater Than 3 Inches Water Gage: All transverse joints, longitudinal seams and penetrations.

C. Pressure Classifications Greater than 2 to 3 Inches Water Gage: All transverse joints and longitudinal seams.

1. Pressure Classification Less than 2 Inches Water Gage: All transverse joints and longitudinal seams.

D. Seal externally insulated ducts prior to insulation installation.

E. Self-adhesive foil faced tape not acceptable as a means of ductwork sealant.

F. Cover all sheet metal screws.

G. Joint and Seam Sealants, General: The term "sealant" is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.

1. All sealants shall be UL181A compliant.

H. All ductwork joints and seams to be sealed with joint and seam hardcast. Water Based Duct Sealant to be Versa-Grip 102 as manufactured by HardCast, Miracle Kingco D-619 Water Based Duct Sealant or prior approved equal.

1. All seams on exposed ductwork shall be neatly caulked with HardCast Iron-Grip 601 or prior approved equal. Contractor to seal one (1) duct joint/seam for aesthetic approval by architect prior to sealing entire duct system.

I. Flange Gaskets Joints: Butyl rubber or EPDM polymer with polyisobutylene plasticizer to be installed at joint connection and then sealed with joint and seam hardcast.

3.03 HANGING AND SUPPORTING

A. Install rigid round, rectangular, and flat oval metal duct with support systems indicated in SMACNA “HVAC Duct Construction Standards (Most Current Edition),” Tables 4-1 through 4-3 and Figures 4-1 through 4-8.

B. Support horizontal ducts with 2 feet of each elbow and withing 4 feet of each branch intersection.

C. Support vertical ducts at a maximum interval of 16 feet and at each floor.

D. Upper attachments to structures shall have an allowable load not exceeding 1/4 of the failure (proof test) load but are not limited to the specified methods indicated.

E. Install concrete insert prior to placing concrete.

F. Install powder actuated concrete fasteners after concrete is placed and completely cured.

3.04 CONNECTIONS

A. Equipment Connections: Connect equipment with flexible connectors in accordance with Division 23 Section “Duct Accessories.”

B. Branch Connections: Comply with SMACNA “HVAC Duct Construction Standards” (Most Current Edition), Figures 2-7 and 2-8.

C. Outlet and Inlet Connections: Comply with SMACNA “HVAC Duct Construction Standards” (Most Current Edition), Figures 2-16 through 2-18.

D. Terminal Units Connections: Comply with SMACNA “HVAC Duct Construction Standards” (Most Current Edition), Figure 2-19.

3.05 FIELD QUALITY CONTROL

A. Disassemble, reassemble, and seal segments of the systems as required to accommodate leakage testing, and as required for compliance with test requirements.

B. Conduct tests, in the presence of the Architect, at static pressures equal to the maximum design pressure of the system or the section being tested. If pressure classifications are not indicated, test entire systems at the maximum system design pressure. Do not pressurize systems above the maximum design operating pressure. Give 7 days advanced notice for testing.

C. Determine leakage from entire system or section of the system by relating leakage to the surface area of the test section.

D. Maximum Allowable Leakage: As described in ASHRAE (most current edition) Handbook, “Fundamentals” Volume, Chapter 32, Table 6 and Figure 10. Comply with requirements for leakage classification 3 for round and flat oval ducts, leakage classification 12 for rectangular ducts in pressure classifications less than and equal to 2 inches water gage (both positive and negative pressures), and leakage classification 6 for pressure classifications greater than 2 inches water gage and less than and equal to 10 inches water gage.

E. Remarks leaking joint as required and apply sealants to achieve specified maximum allowable leakage.

F. Leakage Test: Perform volumetric measurements and adjust air systems as described in ASHRAE (most current edition) “HVAC Systems and Applications” Volume, Chapter 57 and ASHRAE (most current edition) “Fundamentals” Volume, Chapter 13, and Division 15 Section “TESTING, ADJUSTING, AND BALANCING.”

G. Leakage tests shall be performed for the main trunk line up to the terminal units of each air handling unit. The tests shall be concluded as a requirement of Test and Balance Contract.

3.06 ADJUSTING

A. Adjust volume control devices as required by the testing and balancing procedures to achieve required air flow. Refer to Division 23 Section “TESTING, ADJUSTING, AND BALANCING” for requirements and procedures for adjusting and balancing air systems.

3.07 CLEANING NEW SYSTEMS

A. Mark position of dampers and air-directional mechanical devices before cleaning, and perform cleaning before air balancing.

B. Use service openings, as required, for physical and mechanical entry and for inspection.

1. Create other openings to comply with duct standards.
2. Disconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling sections to gain access during the cleaning process.

C. Vent vacuuming system to the outside. Include filtration to contain debris removed from HVAC systems, and locate exhaust down wind and away from air intakes and other points of entry into building.

D. Clean the following metal duct systems by removing surface contaminants and deposits:
1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, and actuators except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.

E. Mechanical Cleaning Methodology:
1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.

F. Cleanliness Verification:
1. Visually inspect metal ducts for contaminants.
2. Where contaminants are discovered, re-clean and reinspect ducts.

G. All ductwork shall be in accordance to SMACNA's (current edition) "Duct Cleanliness for New Construction Guidelines". All supply ducts should be considered intermediate level. If upon inspection or during construction it is deemed that the criteria per section 3 of SMACNA's "Cleanliness Guidelines" were violated and the contamination has been identified, NADCA (current edition) "Cleaning New Systems" shall be followed.

3.08 HOOD EXHAUST DUCTS, SPECIAL INSTALLATION REQUIREMENTS

1. Install ducts to allow for thermal expansion through 2000 deg F temperature range.
2. Install ducts without dips or traps that may collect residues unless traps have continuous or automatic residue removal.
3. Install access openings at each change in direction and at intervals defined by NFPA 96; locate on sides of duct a minimum of 1-1/2 inches from bottom; and fit with grease-tight covers of same material as duct.
4. Do not penetrate fire-rated assemblies except as permitted by applicable building codes.
5. Perform grease duct test in accordance with IMC 2021 section 506.3.2.5 Grease duct test. Prior to the use or concealment of any portion of a grease duct system, a leakage test shall be performed. Ducts shall be considered to be concealed where installed in shafts or covered by coatings or wraps that prevent the ductwork from being visually inspected on

all sides. The permit holder shall be responsible to provide the necessary equipment and perform the grease duct leakage test. A light test shall be performed to determine that all welded and brazed joints are liquid tight. A light test shall be performed by passing a lamp having a power rating of not less than 100 watts through the entire section of ductwork to be tested. The lamp shall be open so as to emit light equally in all directions perpendicular to the duct walls. A test shall be performed for the entire duct system, including the hood-to-duct connection. The duct work shall be permitted to be tested in sections, provided that every joint is tested. For listed factory-built grease ducts, this test shall be limited to duct joints assembled in the field and shall exclude factory welds.

END OF SECTION

8-21-26

SECTION 23 3300 - DUCTWORK ACCESSORIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Backdraft dampers.
2. Volume dampers.
3. Motorized control dampers.
4. Fire dampers.
5. Turning Vanes.
6. Duct-mounting access doors.
7. Flexible connectors.
8. Flexible Duct.
9. Round Branch Takeoff to Diffusers.
10. Cable Control System & Balancing Dampers.
11. Misc Sheetmetal & Duct Accessory Hardware.
12. Smoke Dampers
13. Combination Fire/Smoke Dampers.

B. Related Sections include the following:

1. Division 26 Section "Fire Alarm" for duct-mounting fire and smoke detectors.
2. Division 23 Section 23 09 00 "Building and Automatic Temperature Controls" for electric and pneumatic damper actuators.

1.03 SUBMITTALS

A. Product Data: For the following:

1. Backdraft dampers.
2. Volume dampers.
3. Motorized control dampers.
4. Fire dampers.
5. Turning Vanes.
6. Duct-mounting access doors.
7. Flexible connectors.
8. Flexible Duct.
9. Round Branch Takeoff to Diffusers.
10. Cable Control System & Balancing Dampers.
11. Misc Sheetmetal & Duct Accessory Hardware.
12. Smoke Dampers
13. Combination Fire/Smoke Dampers.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Special fittings.
2. Manual-volume damper installations.
3. Fire-damper installations, including sleeves and duct-mounting access doors.
4. Wiring Diagrams: Power, signal, and control wiring.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale and coordinating penetrations and ceiling-mounting items. Show ceiling-mounting access panels and access doors required for access to duct accessories.

1.04 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

1.05 EXTRA MATERIALS

A. Furnish extra materials matching products installed as described below, packaged with protective covering for storage and identified with labels describing contents. Deliver extra materials to Owner.

1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 PRODUCTS

2.01 SHEET METAL MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated.

B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G90 coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.

C. Stainless Steel: ASTM A 480/A 480M.

D. Aluminum Sheets: ASTM B 209, alloy 3003, temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

E. Extruded Aluminum: ASTM B 221, alloy 6063, temper T6.

F. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.02 BACKDRAFT DAMPERS

A. Description: Multiple-blade, parallel action gravity balanced, with center-pivoted blades of maximum 6-inch width, with sealed edges, assembled in rattle-free manner with 90-degree stop, steel ball bearings, and axles; adjustment device to permit setting for varying differential static pressure.

B. Frame: 0.052-inch- thick, galvanized sheet steel, with welded corners [and mounting flange].

C. Blades: 0.050-inch- thick aluminum sheet.

D. Blade Seals: Felt, Vinyl or Neoprene.

E. Blade Axles: Nonferrous or Galvanized steel.

F. Tie Bars and Brackets: Aluminum or Galvanized steel.

G. Return Spring: Adjustable tension.

2.03 VOLUME DAMPERS

A. General Description: Factory fabricated, with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

1. Pressure Classes of 3-Inch wg or Higher: End bearings or other seals for ducts with axles full length of damper blades and bearings at both ends of operating shaft.

B. Standard Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating,[with linkage outside airstream,] and suitable for horizontal or vertical applications.

1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.

2. Roll-Formed Steel Blades: 0.064-inch- thick, [galvanized] [stainless] sheet steel.
3. Aluminum Frames: Hat-shaped, 0.10-inch- thick, aluminum sheet channels; frames with flanges where indicated for attaching to walls; and flangeless frames where indicated for installing in ducts.
4. Roll-Formed Aluminum Blades: 0.10-inch- thick aluminum sheet.
5. Extruded-Aluminum Blades: 0.050-inch- thick extruded aluminum.
6. Blade Axles: [Galvanized steel] [Stainless steel] [Nonferrous].
7. Bearings: Oil-impregnated bronze or Molded synthetic sleeve].
8. Tie Bars and Brackets: Aluminum.
9. Tie Bars and Brackets: Galvanized steel.

C. Low-Leakage Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, low-leakage rating,[with linkage outside airstream,] and suitable for horizontal or vertical applications.
1. Steel Frames: Hat, U or Angle-shaped, galvanized sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
2. Roll-Formed Steel Blades: 0.064-inch- thick, galvanized sheet steel.
3. Aluminum Frames: Hat, U or Angle-shaped]-shaped, 0.10-inch- thick, aluminum sheet channels; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
4. Roll-Formed Aluminum Blades: 0.10-inch- thick aluminum sheet.
5. Extruded-Aluminum Blades: 0.050-inch- thick extruded aluminum.
6. Blade Axles: Galvanized steel, Stainless steel or Nonferrous.
7. Bearings: Oil-impregnated bronze or Molded synthetic thrust or ball.
8. Blade Seals: Felt, Vinyl, or Neoprene.
9. Jamb Seals: Cambered stainless steel.
10. Tie Bars and Brackets: Galvanized steel.

D. Jackshaft: 1-inch- diameter, galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
1. Length and Number of Mountings: Appropriate to connect linkage of each damper in multiple-damper assembly.

E. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.04.01 MOTORIZED CONTROL DAMPERS

A. Dampers shall bear the AMCA Certified Ratings Seal for Air Performance Air Leakage in accordance with AMCA 511 (Greenheck VCD-23).

B. Dampers shall have a maximum leakage of Class 1 (8 cfm/sq. ft @ 4 in. wg at -40°F) as defined by AMCA and shall be tested in accordance with AMCA standard 500-D.

C. Dampers shall have a maximum differential pressure rating of 5 in. wg. and a maximum velocity rating of 3000 FPM.

D. Damper frame shall be 16 ga. galvanized steel formed into a 5” x 1” structural hat channel. Top and bottom frame members on dampers less than 17” high shall be low profile design to maximize the free area of these smaller dampers. Frame shall be 4-piece construction with 1 ½” (minimum) integral overlapping gusset reinforcements in each corner to assure square corners and provide maximum resistance to racking.

E. Damper blades shall be 16 ga. Galvanized steel strengthened by three longitudinal 1” deep Vee grooves running the entire length of each blade. Each blade shall be symmetrical relative to its axle pivot point, presenting identical performance characteristics with air flowing in either direction through the damper. Provide symmetrical blades of varying size as required to

completely fill the damper opening. Blade orientation shall be horizontal and shall be opposed blade or parallel blade as required.

F. Each blade stop at the top and bottom of the damper frame shall occupy no more than ½" of the damper opening area.

G. Provide TPE blade seals mechanically fastened to each blade, and flexible stainless steel jamb seals.

H. All linkage shall be stainless steel, and concealed in the jamb. A stainless steel axle with stainless steel axle bearings shall be provided.

I. Refer to control specifications for damper actuator.

J. Control dampers shall be equal to Greenheck # VCD-23 with all options specified.

2.05 FIRE DAMPERS

A. Fire dampers shall be labeled according to UL 555.

B. Fire Rating: 1-1/2 hours.

C. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch- thick galvanized steel; with mitered and interlocking corners.

D. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.

1. Minimum Thickness: 16 GA (0.0635) inch thick as indicated and of length to suit application.

E. Mounting Orientation: Vertical or horizontal as indicated.

F. Blades: Roll-formed, interlocking, 0.034-inch- thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- thick, galvanized-steel blade connectors.

G. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

H. Fusible Links: Replaceable, 165 deg F rated. General Description: Labeled according to UL 555C; comply with construction details for tested floor- and roof-ceiling assemblies as indicated in UL's "Fire Resistance Directory."

I. Frame: Galvanized sheet steel, round or rectangular, style to suit ceiling construction.

J. Blades: Galvanized sheet steel with refractory insulation.

K. Fusible Links: Replaceable, 165 deg F rated.

L. Fire dampers to be factory sealed Class "A", suitable to 4" static pressure.

M. Contractor to provide fire dampers at all wall fire wall penetration, refer to architect life safety plan for rating of respective walls and contractor to provide 1-1.2 hr fire damper at all floor penetrations of ductwork (supply, return and/or exhaust).

N. All ductwork housing fire dampers shall be equipped with access door of sufficient size to reset and change out flusible link as necessary. All fire dampers have to be check and tested every three (3) years, access doors of sufficient size are mandatory to reset the flusible link, refer to paragraph 3.1 of this specifications for require sizes of access doors, this will be based in actual size of ductwork.

O. All fire dampers are to be dynamic type.

P. All fire dampers to be type C unless otherwise indicated.

2.06 TURNING VANES

A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for vanes and vane runners. Vane runners shall automatically align vanes.

B. Manufactured Turning Vanes: Fabricate 1-1/2-inch- wide, double-vane, curved blades of galvanized sheet steel set 3/4 inch o.c.; support with bars perpendicular to blades set 2 inches o.c.; and set into vane runners suitable for duct mounting.

C. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

2.07 DUCT-MOUNTING ACCESS DOORS

A. General Description: Fabricate doors airtight and suitable for duct pressure class.

B. Door: Double wall, duct mounting, and rectangular; fabricated of galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch butt or piano hinge and cam latches.

1. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
2. Provide number of hinges and locks as follows:
    a. Less Than 12 Inches Square: Secure with two sash locks.
    b. Up to 18 Inches Square: Two hinges and two sash locks.
    c. Up to 24 by 48 Inches: Three hinges and two compression latches[with outside and inside handles].
    d. Sizes 24 by 48 Inches and Larger: One additional hinge.

C. Door: Double wall, duct mounting, and round; fabricated of galvanized sheet metal with insulation fill and 1-inch thickness. Include cam latches.

1. Frame: Galvanized sheet steel, with spin-in notched frame.

D. Pressure Relief Access Door: Double wall and duct mounting; fabricated of galvanized sheet metal [with insulation fill and thickness] as indicated for duct pressure class. Include vision panel where indicated, latches, and retaining chain.

1. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.

E. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.

F. Insulation: 1-inch- thick, fibrous-glass or polystyrene-foam board.

2.08 FLEXIBLE CONNECTORS

A. General Description: Flame-retardant or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

B. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Select metal compatible with ducts.

C. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. Yd..
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

D. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

1. Minimum Weight: 24 oz./sq. Yd..
2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
3. Service Temperature: Minus 50 to plus 250 deg F.

E. High-Temperature System, Flexible Connectors: Glass fabric coated with silicone rubber.

1. Minimum Weight: 16 oz./sq. Yd..
2. Tensile Strength: 285 lbf/inch in the warp and 185 lbf/inch in the filling.
3. Service Temperature: Minus 67 to plus 500 deg F.

F. High-Corrosive-Environment System, Flexible Connectors: Glass fabric with chemical-resistant coating.

1. Minimum Weight: 14 oz./sq. Yd..
2. Tensile Strength: 450 lbf/inch in the warp and 340 lbf/inch in the filling.
3. Service Temperature: Minus 67 to plus 500 deg F.

2.09.01 LOW PRESSURE FLEXIBLE DUCT

A. Core material shall be an acoustical transparent CPE fabric supported by helically wound galvanized steel. The fabric shall be mechanically fastened to the steel helix without the use of adhesive.

B. The internal working pressure rating shall be at least as follows with a bursting pressure of at least 2-1/2 times the working pressure.

1. Positive: 10 inches W.G.
2. Negative: 5 inches W.G.

C. The duct shall be rated for a velocity of at least 5500 feet per minute.

D. Suitable for operating temperatures of at least 250 degrees F.

E. Minimum Acoustic Performance:

1. The insertion loss (dB) of a 10 foot length of duct when tested in accordance with ASTM E 477 at a velocity of 2500 feet per minute shall be at least:

	125 Hz	*250 Hz*	*500 Hz*	*1000 Hz*	*2000 Hz*	*4000 Hz*
8 inch dia.	12	31	40	38	38	23
12 inch dia.	17	35	31	31	28	13

2. The radiated noise reduction (dB) of a 10 foot length of duct when tested in accordance with ASTM E 477 at a velocity of 2500 feet per minute shall be at least:

	125 Hz	*250 Hz*	*500 Hz*	*1000 Hz*	*2000 Hz*	*4000 Hz*
8 inch dia.	10	7	7	8	10	13
12 inch dia.	9	6	6	5	9	13

3. The self generated sound power levels (dB re: 10-12 watts) of a 10 foot length of duct when tested in accordance with ASTM E 477 at a velocity of 1000 feet per minute shall not exceed:

	125 Hz	*250 Hz*	*500 Hz*	*1000 Hz*	*2000 Hz*	*4000 Hz*
8 inch dia.	41	34	27	19	18	21
12 inch dia.	54	45	38	31	27	23

F. Factory insulate the flexible duct with flexible fiberglass insulation. The R value shall be at least 6.0 at a mean temperature of 75 degrees F.

G. Cover the insulation with a reinforced aluminum pigmented vapor barrier jacket having a permeance of not greater than 0.05 perms when tested in accordance with ASTM E96, procedure A.

H. The ductwork shall be UL listed, Class 1 Air Duct and comply with NFPA 90A and 90B.

I. Manufacturer: Flexmaster Type 1M, 8M, Thermaflex #MKE with Thermaflex #Flexflow Elbow, or prior approved equal. Sample required for prior approval.

2.09.02 ACOUSTICAL LOW PRESSURE FLEXIBLE DUCT

A. Core material shall be an acoustical Spun Bond Nylon inner film supported by helically wound galvanized steel. The fabric shall be mechanically fastened to the steel helix without the use of adhesive. The core shall maintain its free area and a center line radius of 1.0 or better.

B. The internal working pressure rating shall be at least as follows with a bursting pressure of at least 2-1/2 times the working pressure.

1. Positive: 6 inches W.G.
2. Negative: 5 inches W.G.

C. The duct shall be rated for a velocity of at least 5500 feet per minute.

D. Suitable for operating temperatures of at least 250 degrees F.

E. Minimum Acoustic Performance:

1. Sound Attenuation - Straight Duct

Flexmaster U.S.A. Flexible Duct	Dia (in.)	Length (ft.)	Insertion Loss, dB Octave Band Center Frequency, Hz						
			63	125	250	500	1,000	2,000	4,000
Type 6	6	12	6.9	36	43	45	47	53	46
		9	5.5	24	28	29	30	33	29
		6	4.0	13	15	15	16	17	16
		3	2.3	4.9	5.3	5.3	5.5	5.8	5.4
		1	0.85	1.36	1.51	1.44	1.55	1.51	1.45
Type 6	8	12	11.3	39	37	46	49	55	49
		9	8.5	25	24	29	31	34	31
		6	5.7	14	13	15	16	18	16
		3	2.9	5.0	4.9	5.4	5.6	5.8	5.6
		1	0.98	1.39	1.37	1.45	1.48	1.52	1.48
Type 6	12	12	10.0	35	33	43	44	55	36
		9	8.1	23	22	28	28	34	24
		6	5.5	13	12	15	15	18	13
		3	2.8	4.8	4.7	5.3	5.3	5.8	4.9
		1	0.96	1.34	1.33	1.43	1.44	1.53	1.36

2. Sound Attenuation - 90º Elbow

Flexmaster U.S.A. Flexible Duct	Dia (in.)	Length (ft.)	Insertion Loss, dB Octave Band Center Frequency, Hz						
			63	125	250	500	1K	2K	4K
Type 6	6	12	21	46	47	52	56	55	55
		9	14	29	30	32	35	34	35
		6	9	15	16	17	18	17	18
		3	3.8	5.4	5.5	5.7	5.9	5.8	5.9
Type 6	8	12	25	44	50	55	50	56	57
		9	17	28	32	34	32	35	36
		6	10	15	16	17	16	18	18
		3	2.4	5.3	5.6	5.8	5.6	5.9	6.0
Type 6	12	12	29	40	43	47	46	49	43
		9	19	26	28	30	29	31	28
		6	11	14	15	16	15	16	15
		3	4.4	5.1	5.3	5.5	5.4	5.6	5.3

F. Factory insulate the flexible duct with flexible fiberglass insulation. The R value shall be at least 6.0 at a mean temperature of 75 degrees F. (R4.2 not acceptable)

G. Cover the insulation with a reinforced aluminum pigmented vapor barrier jacket having a permeance of not greater than 0.05 perms when tested in accordance with ASTM E96, procedure A.

H. The ductwork shall comply with UL Standard 181, as a Class 1 Air Duct and comply with NFPA 90A and 90B.

I. Manufacturer: Flexmaster Type 6M, with Thermaflex #Flexflow Elbow, or prior approved equal. Sample required for prior approval.

1. Maximum length: 12'0".

2.09.03 FLEXIBLE DUCT ELBOW SUPPORTS

A. Flexible Duct Elbow Supports: "FlexRight" (Durable Elbow Support).
   1. Universal-mount, 1-piece, fully adjustable, radius-forming brace to support 4-inch (102-mm) through 16-inch (406-mm) diameter flexible air ducts.
   2. Classified: UL 2043.
   3. Material: 100 percent recycled copolymer polypropylene.
   4. Support Frame Radius: 8 inches.
   5. Compliance for Flexible Duct Radius:
      a. SMACNA HVAC Duct Construction Standards.
      b. ASHRAE Advanced Energy Design Guides.
      c. ADC Flexible Duct Performance and Installation Standards.

B. Manufacturer: Build Right Products (www.BuildRightProducts.com) or prior approved equal.

2.10 ROUND BRANCH TAKEOFF W/ DAMPER TO DIFFUSERS

A. Furnish and install Flexmaster #STOD-BO3 45, Hamlin Sheetmetal, Spiral Pipe of Texas or approved equal degree side take off fittings with dampers for all round ducts connecting to the side of rectangular ducts. Construction shall be 26 gauge, G-90 galvanized steel. Mounting flanges must be pre-punched, 1” wide, and provided with corner clips and adhesive gaskets. Dampers shall have full length 3/8” square shafts connected with U-Bolts, nylon bearings, 2” insulation build outs and Duro Dyne #KR-3, Elgin Quadrant or approved equal heavy duty locking hand quadrants. Spin collar with wing nut dampers not allowed.

2.11 REMOTE ELECTRONIC BALANCING DAMPER ASSEMBLY FOR INACCESSIBLE MANUAL VOLUME DAMPERS

A. Dampers above a hard ceiling, dampers located more then 10’-0” above finished floor, or in any inaccessible location shall be controlled with a remote electronic balancing damper positioner (EBDP). Damper positioner shall include an LCD visual indicator meter that shows blade position modulating over a range of 0-100% open via a voltage signal that is proportional to the blade angle. A non-rechargeable 9v lithium battery powers the positioner. Provide multiple EBDP Positioner as noted on drawing detail.

B. The Electronic Balancing Damper (EBD) shall include a 12V DC motor and a positive feedback control system. When used for shut off, damper shall be provided with blade seals. Damper actuator shall not require electrical power connection.

C. Round dampers shall be constructed of galvanized steel and shall be available in the following sizes and gages:

   4” through 9” (24 gage)

   10” through 16” (20 gage)

D. Rectangular dampers shall be constructed of .050 aluminum extrusion frames and blades with reinforcing channels. Dampers shall be available in the following sizes:

   Min size = 4” x 3”

   Max size = 24” x 24”

E. Damper actuator shall be connected to a wall plate available in 1,2,4,6, and 12 ports. This wall plate shall be installed in an accessible space, preferably above a lay in ceiling, or as noted on drawings. Connecting cable shall be plenum rated 5 conductor wire. This cable shall be provided by the manufacturer of the remote damper system. Field connection between 12V DC motor (Delphi end) and termination wall plate (RJ-12 end) shall be accomplished by connectors installed on the cable by the factory. Standard cable lengths shall be 10’, 25’, and 50’ with longer lengths up to 1000’ where required.

F. The remote electronic balancing damper, wall plate, cable, and remote positioner shall be as manufactured by Young Regulator EBD series.

2.12 MISCELLANEOUS SHEETMETAL AND DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

C. Auxiliary Drain Pans: Fabricate of 12-gauge galvanized steel (seamless) turned up four (4) inches all around and extend six (6) inches beyond all sides of equipment (air handling units, hot water heaters, etc.). Size of auxiliary drain pans to be based on equipment size maintaining minimum 6" clearance all around. Provide float switch in auxiliary drain pan, unit to de-energize when tripped.

2.13 SMOKE DAMPERS

A. General: Smoke Dampers meeting the following specifications shall be furnished and installed where shown on plans and/or as described in schedules, and at all rated wall duct penetrations (refer to architectural life safety plan). Dampers shall meet the requirements of NFPA 92A, 92B, 101 & 105 and further shall be tested, rated, and labeled in accordance with the latest edition of UL Standards 555S. Dampers shall have a low leakage design qualified to UL555S Leakage Class I.

B. Each damper /actuator combination shall have a UL555S elevated temperature rating of 350 F degree minimum and shall be operational at maximum design air flow at its installed location. Each damper shall be supplied with an appropriate actuator installed by the damper manufacturer at the time of damper fabrication. Damper actuator shall be electric type for 24 volt AC, 2-position operation.

C. Damper blades shall be 16 ga galvanized steel 3V type with three longitudinal grooves for reinforcement. Damper frame shall be galvanized steel formed into a structural hat channel shape with reinforced corners. Bearings shall be sintered bronze sleeve type rotating in polished extruded holes in the damper frame. Blade edge seals shall be silicone rubber designed to inflate and provide a tighter seal against leakage as pressure on either side of the damper increases. Jamb seals shall be stainless steel compression type. Blades shall be completely symmetrical relative to their axle pivot point, presenting identical resistance to airflow in either direction or pressure on either side of the damper. Airfoil blades shall be provided for all dampers with airflow velocities greater than 2000 FPM.

D. The Damper Manufacturer's submittal data shall certify all air performance pressure drop data is licensed in accordance with the AMCA Certified Ratings Program for Test Figures 5.2, 5.3, and 5.5. Damper air performance data shall be developed in accordance with the latest edition of AMCA Standard 500-D. Dampers shall be labeled with the AMCA Air Performance Seal.

E. Damper must be rated for mounting vertically (with blades running horizontal) or horizontally and be UL 555S rated for leakage and airflow in either direction through the damper.

F. The basis of design is Greenheck Model SMD-201 (for ducts with velocities up to 2000 FPM and systems with pressure ratings of 4” w.g. or 6” w.g.) or Greenheck Model SMD-301 (for ducts with velocities greater than 2000 FPM and up to 4000 FPM and systems with pressure ratings of 4” w.g., 6” w.g. and up to 8” w.g.) or prior approved equal.

G. All smoke dampers shall be provided with the following:

1. Minimum 20 gauge galvanized sleeve.
2. All ductwork housing smoke dampers shall be equipped with access door of sufficient size for damper maintenance and to reset and test actuation of smoke damper. All smoke dampers located in facility have to be check and tested every three (3) years, access doors of sufficient size are mandatory to check operation of smoke dampers, refer to paragraph 3.1 of this specifications for require sizes of access doors, this will be based in actual size of ductwork.
3. Smoke dampers/sleeves must be sealed to a seal class A.
4. All smoke dampers must be rated to 4" w.g. or 6” w.g. (depending on the duct system construction specified) and include velocity ratings that meet or exceed the actual velocity at the smoke damper.
5. Unless otherwise noted, all smoke dampers must fail to the closed position.
6. All smoke dampers must be supplied with single point wiring for damper and specified test switches.
7. All smoke dampers shall be provided with model OCI blade position indicator. Actuator end switches are not a replacement for blade position indicator switches.

8. All smoke dampers must be provided with a factory wired and installed Greenheck #GTS-3 test switch with open/closed LED lights to enable one person to test the damper. Contractor must ensure test switch is accessible.
9. Step-Down transformers: Include to transform from available voltage, single phase to 24V, single phase which comply with UL, FM NFPA Requirements for smoke control systems. Coordinate with Electrical Contractor prior to bid as to ensure a complete and working system.
10. Smoke dampers located in all round ducts and in oval ducts with a minor axis less than 14" shall be supplied as square or rectangular dampers. The minimum damper size shall be 14" x 14" to allow for a minimum 12x12 duct access door for service and maintenance of internal smoke damper components. The sheet metal contractor shall provide and install square/rectangle to round/oval transitions as required.
11. Smoke dampers located in square/rectangular ducts 12x12 and smaller shall be supplied as 14x14 dampers. The sheet metal contractor shall provide transitions from the damper to the duct size shown, as required.
12. Where required for complete access to all damper components, sheet metal contractor shall provide an easily removable section of duct, length as required.
13. Provide a smoke damper schedule with submittal data to include the following information:
    a. Plan Page
    b. Room Number
    c. Duct system served (Exhaust, supply, primary supply, return)
    d. Damper Tag

    (Example #1: SMD-1-AHU 1-Rm #___)

    (Example #2: SMD-2-EF-1-Rm #____)
    e. Damper Size
    f. Manufacturer's Model #_____
    g. Install Arrangement (Vertical or Horizontal)
    h. Wall/Floor thickness
    i. Sleeve Length
    j. Sleeve gage
    k. Actuator voltage/action - 24 volt AC / PO/SR (Power Open/Spring Closed)
    l. CFM through damper
    m. Duct airflow velocity
    n. Damper velocity rating
    o. Duct access door size

H. Contractor to coordinate with electrical contractor and fire alarm contractor (prior to bid and after award of project) to ensure a complete working and accessible system is installed. Smoke detectors shall be provided & installed by the fire alarm contractor to notify the fire alarm panel in the event of an alarm. Control of smoke damper is by the fire alarm contractor.

2.14 COMBINATION FIRE/SMOKE DAMPERS

A. Combination Fire Smoke Dampers meeting the following specifications shall be furnished and installed where shown on plans and/or as described in schedules and at all rated wall duct penetrations (refer to architectural life safety plan). Dampers shall meet the requirements of NFPA 80, 90A, 92A, 92B, 101 & 105 and further shall be tested, rated, and labeled in accordance with the latest edition of UL Standards 555 and 555S. Dampers shall have a UL555 fire rating of 1 1/2 hours and be of low leakage design qualified to UL 555S Leakage Class I.

B. Each damper /actuator combination shall have a UL555S elevated temperature rating of 350 F minimum and shall be operational and dynamic rated to operate at maximum design air flow at its installed location. Each damper shall be supplied with an appropriate actuator installed by the damper manufacturer at the time of damper fabrication. Damper actuator shall be electric type for 24 volt AC, 2-position operation.

C. Damper blades shall be 16 ga galvanized steel 3V type with three longitudinal grooves for reinforcement. Damper frame shall be 16 ga. galvanized steel formed into a 5” x 1” structural hat channel. Dampers less than 17” high shall utilize low profile geometry and 20 ga. galvanized steel for the top and bottom frame members to maximize free area. Frame shall be 4-piece construction with 1 ½” (minimum) integral overlapping gusset reinforcements in each corner to assure square corners and provide maximum resistance to racking. No welding of damper frames shall be permitted. Bearings shall be stainless steel sleeve type rotating in polished extruded holes in the damper frame. Blade edge seals shall be silicone rubber designed to inflate and provide a tighter seal against leakage as pressure on either side of the damper increases. Jamb seals shall be stainless steel compression type. Blades shall be completely symmetrical relative to their axle pivot point, presenting identical resistance to airflow in either direction or pressure on either side of the damper. Airfoil blades shall be provided for all dampers with airflow velocities greater than 2000 FPM.

D. The Damper Manufacturer's submittal data shall certify all air performance pressure drop data is licensed in accordance with the AMCA Certified Ratings Program for Test Figures 5.2, 5.3, and 5.5. Damper air performance data shall be developed in accordance with the latest edition of AMCA Standard 500-D. Dampers shall be labeled with the AMCA Air Performance Seal.

E. Damper must be rated for mounting vertically (with blades running horizontal) or horizontally and be UL 555S rated for leakage and airflow in either direction through the damper. Each damper shall be supplied with a 165 F RRL/OCI (reusable resettable link with blade position indicator package). Actuator end switches are not a replacement for blade position indicator switches.

F. The basis of design is Greenheck model FSD-211 (for ducts with velocities up to 2000 FPM and systems with pressure ratings of 4” w.g. or 6” w.g.) or Greenheck Model FSD-311 (for ducts with velocities greater than 2000 FPM and up to 4000 FPM and systems with pressure ratings of 4” w.g., 6” w.g. and up to 8” w.g.) or prior approved equal. Combination fire/smoke dampers located in 3 hour or greater walls shall be Greenheck #FSD-311 or prior approved equal.

G. All combination/fire smoke dampers shall be provided with the following:

1. Minimum 16 gauge galvanized sleeve for sizes up to 36" wide and/or 24" high. Minimum 14 gauge galvanized sleeve for sizes over 36" wide and/or 24" high.
2. All ductwork housing smoke/fire dampers shall be equipped with access door of sufficient size for damper maintenance and to reset and test actuation of smoke damper and/or rest the fusible link. All smoke dampers located in facility have to be check and tested every three (3) years, access doors of sufficient size are mandatory to check operation of smoke dampers, refer to paragraph 3.1 of this specifications for require sizes of access doors, this will be based in actual size of ductwork. Where required for complete access to all damper components, sheet metal contractor shall provide an easily removable section of duct, length as required.
3. Combination fire/smoke dampers and sleeves must be sealed to a seal class A.
4. Combination fire/smoke dampers must be rated to 4" w.g. and include velocity ratings that meet or exceed the actual velocity at the smoke damper.
5. Unless otherwise noted, all combination fire/smoke dampers must fail to the closed position.
6. All combination fire/smoke dampers must be supplied with single point wiring for damper and specified test switches.
7. All combination fire/smoke dampers shall be provided with model RRL/OCI (reusable resettable link with blade position indicator package). Actuator end switches are not a replacement for blade position indicator switches.
8. All combination fire/smoke dampers must be provided with a factory wired and installed Greenheck #GTS-3 test switch with open/closed LED lights to enable one person to test the damper. Contractor must ensure test switch is accessible.
9. Step-Down transformers: Include to transform from available voltage, single phase to 24V, single phase which comply with UL, FM NFPA Requirements for smoke control systems. Coordinate with Electrical Contractor prior to bid as to ensure a complete and working system.

10. Combination fire/smoke dampers located in all round ducts and oval ducts with a minor axis less than 14” shall shall be supplied as square or rectangular dampers. The minimum damper size shall be 14” x 14” to allow for a minimum 12x12 duct access door for service and maintenance of internal smoke damper components. The sheet metal contractor shall provide and install square/rectangle to round/oval transitions as required.
11. Smoke dampers located in square/rectangular ducts 12x12 and smaller shall be supplied as 14x14 dampers. The sheet metal contractor shall provide transitions from the damper to the duct size shown, as required.
12. Where required for complete access to all damper components, sheet metal contractor shall provide an easily removable section of duct, length as required.
13. Provide a combination fire/smoke damper schedule with submittal data to include the following information:
    a. Plan Page
    b. Room Number
    c. Duct system served (Exhaust, supply, primary supply, return)
    d. Damper Tag

    (Example #1: SMD-1-AHU 1-Rm #___)

    (Example #2: SMD-2-EF-1-Rm #____)
    e. Damper Size
    f. Manufacturer’s Model #_____
    g. Install Arrangement (Vertical or Horizontal)
    h. Wall/Floor thickness
    i. Sleeve Length
    j. Sleeve gage
    k. Actuator voltage/action - 24 volt AC / PO/SR (Power Open/Spring Closed)
    l. CFM through damper
    m. Duct airflow velocity
    n. Damper velocity rating
    o. Duct access door size

H. Contractor to coordinate with electrical contractor and fire alarm contractor (prior to bid and after award of project) to ensure a complete working and accessible system is installed. Smoke detectors shall be provided & installed by the firm alarm contractor to notify the fire alarm panel in the event of an alarm. Control of smoke damper is by the fire alarm contractor.

2.15 CEILING FIRE SMOKE DAMPER

A. Not used.

2.16 INSULATED MEDIUM AND HIGH PRESSURE DUCT

A. Provide where indicated on drawings Flexmaster Type 4M UL181 Class I Air Duct. Approved equal: Thermaflex model MK-C or prior approved equal. The duct shall be constructed of a heavy coated fiberglass cloth fabric supported by helical wound galvanized steel. The fabric shall be mechanically locked to the steel helix without the use of adhesives or chemicals. The internal working pressure rating shall be at least 12" w.g. positive and 5" w.g. negative with a bursting pressure of at least 2½ time the working pressure. The duct shall be rated for a velocity of at least 5500 feet per minute. The duct must be suitable for continuous operation at a temperature range of -20° F to +250° F.

B. Factory insulate the flexible duct with fiberglass insulation. The R value shall be at least 6 minimum (R-4.2 is not acceptable) at a mean temperature of 75° F.

C. Cover the insulation with a fire retardant metalized vapor barrier jacket reinforced with crosshatched scrim having a permeance of not greater than 0.05 perms when tested in accordance with ASTM E96, Procedure A.

D. Maximum length: 1'0".

2.17 BAG IN/ BAG OUT HEPA FILTER HOUSING & FILTER

A. Not used.

2.18 ABSORPTIVE SILENCERS

A. General - Furnish and install Price Silencers of the sizes, configuration and performance as described on plans and / or absorptive silencer schedules. Silencer inlet and outlet connections shall be equal to the duct sizes shown on the drawings. Duct transitions shall be provided by the contractor and are not permitted unless shown on the drawings and approved by the engineer. If discrepancies between the suggested specifications and the silencer schedule occur, the latter takes precedence.

1. Performance - Silencer performance characteristics, including insertion loss, pressure drop, and generated noise, shall be attained through testing in accordance with the latest ASTM E477 test standard for acoustical duct silencers. Performance data shall be obtained from the manufacturer's NVLAP accredited laboratory. Laboratory performance verification in the manufacturer's test facility may be requested, in which case a comparative test report shall be made available to the engineer.
2. Submittal - Manufacturer's performance data for dynamic insertion loss, generated noise and pressure drop shall be provided and shall be obtained in accordance with ASTM E477-13. Data for each scheduled silencer shall be provided with the size, configuration, air volume and air flow direction as it appears on the drawing and / or schedule.

B. Construction

1. Absorptive Silencers shall consist of solid steel casings, perforated sheet metal liners, absorptive acoustic fiberglass media, and fiberglass cloth as required. Suggested construction gauges are a minimum Stainless Steel or Aluminum gauges shall be adjusted accordingly.
2. Absorptive Rectangular Silencers: RL, RM, RH, RLX, RMX, RHX.
3. Absorptive Elbow Silencers: ERM, ERMX.
4. (Standard) Construction Class 1: 22ga galvanized casing / 26ga galvanized perforated liner.
5. Construction Class 2: 18ga galvanized casing / 26ga galvanized perforated liner.
4. High Transmission Loss 1: 16ga galvanized casing / 26ga galvanized perforated liner.
5. High Transmission Loss 2: 10ga galvanized casing / 26ga galvanized perforated liner.
6. High Transmission Loss 3: For critical applications where high transmission loss is required, custom HTL3 construction shall be specified by the designing manufacturer to meet project requirements.
7. Absorptive Circular Silencers: CH

Connection Diameter		Minimum Casing Gauge
Min	Max	
6	20	22
6	44	18
6	60	16

8. Construction Class 1: 22ga galvanized casing / 26ga galvanized perforated liner.
9. Construction Class 2: 18ga galvanized casing / 26ga galvanized perforated liner.
10. Construction Class 3: 16ga galvanized casing / 26ga galvanized perforated liner.
11. Acceptable methods of fastening include button lock, Pittsburgh lock and welds. In situations where these methods are not feasible, rivets can be used. Screws or other types of mechanical fasteners will not be acceptable.
12. The silencer perforated liners shall be rigidly fastened to the casing of the silencer on both ends, and attached to the outer casing with a minimum of two stiffeners.

    a. Acoustic Media - Acoustic media shall be shot-free inorganic glass fiber with long, resilient fibers, bonded with thermosetting resin. Glass fiber shall be packed with a

minimum 10% compression to eliminate voids and settling; density shall be consistent with that used to generate cataloged test data.

b. Fiberglass Cloth - For absorptive silencers with internal velocities that exceed 4000 fpm, a fiberglass cloth shall be added to the silencer between the internal perforated liner and the acoustic media to protect the media from erosion. If Fiberglass Cloth Bagged is required, the acoustic media will be fully encapsulated.

c.. Combustion Ratings - Combustion ratings for acoustic media shall be equal to or less than the combustion ratings noted below when tested in accordance with ASTM E84, UL723 and NFPA255.

d. Flame Spread Classification: < 25

e. Smoke Development Rating: < 50

2.19 SECURITY DUCT/BARRIER BARS

A. Not used.

PART 3 EXECUTION

3.01 APPLICATION AND INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Provide duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

D. Install volume dampers in ducts with liner; avoid damage to and erosion of duct liner.

E. Provide balancing dampers at points on supply, return, and exhaust systems where branches lead from larger ducts as required for air balancing. Install at a minimum of two duct widths from branch takeoff.

F. Provide test holes at fan inlets and outlets and elsewhere as indicated.

G. Install fire and smoke dampers, with fusible links, according to manufacturer's UL-approved written instructions.

H. Install duct silencers independent of ducts with flexible duct connectors.

I. Install duct access doors to allow for inspecting, adjusting, and maintaining accessories and terminal units as follows:

1. On both sides of duct coils.
2. Downstream from volume dampers, turning vanes, and equipment.
3. Adjacent to fire or smoke dampers, providing access to reset or reinstall fusible links.
4. To interior of ducts for cleaning; before and after each change in direction, at maximum 40-foot spacing.
5. On sides of ducts where adequate clearance is available.
6. Install the following sizes for duct-mounting, rectangular access doors:
   a. One-Hand or Inspection Access: 8 by 5 inches.
   b. Two-Hand Access: 12 by 6 inches.
   c. Head and Hand Access: 18 by 10 inches.
   d. Head and Shoulders Access: 21 by 14 inches.
   e. Body Access: 25 by 14 inches.
   f. Body Plus Ladder Access: 25 by 17 inches.
7. Install the following sizes for duct-mounting, round access doors:
   a. One-Hand or Inspection Access: 8 inches in diameter.
   b. Two-Hand Access: 10 inches in diameter.

c. Head and Hand Access: 12 inches in diameter.

d. Head and Shoulders Access: 18 inches in diameter.

e. Body Access: 24 inches in diameter.

8. Install the following sizes for duct-mounting, pressure relief access doors:

a. One-Hand or Inspection Access: 7 inches in diameter.

b. Two-Hand Access: 10 inches in diameter.

c. Head and Hand Access: 13 inches in diameter.

d. Head and Shoulders Access: 19 inches in diameter.

9. Label access doors according to Division 23 05 53 Section "Mechanical Identification."

J. Install flexible connectors immediately adjacent to equipment in ducts associated with fans and motorized equipment supported by vibration isolators.

K. For fans developing static pressures of 5-inch wg and higher, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

L. Connect terminal units to supply ducts with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.

M Low Pressure Flexible Duct Length Limitation: Connect diffusers to low pressure ducts with maximum 36-inch lengths of flexible duct clamped or strapped in place. Coordinate with owner/architect/engineer for locations requiring 10'-0" of flex duct for owner air device relocation flexibility.

N. Acoustical Low Pressure Flexible Duct Length Limitation: Connect diffusers to acoustical low pressure ducts with maximum 12’-0” lengths of flexible duct clamped or strapped in place.

O. Connect flexible ducts to metal ducts with draw bands.

P. Install duct test holes where indicated and required for testing and balancing purposes.

Q. Not used.

R. HEPA filter housing to be installed in strict accordance with manufacturers recommendation.

S. Not used.

T. Install flexible duct elbow supports at all flexible duct connections to air devices, typical entire project. Install in accordance with manufacturer’s instructions. Install over outer flexible ducts to form smooth, 90° bends to eliminate flexible duct kinks and airflow restrictions. Make bends in flexible ducts with minimum of 1-duct diameter centerline radius.

U. Not used.

3.02 ADJUSTING

A. Adjust duct accessories for proper settings.

B. Adjust fire and smoke dampers for proper action.

C. Final positioning of manual-volume dampers is specified in Division 23 Section 23 05 93 "Testing, Adjusting and Balancing."

3.03 FIRE, SMOKE, FIRE/SMOKE DAMPER FIELD VERIFICATION

A. Fire dampers, smoke dampers, & combination fire/smoke dampers shall not be ordered and delivered to the site until field measurements have been taken and ceiling space has been coordinated with other trades. Figure in bid rush delivery for all fire, smoke, & combination fire/smoke dampers in bid in order to accommodate construction schedule. No exception.

END OF SECTION

8-21-26

SECTION 23 3400 - AIR DISTRIBUTION EQUIPMENT (FANS)

PART 1 - GENERAL

1.1 GENERAL

A. Fan Accessories

B. In-Line Fans

C. Cabinet Fans

RELATED WORK

A. Section 20 0100: General Provisions

B. Section 23 3100: Metal Ductwork

1.2 QUALITY ASSURANCE

A. Conform to AMCA bulletins regarding construction and testing and bear AMCA certified rating seal.

1.3 SUBMITTALS

A. Submit shop drawings and product data.

B. Submit curves showing operating point plotted on curve.

C. Submit manufacturer's printed installation instructions.

PART 2 - PRODUCTS

2.1 GENERAL

A. Drives: V-belt drives shall be designed for not less than 150% of connected driving capacity and motor sheaves shall be adjustable to provide not less than 20% speed variation. Sheaves shall be selected to drive the fan at a speed to produce the scheduled capacity indicated on the drawings when set at the approximate midpoint of the sheave adjustment. Motors with V-belt drives shall be provided with adjustable bases.

B. Disconnects: Safety disconnect switches shall conform to requirements of division 26 - Electrical.

2.2 SELECTING AND BALANCING

A. Provide fans capable of accommodating static pressure variations of plus or minus ten percent.

B. Statically and dynamically balance fans to eliminate vibration or noise transmission to occupied areas of building.

C. Provide safety grille where inlet or outlet is exposed of aluminum wire guard construction. Provide belt guards on all belt-driven fans where drive is exposed.

D. Integral roof mounted and/or wall mounted fans to have aluminum dome type housing, and of all aluminum construction.

E. Fans shall be tested and rated in accordance with AMCA 210.

2.3 CABINET TYPE FANS

1. Provide cabinet type fan of type, size and capacity as scheduled in the plans and herein specified. Fans shall be A.M.C.A. certified and all fans shall bear the A.M.C.A. Certified Rating Seal. Centrifugal Fan Unit: V-belt or direct driven, with galvanized steel housing lined with 1/2" acoustic insulation, resilient mounted motor, gravity backdraft damper in discharge.

2. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protection motor and solid state speed controller.

3. Grille (Ceiling Mount Fans): Molded white aluminum grille with baked white enamel finish.

4. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings. Fan motor shall be suitably grounded and mounted on vibration isolators.
5. Direct drive fans shall be provided with an electronic speed controller.
6. Fan to be Greenheck model SP-A or approved equal.

2.4 IN-LINE FANS

1. Fans shall be in-line cabinet type with square or rectangular housing and backdraft damper. Fan shall be designed for horizontal or vertical mounting. Where indicated on the drawings to be spark resistant, fans shall comply with AMCA 99-401 for type B construction.
2. Fan housing shall be steel with factory applied baked enamel paint on exterior. Housing shall be internally insulated with 1/2" thk. (minimum) coated fiberglass insulation. Insulation shall comply with ASTM E84 and NFPA 255 for maximum ratings of flame - 25 and smoke - 50. housing shall have mounting brackets at each corner.
3. Fan wheel shall be backward inclined centrifugal type with aluminum construction. On belt driven units, shaft bearings shall be self-aligning, pillow block ball type. Bearings not permanently sealed and lubricated shall have grease fittings.
4. Where fan is indicated to be spark resistant, motor shall be explosion proof type. motor and drive shall be mounted on vibration isolators. Fan shall have a factory installed disconnect switch mounted on exterior of housing and pre-wired to fan motor.
5. Direct driven fans shall be provided with an electronic speed controller.
6. Greenheck model SQ or BSQ, refer to schedules.

PART 3 - EXECUTION

3.1 INSTALLATION:

1. Supply and install sheaves as necessary for final air balancing.
2. Set roof mounted fans on factory fabricated all-welded aluminum curbs, minimum 18" high. Provide acoustical insulation on roof curb and on fan inlet plenum.
3. Install fans as per manufacturer's recommendations.
4. Provide manual volume damper within exhaust air discharge ductwork, applicable all cabinet fans.
5. In-line centrifugal fan units shall be supported as indicated on detail (all corners) in drawings. All supports shall be equipped with vibration isolators (spring type).
6. Secure rooftop fan assemblies to curbs with minimum 1/4" diameter, stainless steel hex-head lag screws with cadmium-plated washers; provide minimum 2 lag screws per side, but no less than one for each factory-drilled hole provided by the fan manufacturer.
7. Provide complete structural, mechanical, and electrical connections and install in strict accordance with manufacturer's recommendations.
8. Hoods to be built in compliance with the following codes and standards: NFPA 96, SBCCI, UL #710, BOCA, UMC, & NSF #2.

3.02. MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, including technical bulletins, product catalog installation instructions

3.03. EXAMINATION

A. Examine areas to receive fans. Notify the Engineer of conditions that would adversely affect installation or subsequent utilization and maintenance of fans. Do not proceed with installation until unsatisfactory conditions are corrected

3.04. PREPARATION

A. Ensure roof openings are square, accurately aligned, correctly located, and in tolerance

B. Ensure duct is plumb, sized correctly, and to proper elevation above roof deck. Install duct as specified in Air Distribution (Division 23)

3.05. INSTALLATION

A. Install fans system as indicated on the Installation, Operation and Maintenance Manual (IOM) and contract drawings

B. Install fans in accordance with manufacturer's instructions

3.06. SYSTEM STARTUP

A. Refer to Installation, Operation, and Maintenance Manual (IOM)

3.07. ADJUSTING

A. Adjust exhaust fans to function properly

B. Adjust Belt Tension

C. Lubricate bearings

D. Adjust drive for final system balancing

E. Check wheel overlap

3.7. CLEANING

A. Clean as recommended by manufacturer. Do not use material or methods which may damage finish surface or surrounding construction

3.8. PROTECTION

A. Protect installed product and finished surfaces from damage during construction

B. Protect installed exhaust fans to ensure that, except for normal weathering, fans will be without damage or deterioration at time of substantial completion

END OF SECTION
8-21-26

SECTION 23 3500 - AIR PURIFICATION SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This section describes the design, performance and installation of an air purification system intended for use as part of another manufacturer's air handling unit or mounted on the duct as shown on the plans, details and/or equipment schedules.

1.2 REFERENCED CODES & STANDARDS

A. The following codes and standards are referenced through out. The edition to be used is that currently enforced by the authority having jurisdiction (AHJ) or in absence of such direction that referenced by the current enforceable IBC code or as indicated by the contract documents, except where specifically referenced by this section of the specifications.

1. ASHRAE Standards 62 & 52
2. National Electric Code NFPA 70
3. UL 867 including ozone chamber test required as of December 21, 2007
4. UL 2998 Environment – No Ozone Certification
5. The cold plasma equipment and power supply shall be UL listed.
6. The technology shall have been tested to DO-160 by an independent lab and successfully passed all requirements for shock, vibration, EMF and line noise. Manufacturers not tested to DO-160 shall not be acceptable. DO-160 is normally used to test devices in aviation applications, but this standard is applicable to confirm EMF and line noise in HVAC applications.

1.3 RELATED WORK

A. Testing, Adjusting and Balancing
B. Facility Access and Protection
C. Ductwork
D. Filters
E. Water and Refrigerant Piping
F. Electrical Wiring
G. Control Wiring

1.4 QUALITY & IP ASSURANCE

A. Basis of design is Global Plasma Solutions. All other manufacturers requesting prior approval must submit product drawings, specifications and test results specified in section 2.2 at least four weeks prior to bid date.

B. The Air Purification System shall be a product of an established manufacturer within the USA. Direct Current (DC) Ion modules manufactured outside the USA and assembled in the USA on mounting plates or formed channels shall not be acceptable.

C. A qualified representative from the manufacturer shall be available to inspect the installation of the air purification system to ensure installation in accordance with manufacturer's recommendation.

D. Technologies that do not address gas disassociation such as UV Lights, Powered Particulate Filters and/or polarized media filters shall not be considered. Uni-polar ion generators shall not be acceptable. "Plasma" particulate filters shall not be acceptable. Any system containing titanium dioxide (Ti02), which has been listed by the CDC as a known carcinogen, shall not be acceptable.

E. Projects designed using ASHRAE Standard 62, IAQ Procedure shall require the manufacturer to provide Indoor Air Quality calculations using the formulas within ASHRAE Standard 62.1-2007 to validate acceptable indoor air quality at the quantity of outside air scheduled with the technology submitted. The manufacturer shall provide independent test data on a previous installation performed within the last two years and in a similar application, that proves compliance to ASHRAE 62 and the accuracy of the calculations. The data shall be based on the manufacturer's use of the same make and model number as the equipment submitted on this project.

F. The Air Purification Technology shall have been tested by UL to prove conformance to UL 867-2007 including the ozone chamber testing and peak ozone test for electronic devices. Manufacturers that achieved UL 867 prior to December 21, 2007 and have not been tested in accordance with the newest UL 867 standard with the ozone amendment shall not be acceptable. All manufacturers requesting prior approval shall submit their independent UL

867 test data with ozone results to the engineer for preliminary review and during the submittal process. All manufacturers shall submit a copy with their quotation. Contractors shall not accept any proposal without the proper ozone testing documentation.

G. The maximum allowable ozone concentration per the UL 867-2007 chamber test shall be 0.001 PPM. The maximum peak ozone concentration per the UL 867-2007 peak test as measured 2 inches away from the electronic air cleaner's output shall be no more than 0.001 PPM. Manufacturers with ozone output exceeding these ozone values shall not be acceptable.

H. All manufacturers shall have their product tested to UL 2998 Environmental Standard for confirmation of no ozone with certificate available. The final report shall indicate the ozone levels and high voltage output the device's electrode(s) were operating during the test. Reports that do not include high voltage output during the UL 2998 testing shall not be acceptable.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data for ion generators including:
   1. Schedule of plasma generators indicating unit designation, number of each type required for each unit/application.
   2. Data sheet for each type of plasma generator, and accessory furnished; indicating construction, sizes, and mounting details.
   3. Performance data for each type of plasma device furnished.
   4. Indoor Air Quality calculations using the formulas within ASHRAE Standard 62.1-2007 to validate acceptable indoor air quality at the quantity of outside air Scheduled (when projects are designed with outside air reduction).
   5. Product drawings detailing all physical, electrical and control requirements.
   6. Copy of UL 867 independent ozone test.
   7. Copy of UL 2998 conformance certificate.
   8. Statement on the manufacturer's letterhead stating that the technology contains no titanium dioxide (Ti02).

B. Operating & Maintenance Data: Submit O&M data and recommended spare parts lists.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver in factory fabricated shipping containers. Identify on outside of container type of product and location to be installed. Avoid crushing or bending.

B. Store in original cartons and protect from weather and construction work traffic.

C. Store indoors and in accordance with the manufacturers' recommendation for storage.

1.7 WARRANTY

A. Equipment shall be warranted by the manufacturer against defects in material and workmanship for a period of thirty-six months after shipment or eighteen months from owner acceptance, whichever occurs first. Labor to replace equipment under warranty shall be provided by the owner or installing contractor.

PART 2 - PRODUCTS

2.1 GENERAL

A. The air purification system(s) shall be of the size, type, arrangement and capacity indicated and required by the unit furnished and shall be of the manufacturer specified.

B. Basis of Design: Global Plasma Solutions

C. All other Suppliers of comparable products requesting prior approval shall:
   1. Submit for prior approval four weeks in advance in accordance with the requirements of Section 20 0100.
   2. In addition, manufacturers submitting for prior approval for Bi-Polar Ionization must as part of the prior approval request provide their ASHRAE 62.1-2007 calculations that prove conformance to the ASHRAE Standard with the reduction of outside air to the scheduled values. A letter on the manufacturer's letterhead requesting prior approval must accompany the request for prior approval stating their calculations are ASHRAE compliant. A third party validation study performed on a previous installation of the same application using the same make and model equipment shall also be included.
   3. Submit independent test data from UL showing ozone levels produced during the UL 867 ozone chamber test. Manufacturers without this test data shall not be acceptable.

4. Submit UL 2998 Environmental Claim Certificate proving no ozone output.
5. Submit pathogen testing per section 2.2.
6. Submit at least two other end user references in the same application with contact phone number, email, equipment used and application for the equipment at that facility. Manufacturers not having the above references in similar applications using the same equipment models as proposed on the current project shall not be acceptable.
7. Ionization bars manufactured using DC output ionization modules shall not be permitted due to corrosion, ion short-circuiting, and intermittent coil coverage and shock hazard.
8. Ionization bars manufactured using ion modules not having epoxy coating all circuit boards and internal components shall not be acceptable.
9. Manufacturers submitting as an alternate shall include their DO-160 test results.
10. It is the responsibility of any alternate manufacturer and mechanical contractor proposing an alternate to the basis of design to confirm any proposed substituted product does not infringe on the patented intellectual property of the basis of design. The engineer and owner recognize the basis of design holds multiple patents and multiple patents are pending.

2.2 BI-POLAR IONIZATION DESIGN & PERFORMANCE CRITERIA

A. Each piece of air handling equipment, so designated on the plans, details, equipment schedules and/or specifications shall contain a Plasma Generator with Bi-polar Ionization output as described here within.

B. The Bi-polar Ionization system shall be capable of:
1. Effectively killing microorganisms downstream of the bi-polar ionization equipment (mold, bacteria, virus, etc.).
2. Controlling gas phase contaminants generated from human occupants, building structure, furnishings and outside air contaminants.
3. Capable of reducing static space charges.
4. Effectively reducing space particle counts.
5. When mounted to the air entering side of a cooling coil, keep the cooling coil free from pathogen and mold growth.
6. All manufacturers shall provide documentation by an independent NELEC accredited laboratory that proves the product has minimum kill rates for the following pathogens given the allotted time and in a space condition:
   A. MRSA - >96% in 30 minutes or less
   B. E.coli - > 99% in 15 minutes or less
   C. TB - > 69% in 60 minutes or less
   D. C. diff - >86% in 30 minutes or less
   E. Noro Virus -> 93.5% in 30 minutes or less
   F. Legionella -> 99.7% in 30 minutes or less

   Manufacturers not providing the equivalent space kill rates shall not be acceptable. All manufactures requesting prior approval shall provide to the engineer independent test data from a NELAC accredited independent lab confirming kill rates and time meeting the minimum requirements stated in section 2.2 B, points 6A, 6B and 6C. Products tested only on Petri dishes to prove kill rates shall not be acceptable. Products being sold under different trade names than those tested shall not be acceptable.
7. Capable of modular field assembly in six inch (150mm) sections.

C. The bi-polar ionization system shall operate in a manner such that equal amounts of positive and negative ions are produced. Uni-polar ion devices shall not be acceptable. Ionizers with positive and negative output (DC type) shall not be acceptable. All ionizers provided shall be AC type ionizers with one electrode pulsing between positive and negative.
1. Air exchange rates may vary through the full operating range of a constant Volume or VAV system. The quantity of air exchange shall not be increased due to requirements of the air purification system.
2. Velocity Profile: The air purification device shall not have maximum velocity profile.

D. Humidity: Plasma Generators shall not require preheat protection when the relative humidity of the entering air exceeds 85%. Relative humidity from 0 - 100%, condensing, shall not cause

damage, deterioration or dangerous conditions within the air purification system. Air purification system shall be capable of wash down duty.

E. Equipment Requirements:

1. Electrode Specifications (Bi-polar Ionization):
   a. Each alternating current (AC) Ionization Bar with Bi-polar Ionization output shall include a minimum of eighteen carbon fiber cluster ion needles per foot of coil face width shall be provided. The entire cooling coil width shall have equal distribution of ionization across the face. Systems without ion needles at least 0.50" (12.5mm) apart shall not be acceptable. The plasma electrode shall require no more than 1.0" (25mm) in the direction of airflow for mounting. All hardware required for mounting shall be provided by the air purification manufacturer except self-tapping screws for the power supply. Bi-polar ionization tubes manufactured of glass and steel mesh shall not be acceptable due to replacement requirements, maintenance, and performance output reduction over time, ozone production and corrosion.
   b. Electrodes shall be provided in 6.0" (150mm) increments, epoxy filled for an IP55 rating and utilizing brass connection hardware that is recessed into the connection joint once fully engaged and assembled.
   c. Electrodes shall be energized when the main unit disconnect is turned on.
   d. The ionization output shall be a minimum of 60 million ions/cc per inch of cooling coil width as measured 1 inch from the cold plasma needles.
   e. Ionization bars shall be provided with magnet mounting kits to prevent penetration into cooling coils.
   f. Ionization bars shall be constructed of UL 94VO and UL746C composite material.

F. Air Handler & Plenum Mounted Units (non-ductless mini-split units):

1. Plasma Generator(s) shall be supplied and installed at all air handling systems. The mechanical contractor shall mount the Plasma Generator and wire it to the AHU control power (24VAC) as instructed by the Air Purification Manufacturer's instructions or line voltage subject to power available. Each unit shall be designed with a molded casing, self-cleaning system, weather proof housing with clear cover, integral digital display that provides unit status, self-cleaning test button, power status LED and dry contacts to prove ion output is operating properly. The dry contacts shall close to prove the ion generator is working properly and may be daisy chained in series such that only one dry contact per AHU is required to interface to the BAS or the DDC controller. Dry contacts proving power has been applied in lieu of the ion output is actually operating, are not acceptable. Manufacturers providing multiple ion modules that have alarm status wired in parallel, and not in series, shall not be acceptable.

G. Ionization Requirements:

1. Plasma Generators with Bi-polar ionization output shall be capable of controlling gas phase contaminants and shall be provided for all equipment listed above.
   a. The Bi-polar ionization system shall consist of Bi-Polar Plasma Generator and integral power supply. The Bi-polar system shall be installed at all air handling systems. The device shall be capable of being powered by 18VAC to 260VAC without the use of an external transformer. Ionization systems requiring isolation transformers shall not be acceptable.
   b. Ionization Output: The ionization output shall be controlled such that an equal number of positive and negative ions are produced. Imbalanced levels shall not be acceptable.
   c. Ionization output from each electrode shall be a minimum of 200 million ions/cc when tested at 2" from the ionization generator.
   d. All manufacturers shall provide documentation by an independent NELAC accredited laboratory that proves the product has minimum kill rates for the following pathogens given the allotted time and in a space condition:
      A. MRSA - >96% in 30 minutes or less
      B. E.coli - > 99% in 15 minutes or less

C. TB - > 69% in 60 minutes or less
D. C. diff - >86% in 30 minutes or less

Manufacturers not providing the equivalent space kill rates shall not be acceptable. All manufactures requesting prior approval shall provide to the engineer independent test data from a NELEC accredited independent lab confirming kill rates and time meeting the minimum requirements stated in section 2.2 B, points 6A, 6B and 6C. Products tested only on Petri dishes to prove kill rates shall not be acceptable.

2. Ozone Generation:
   a. The operation of the electrodes or Bi-polar ionization units shall conform to UL 867-2007 with respect to ozone generation. There shall be no ozone generation during any operating condition, with or without airflow.

J. Electrical Requirements:
   1. Wiring, conduit and junction boxes shall be installed within housing plenums in accordance with NEC NFPA 70. Plasma Generator shall accept an electrical service of 18VAC to 260VAC, universal input, 1 phase, 50/60 Hz. The contractor shall coordinate electrical requirements with air purification manufacturer during submittals.

K. Control Requirements:
   1. All Plasma Generators shall have internal short circuit protection, overload protection, and automatic fault reset circuit breakers. Systems with manual fuses shall not be allowed.
   2. Integral airflow sensing shall modulate the Plasma output as the airflow varies or stops. A mechanical airflow switch shall not be acceptable as a means to activate the Plasma device due to high failure rates and possible pressure reversal.
   3. The installing contractor shall mount and wire the Plasma device within the air handling unit specified or as shown or the plans. The contractor shall follow all manufacturer IOM instructions during installation.
   4. All Plasma devices shall have a means to interface with the BAS system. Dry contacts shall be provided to prove there are ions being produced. Systems providing indication that power is applied to the Plasma device, but not directly sensing the power at the ion output, shall not be acceptable.

L. VRF Units:
   1. Where so indicated on the drawings and/or schedules Plasma Generator(s) shall be supplied and installed. The mechanical contractor shall mount the Plasma Generator and wire it to the remote mount power supply using the cables provided by the air purification manufacturer. A 24VAC, 115VAC or 208-230VAC circuit shall be provided to the plasma generator power supply panel. No more than 15 watts shall be required per power supply. Each power supply shall be capable of powering up to 6 ionization bars or a total of 100 linear feet of bar. Each plasma generator shall be designed with powder coated metal casing, liquid tight flexible conduit and a high voltage quick connector.

G. Plasma Requirements:
   3. Plasma Generators with Bi-polar ionization output shall be capable of controlling gas phase contaminants and shall be provided for all equipment listed above.
      a. The Bi-polar ionization system shall consist of Bi-Polar Plasma Generator and power supply. The Bi-polar system shall be installed where indicated on the plans or specified to be installed. The device shall be capable of being powered by 24VAC, 115VAC or 208-230VAC without the use of an external transformer. Ionization systems requiring isolation transformers shall not be acceptable.
      b. Ionization Output: The ionization output shall be controlled such that an equal number of positive and negative ions are produced (AC Ionizers only are acceptable). Imbalanced levels shall not be acceptable.
      c. Ionization output from each bar shall be a minimum of 60 million ions/cc per inch of bar when tested at 1" from the ionization bar. Bars with needles spaced further apart than 0.5" shall not be acceptable.
      d. Each plasma electrode shall be made from an all composite, UL 94V0 and UL 746C rated material for prevention of corrosion and electrical insulation.

4. Ozone Generation:
    a. The operation of the electrodes or Bi-polar ionization units shall conform to UL 2998 as tested by UL proving no ozone output.

H. Electrical Requirements:
1. Wiring, conduit and junction boxes shall be installed within housing plenums in accordance with NEC NFPA 70. Plasma Generator shall accept an electrical service of 24VAC, 115 VAC or 208-230VAC, 1 phase, 50/60 Hz. The contractor shall coordinate electrical requirements with air purification manufacturer during submittals.

I. Control Requirements:
1. All Plasma Generators shall have internal short circuit protection, overload protection, and automatic fault reset. Systems requiring fuses shall not be acceptable.
2. The Plasma Generator power supply shall have internal circuitry to sense the ionization output and provide dry contact alarm status to the BMS as well as a local “Plasma On” indication light.
3. If scheduled, the ionization system shall be provided with a stand-alone, independent ion sensor designed for duct mounting to the ionization bar to monitor the ion output and report to the BAS system that the ion device is working properly. Ion systems provided without an independent ion sensor, shall not be permitted. The control voltage to power the ion sensor shall be 24VAC to 260VAC and draw no more than 150mA of current. The sensor shall provide at minimum, dry contact status to the BAS and optionally a BacNet or Lonworks interface as specified on the control drawings. If scheduled, manufacturers not providing a stand-alone ion sensor shall not be acceptable.
4. The installing contractor shall mount and wire the Plasma device within the air handling unit specified or as shown or the plans. The contractor shall follow all manufacturer IOM instructions during installation.
5. An optional fiberglass NEMA 4X panel with Plasma On/Off Indicator Light (interfaced with stand-alone ionization detector), Ionization Output On/Off Indicator Light and an On/Off Illuminated Switch shall be provided to house the power supply, if noted on the schedule.

PART 3 - EXECUTION

3.1 GENERAL
A. The Contractor shall be responsible for maintaining all air systems until the owner accepts the building (Owner Acceptance).

3.2 ASSEMBLY & ERECTION: PLASMA GENERATOR WITH BI-POLAR IONIZATION
A. All equipment shall be assembled and installed in a workman like manner to the satisfaction of the owner, architect, and engineer.
B. Any material damaged by handling, water or moisture shall be replaced, by the mechanical contractor, at no cost to the owner.
C. All equipment shall be protected from dust and damage on a daily basis throughout construction.

3.3 TESTING
A. Provide the manufacturers recommended electrical tests.

3.4 COMMISSIONING & TRAINING
A. A manufacturer's authorized representative shall provide start-up supervision and training of owner's personnel in the proper operation and maintenance of all equipment.

END OF SECTION

8-21-26

SECTION 23 3700 - AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 GENERAL

A. Grilles and Diffusers

B. Louvers

1.02 RELATED WORK

A Section 20 01 00: General Provisions

B. Section 23 31 00: Metal Ductwork

1.03 REFERENCES

A. ADC 1062 - Certification, Rating and Test Manual.

B. AMCA 500 - Test Method for Louvers, Dampers and Shutters.

C. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

D. ARI 650 - Air outlets and inlets.

E. ASHRAE 70 - Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.

F. SMACNA - Low Pressure Duct Construction Standard.

1.04 QUALITY ASSURANCE

A. Test and rate performance of air outlets and inlets in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.

B. Test and rate performance of louvers in accordance with AMCA 500.

1.05 REGULATORY REQUIREMENTS

A. Conform to ANSI/NFPA 90A.

1.06 SUBMITTALS

A. Submit product data under provisions of Section 01300.

B. Provide product data for items required for this project.

C. Submit schedule of outlets and inlets indicating type, size, application, and noise level.

D. Review requirements of outlets and inlets as to size, finish, and type of mounting prior to submitting product data and schedules of outlets and inlets.

E. Submit diffuser, grille and register color data to Architect of approval.

1.07 JOB CONDITIONS

A. Review requirements of outlets as to size, finish and type of mounting prior to submitting shop drawings and schedules of outlets.

B. Check location of outlets and make sure necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Base air outlet application of space noise level of NC 35 maximum.

B. Provide supply outlets with sponge rubber seal around edge.

C. Provide appropriate frame for all outlets compatible with ceiling/wall construction.

D. Finish

1. Aluminum grilles, registers, and diffusers which are ceiling mounted shall be provided with a factory applied white baked enamel finish unless otherwise, herein or on the drawings.

2. Aluminum grilles and registers which are wall or floor mounted shall be factory etched to a satin finish and coated with a clear lacquer.

E. Mounting

1. Model numbers indicated herein are for surface mounting in exposed tee-bar grids or for integral mountain in exposed tee-bar grids. Where grilles, registers or diffusers are to be installed in concealed spine ceilings or plaster ceilings the mounting frame shall be adjusted to match the ceiling requirements. In plaster ceilings, provide plaster frames.

2.02 LOUVER FACE CEILING DIFFUSER

A. Ceiling diffuser shall be round, square or rectangular with to provide 1, 2, 3, or 4-way air patterns as indicated on the drawings. All items to be of aluminum construction. Frame and directional core to have baked white enamel finish.

B. Frame style for fixed ceiling shall be raised "V" type. Frame style for lay-in ceilings shall be lay-in matching frames, panel size 24-inch x 24-inch unless otherwise required. For spline or other type ceiling systems, use appropriate matching frame styles. Diffusers shall be sized as indicated on the drawings.

2.03 SIDEWALL SUPPLY GRILLES

A. Provide sidewall supply grilles with streamlined and individually adjustable blades, maximum 3/4" spacing. Provide spring tension or other device to set blades. Provide units with vertical face, double Deflection bar style grilles.

B. Provide 1/4" margin frame with counter sunk screw holes.

C. Fabricate of steel 20 gage minimum frames and 22 gage blades, or of all aluminum with 20 gauge for frames and blades.

D. Provide grille with integral gang-operated opposed blade dampers with removable key operators, operable from face.

E. Finish for steel construction in standard baked enamel finish.

2.04 RETURN GRILLES

A. Provide sidewall and ceiling return grilles having fixed vee blades. Provide units with horizontal face.

B. Provide 1/4" margin frame countersunk screw holes.

C. Fabricate of steel with 20 gage minimum frames and 22 gage minimum blades, or all aluminum construction, 20 gage minimum for frames and blades.

D. Provide return grilles, where not individually connected to return fans, with integral, gang-operated opposed blade dampers with removable key operator, operable from face.

E. Finish steel outlets in factory baked enamel finish.

2.05 DOOR GRILLES

A. Door grilles shall be inverted bee shaped on 1/2 inch centers with telescoping frame. Louvers and frame to be steel construction with prime coat or aluminum as indicated on Air distribution Schedule in the drawings.

B. Where required on drawings, contractor shall provide filter housing on back side of door grille.

2.06 OUTSIDE LOUVERS

A. Greenheck #EHV-901D:

1. Louvers shall be stationary high velocity wind driven rain style with Horizontal front blades and Vertical rear blades and shall have Florida Product Approval and/or Miami-Dade Notice of Acceptance to ensure a tested and qualified installation. Louver blades shall be contained within a 9-inch frame and shall be fully factory assembled. Extended sill pans shall be provided to capture and drain water to exterior of building. Louver components (heads, jambs, sill and blades) shall be factory assembled by the louver manufacturer.

2. Louver performance shall be certified in accordance with the AMCA 511 Certified Ratings Program for AMCA 500-L Air Performance, Water Penetration and Wind Driven Rain and shall be licensed to bear the AMCA Seal. Free area for a size 48 in. x 48 in. louver shall not be less than 8.32 Sq. Ft. (52.0%).

3. Louvers shall allow for sizes up to 60” wide x 120” high. Openings larger than the maximum section width may comprise of multiple individual louver panels without the need for additional structural reinforcing members as per the manufacturers installation instructions. Where louvers are required to be multiple sections high, adequate structural

supports shall be provided in order to install the louver in accordance with the manufacturers installation instructions. Structural supports for multi-high assemblies, if required, shall be considered as part of the building structure and not provided by the louver manufacturer.

4. Vertical mullions shall be visible for openings wider than the maximum allowable single section width. Recessed mullions for continuous blade appearance shall be provide where noted on drawings.
5. Static pressure drop shall not be greater than 0.34 in. WG at 8500 cfm intake through a 48” x 48” louver.
6. Any manufacturer that has a higher pressure drop shall be responsible for resizing the louvers to meet the specified pressure drop, or the pressure drop scheduled on drawings.
7. Beginning point of water penetration shall not be less than 1250 FPM free area intake velocity.
8. Louvers shall maintain Class A wind driven rain performance up to 900 FPM core velocity with an external wind speed of 29 MPH and an external rainfall rate of 3 in. per hour. Louvers shall maintain Class A wind driven rain performance up to 900 FPM core velocity with an external wind speed of 50 MPH and an external rainfall rate of 8 in. per hour.
9. Louvers shall comply with Florida test protocols TAS 201 (Large Missile Impact), TAS 202 (Uniform Static Air Pressure) and TAS 203 (Cyclic Wind Loading). Louvers shall be AMCA 540 Listed for Enhanced Protection Impact Resistance of Missile Level E and AMCA 550 Listed for High Velocity Wind Driven Rain. Louvers shall be capable of withstanding both positive and negative wind pressure loads up to 130 PSF when installed in accordance with the manufacturer’s published installation instructions.
10. Louvers shall be Greenheck #EHV-901D, Construction Specialties #DC-9614, or prior approved equal, extruded aluminum alloy shall be 6063T5 construction, or as required to meet the louvers structural requirements as follows:
    a. Frame: 0.081 inch (minimum) wall thickness, caulking surfaces provided.
    b. Front Blades: 0.081 inch (minimum) wall thickness, installed horizontally on approximately 4” inch centers.
    c. Rear Blades: 0.063 inch (minimum) wall thickness, installed vertically on approximately 1.5” inch centers.
    d. Extended Sill Pan: 0.060 inch (minimum) aluminum sheet wall thickness, with upturned side panels to help prevent water leakage.
    e. Screen: ½” x .063” aluminum mesh bird screen in removable frame, mounted on interior (rear) of louver.
    f. Finish: 70% 2-coat baked Kynar, custom color, color as selected by Architect.
11. Provide “blank-off” panel(s) where noted within contract documents. Panel shall consist of 1” thick mineral wool insulation sandwiched between sheet metal panels. Exterior and Interior (facing) panels shall be 0.032 inch (minimum) thickness aluminum; conceal edges of insulation with sheet metal or heavy plastic closure. Insulation shall comply with ASTMC612, with a minimum R-value of 4.2 at 75° F.
12. Exterior side shall have a black kynar finish.

2.07 EXHAUST GRILLES

A. Register (Wall): 35 degree deflection register with horizontal bars, opposed blade damper and plaster frame. All items to be aluminum construction. Register and plaster frame to have an anodized finish.

B. Register (Ceiling): Grid core register with 1/2x1/2x1/2 inch core spacing and opposed blade damper. All items to be of aluminum construction. Register to have an anodized finish. Frames shall be appropriate to type ceiling used in project.

2.08 LINEAR DIFFUSERS

A. Linear diffuser shall be extruded aluminum. Diffuser face shall be natural anodized aluminum with narrow surface mounted border. Interior air pattern controller shall be painted flat black. Diffusers shall be furnished in one piece up to a maximum of four feet; where diffuser exceeds

four feet, multiple sections shall be butted with hairline joints and provided with alignment spines. Diffusers shall have concealed fastening. Linear diffusers shall be furnished in lengths, and number of 1 inch slots, as required for CFM as indicated on the drawings.

B. Contractor to figure in bid field fabrication of internally insulated plenum on rear of linear slot diffuser in the event the structure does not allow for the proper installation of the factory fabricated plenum boxes. Verify exact locations of plenum boxes with structure prior to ordering plenums.

2.09 SQUARE PLAQUE CEILING DIFFUSER

A. Ceiling diffuser shall be round, square or rectangular with to provide 1,2,3, or 4-way air patterns as indicated on the drawings. All items to be of aluminum construction. Frame and directional core to have baked white enamel finish.

B. Frame style for fixed ceiling shall be raised "V" type. Frame style for lay-in ceilings shall be lay-in matching frames, panel size 24-inch x 24-inch unless otherwise required. For spline or other type ceiling systems, use appropriate matching frame styles. Diffusers shall be sized as indicated on the drawings.

2.10 PERFORATED CEILING DIFFUSERS

A. Ceiling diffusers shall be aluminum with removable perforated face panel, adjustable diffusion louvers, and round neck or round neck adapter. Face panel shall fit 24" x 24" ay-in tee-bar ceiling grid. Throw pattern assembly shall be removed, air shall drop/dump into space.. Perforated ceiling diffusers to be located in kitchen cooking area only.

2.11 THERMALLY POWERED VAV DIFFUSERS

A. Thermally powered variable air volume diffusers shall be Therma-Fuser™ model ST manufactured by Acutherm, and shall have separate set points for VAV Heating and VAV Cooling.

B. Thermally powered VAV diffusers shall be a complete VAV terminal and thermostat self-contained in nominal 24”x24”/600mm square diffuser. They shall be thermally powered with one room thermostat/actuator and one changeover thermostat/actuator. External wiring or pneumatics shall not be allowed.

C. The VAV diffusers shall have a thumbwheel and temperature scale to adjust the cooling set point and a separate thumbwheel and temperature scale for the heating set point. The adjustment shall be right above the hinged appearance panel and shall not require tools. Each set point shall be separately adjustable between 70°F/21°C and 78°F/26°C. The initial set point shall be factory set at 74°F/23°C..

D. In the cooling mode the VAV diffusers shall open on a rise in room temperature and in the heating mode they shall close on a rise in room temperature. The changeover thermostat shall be factory installed and adjusted to engage the heating mode when the supply air temperature rises above 80°F/27°C and return to the cooling mode when the supply air temperature falls below 68°F/20°C. During changeover the diffuser shall close or, if a minimum flow is set, go to the minimum. Nothing including the changeover mechanism shall extend above the inlet of the diffuser.

E. All VAV diffusers shall have a dial and scale to adjust minimum flow between 5 cfm/2.4 l/s and 50% of maximum flow without tools. Minimum flow shall be factory set at 10%. A fixed maximum flow stop shall be factory set for the full open air flow of the specified inlet size.

F. All VAV diffusers shall have a lever which will open the damper for balancing without tools. The balancing lever shall be accessible from the outside of the diffuser without folding down the appearance panel or removing any part of the diffuser.

G. All VAV diffusers shall have a solid (no holes or slots), hinged appearance panel that can be unlatched and folded down to hang allowing hands to be free for adjusting temperature set points. Instructions for the VAV diffuser shall be on the inside of the appearance panel.

H. The VAV diffusers shall have positive induction of secondary room air over the room thermostat/actuator at all flows from fully closed to fully open.

I. The manufacturer shall warrant that all VAV diffusers shall be free from defects in materials and workmanship for a period of ten years from date of shipment.

J. Supply air to the VAV diffuser shall be constant temperature (may be reset to another constant temperature). Supply air shall be limited to no lower than 50°F/10°C on cooling and no higher than 120°F/49°C on heating. The heating high limit shall be as low as possible but no lower than 80°F/27°C.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install items in accordance with manufacturer's recommendations.

B. Paint ductwork visible behind air outlets flat black, if not inherently black.

C. Install items in accordance with manufacturer's instructions.

D. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

E. Install diffusers to ductwork with air tight connection.

F. Provide balancing dampers on duct take-off to diffusers, and grilles and register, regardless of whether dampers are specified as part of the diffuser, or grille and register assembly.

G. Furnish and install necessary frames, bucks, sponge rubber gasketed, etc. to make a neat setting job.

H. Diffusers shall be placed to insure that air does not blast against columns and lights.

I. All diffusers, registers etc. shall have external volume controls and deflecting grids.

J. Ceilings in areas where plaster or gypsum board ceiling are used, shall be surfaced mounted.

3.02 AIR OUTLET SCHEDULE

A. Refer to schedules within contract documents.

END OF SECTION

8-21-26

SECTION 23 64 23 - AIR-COOLED SCROLL WATER CHILLERS

PART 1 - GENERAL

1.01 SYSTEM DESCRIPTION

1. Microprocessor-controlled, air-cooled liquid chiller for outdoor installation, utilizing scroll compressors, low sound fans with Greenspeed intelligence. Greenspeed intelligence, all fans are controlled with variable speed fan drive motors. Chiller software shall be specifically developed to coordinate optimal fan speed for application conditions and provide refrigerant circuit optimization, resulting in higher part-load efficiency and reduced acoustic levels.

1.02 QUALITY ASSURANCE

A. Unit shall be rated in accordance with AHRI (Air-Conditioning, Heating and Refrigeration Institute) Standard 550/590, latest edition (U.S.A.) and all units shall be in compliance with ASHRAE (American Society of Heating, Refrigeration, and Air-Conditioning Engineers) 90.1.2019.

B. Unit construction shall comply with ASHRAE 15 Safety Code, UL (Underwriters Laboratories) latest edition, and ASME (American Society of Mechanical Engineers) applicable codes (U.S.A. codes).

C. The management system governing the manufacture of this product is ISO 9001:2015 certified.

D. An operational test, in which the chiller is run under load, is performed at the factory. This test checks for proper operation of fans, as well as various controls and safeties, and a Certificate of Unit Testing, indicating successful end-of-line testing is provided with the unit.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Unit controls shall be capable of withstanding 150°F (66°C) storage temperatures in the control compartment.

B. Unit shall be stored and handled per unit manufacturer's recommendations.

1.04 WARRANTY

A. Unit shall be provided with factory startup, 1st year complete unit parts, compressor, refrigerant and labor warranty. Extended warranty shall include 2nd-10th year complete unit parts, compressor, refrigerant, and labor.

1.05 MANUFACTURERS

A. Carrier 30RC or prior approved equal.

PART 2 — PRODUCTS

2.01 EQUIPMENT

A. General:

1. Factory-assembled, single-piece air-cooled liquid chiller. Contained within the unit cabinet shall be all factory wiring, piping, controls, refrigerant charge, and special features required prior to field start-up.

2. A full charge of refrigerant shall also be contained within the unit.

B. Materials of Construction:

1. The base rail is 11 ga structural quality (Grade 50, Class 2), hot-dipped, zinc-coated, minimized spangle sheet steel (with Magni-coated screws).

2. Cabinet shall be galvanized steel casing with a baked enamel powder or pre-painted finish.

3. Painted parts shall withstand 1000 hours in constant neutral salt spray under ASTM B117 conditions with a 1 mm scribe per ASTM D1654. After test, painted parts shall show no signs of wrinkling or cracking, no loss of adhesion, and no evidence of blistering, and the mean creepage shall not exceed 1/4 in. (Rating ≥ 4 per ASTM D1654) on either side of the scribe line.

C. Fans:

1. Condenser fans shall be direct-driven, 9-blade airfoil cross-section, reinforced polymer construction, shrouded-axial type, and shall be statically and dynamically balanced with inherent corrosion resistance.
2. Air shall be discharged vertically upward.
3. Fans shall be protected by coated steel wire safety guards.
4. Fan blades shall have serrated edges to minimize the sound that is produced.

D. Compressor/Compressor Assembly:

1. Fully hermetic scroll type compressors.
2. Direct drive, 3500 rpm (60 Hz), protected by motor temperature sensors, suction gas cooled motor.
3. External vibration isolation rubber-in-shear.
4. Each compressor shall be equipped with crankcase heaters to minimize oil dilution.

E. Shell and Tube DX Evaporator:

1. Shell-and-tube type, direct expansion. Brazed plate heat exchangers are not allowed.
2. Tubes shall be internally enhanced seamless copper type rolled into tube sheets.
3. Shall be equipped with Victaulic-type water connections.
4. Shell shall be insulated with 3/4-in. PVC foam (closed-cell) with a maximum K factor of 0.28.
5. Design shall incorporate a minimum of 2 independent direct-expansion refrigerant circuits.
6. Evaporator shall be tested and stamped in accordance with ASME Code for a refrigerant working side pressure of 445 psig (3068 kPa). Evaporator shall have a maximum water-side pressure of 300 psig (2068 kPa).
7. Evaporator shall be provided with a factory-installed flow switch and heater.

F. Air-Cooled Condenser:

1. Coils shall be seamless copper tubes expanded into aluminum fins. Microchannel coils are not acceptable.
2. Tubes shall be cleaned, dehydrated, and sealed.
3. Assembled condenser coils shall be leak tested and pressure tested at 656 psig (4522 kPa).
4. To plan the chiller installation and for ease of maintenance/coil removal, all refrigerant piping entering and leaving the condenser coils shall be located on only one side of the chiller so the coils can be removed (when needed) from the side free of piping. This is important to consider because removing the coils from the header side, although possible, involves extra labor due to extra bending and brazing of the coil headers.

G. Refrigeration Components:

1. Refrigerant circuit components shall include replaceable core filter drier, moisture-indicating sight glass, electronic expansion device, discharge service valve and liquid line service valves, and complete operating charge of both refrigerant and compressor oil.

H. Controls, Safeties, and Diagnostics:

1. Unit controls shall include the following minimum components:
   a. Microprocessor with non-volatile memory. Battery backup system shall not be accepted.
   b. Separate terminal block for power and controls.
   c. Control transformer to serve all controllers, relays, and control components.
   d. ON/OFF control switch.

e. Replaceable solid-state controllers.

f. Pressure sensors installed to measure suction and discharge pressures. Thermistors installed to measure evaporator entering and leaving fluid temperatures.

2. Unit controls shall include the following functions:

a. Automatic circuit lead/lag.

b. Hermetic scroll compressors are maintenance-free and protected by an auto-adaptive control that minimizes compressor wear.

c. Capacity control based on leaving chilled fluid temperature and compensated by rate of change of return fluid temperature with temperature set point accuracy to 0.1°F (0.05°C).

d. Limiting the chilled fluid temperature pull-down rate at start-up to an adjustable range of 0.2°F to 2°F (0.1 to 1.1°C) per minute to prevent excessive demand spikes at start-up.

e. Seven-day time schedule.

f. Leaving chilled fluid temperature reset from return fluid and outside air temperature.

g. Chilled water pump start/stop control and primary standby sequencing to ensure equal pump run time.

h. Chiller control for parallel chiller applications without addition of hardware modules and control panels (requires thermistors).

i. Timed maintenance scheduling to signal maintenance activities for strainer maintenance and user-defined maintenance activities.

j. Low ambient protection to energize evaporator heaters.

k. Periodic pump start to ensure pump seals are properly maintained during off-season periods.

l. Single step demand limit control activated by remote contact closure.

m. Nighttime sound mode to reduce the sound of the machine per a user-defined schedule.

3. Diagnostics:

a. The control panel shall include, as standard, a display:

1) Color touch screen display with stylus.

2) Display shall allow a user to navigate through menus, select desired options, and modify data.

b. Features of the display shall include:

1) Multiple connection ports for USB, Ethernet, or BACnet™[1] IP, Modbus-RTU (Remote Terminal Unit), LEN (local equipment network), and Carrier Comfort Network® (CCN) connections.
NOTE: BACnet IP required additional programming. Figure in bid.

2) Automatic reporting of alarms over email.

3) Ability to graphically plot trends of system performance and conditions over time.

4) Graphical summary display of current chiller operation and water conditions.

5) Display shall allow access to configuration, maintenance, service, set point, time schedules, alarm history, and status data.

6) Three levels of password protection against unauthorized access to configuration and maintenance information, and display set up parameters.

7) Full compatibility with the Carrier Comfort Network® (CCN) system to provide email alarm notification and to provide network capability to fully monitor and control chiller.

8) Display shall be capable of displaying the last 50 alarms, with clear full text description and time and date stamp, and will store a snapshot of operating conditions before and after the 10 most recent alarms.

9) Display run hours and number of starts for machine and individual compressors.

10) The control system shall allow software upgrade without the need for new hardware modules.

4. Safeties:

a. Unit shall be equipped with thermistors and all necessary components in conjunction with the control system to provide the unit with the following protections:

1) Reverse rotation.

2) Low chilled fluid temperature.

3) Motor overtemperature.

4) High pressure.

5) Electrical overload.

6) Thermal overload.

7) Loss of refrigerant charge.

b. Condenser fan motors shall have internal overcurrent protection.

I. Operating Characteristics:

1. Standard tier units, without modification, shall be capable of starting and running at outdoor ambient temperatures from 0°F to 125.6°F for units employing variable speed condenser fans.

2. Unit shall be capable of starting up with 95°F (35°C) entering fluid temperature to the evaporator.

3. After power restoration, and with the Capacity Recovery™ feature enabled, unit shall be capable of full capacity recovery in less than 4 minutes provided the required chilled water flow is available and no safety/control manual reset items or alarms are in effect.

J. Fan Motors:

1. Condenser fan motors shall be totally enclosed, air over, 3-phase type with permanently lubricated bearings and Class F insulation. Fans shall be 6-pole for variable speed units.

K. Electrical Requirements:

1. Unit primary electrical power supply shall enter the unit at a single location (all chiller voltage/ size combinations shall have the ability to accommodate 2 power supplies to meet job specific requirements).

2. Primary electrical power supply shall be rated to operate up to 125.6°F (52°C) ambient temperature for all models.

3. Unit shall operate on 3-phase power at the voltage shown in the equipment schedule.

4. Control points shall be accessed through terminal block.

5. Unit shall be shipped with factory control and power wiring installed.

6. Unit shall have a standard SCCR (short circuit current rating) value of 10 kA for all voltages.

L. Chilled Water Circuit:

1. Chilled water circuit shall be rated for 300 psig (2068 kPa). Units with optional pump package are rated for 150 psig (1034 kPa) working pressure.

2. Thermal dispersion proof of flow switch shall be factory installed and wired.

M. Insulation

1. Material: Closed-cell, flexible, UV protected, thermal insulation complying with ASTM C 534 Type 2 (Sheet) for preformed flexible elastomeric cellular thermal insulation in sheet and tubular form.

2. Thickness: 2".

3. Thermal conductivity: 0.26 (BTU/HR-Ft2-°F/in) maximum at 75°F mean temperature.

4. Factory-applied insulation over cold surfaces of liquid chiller components including evaporator shell, water boxes, and suction line. Liquid nozzles shall be insulated by Contractor after pipe installation.

5. Adhesive: As recommended by insulation manufacturer and applied to 100 percent of insulation contact surface including all seams and joints.

N. Required Features:

1. High-Efficiency Variable Condenser Fans:

   All fans on the unit shall have variable speed fan motors to provide higher part load efficiency and reduced acoustic levels. Each fan circuit shall have a factory-installed, independent, variable speed drive with display. Variable speed drives are UL Listed. Variable speed fans also act as a low ambient control method, operation down to 0°F ambient.

2. Unit-Mounted Non-Fused Disconnect:

   Unit shall be supplied with factory-installed, non-fused electrical disconnect for main power supply.

3. Aluminum Fin/Copper Tube Coils:

   Coil shall be constructed of seamless copper tubes mechanically bonded to aluminum fins. Fins shall have wavy enhancements. Microchannel coils are not acceptable.

4. Condenser Coil Trim Panels:

   Unit shall be equipped with factory or field-installed coil covers, which provide protection for the coil headers.

5. Security Grilles (Sides) and Hail Guard (Ends):

   Unit shall be equipped with a factory or field-installed option consisting of louvered panels on the ends of the machine and security grilles on the sides of the machine. These coverings shall firmly fasten to the machine frame and provide coverage from the top to the bottom of the unit.

6. Suction Line Insulation:

   Insulation shall be tubular closed-cell insulation.

7. Shell-and-Tube Evaporator:

   Chiller shall be provided with a shell-and-tube evaporator in lieu of a brazed plate evaporator.

8. Pressure Relief Valve:

   Unit shall be provided with reseating-type pressure relief valves on the suction and discharge lines.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Rig and Install in full accordance with Manufacturer's requirements, Project drawings, and Contract documents.

B. Location: Locate chiller as indicated on drawings, including cleaning and service maintenance clearance per Manufacturer instructions. Adjust and level chiller on support structure.

C. Components: Installing Contractor shall provide and install all auxiliary devices and accessories for fully operational chiller.

D. Electrical: Coordinate electrical requirements and connections for all power feeds with Electrical Contractor.

E. Controls: Coordinate all control requirements and connections with Controls Contractor.

F. Finish: Installing Contractor shall paint damaged and abraded factory finish with touch-up paint matching factory finish.

G. Install in accordance with manufacturer's requirements.

H. Level the chiller using the base rail as a reference. The chiller must be level within ½ in over the entire length and width. Use shims as necessary to level the chiller.

I. Provide & install factory supplied vibration isolators.

J. Connect to electrical service.

K. Connect to chilled water piping.

L. Arrange piping for easy dismantling to permit tube cleaning.

M. Install in strict accordance with manufacturer's requirements, submittal drawings, and contract documents.

N. Measures must be taken to avoid accumulation of debris in the evaporator during initial system flushing. A strainer with performations no larger than 0.125" (3.2 mm) diameter must be placed in the supply water line just prior to the inlet of the evaporator. Care shall be exercised when welding pipe or flanges to the evaporator to prevent any slag from entering the vessel. Any welds after the strainer must be mechanically cleaned to avoid slag entering the evaporator.

O. Adjust and level chiller in alignment on supports.

P. Coordinate electrical installation with electrical contractor.

Q. Coordinate controls with control contractor.

R. Provide all required accessories or accompanying parts to insure a fully operational and functional chiller.

3.02 SERVICE AND START-UP

A. Startup - Provide all labor and materials to perform startup. Startup shall be performed by a factory-trained technician from the original equipment manufacturer (OEM). Technician shall confirm that equipment has been correctly installed and passes specification checklist prior to equipment becoming operational and covered under OEM warranty. This shall be done in strict accordance with manufacturer's specifications and requirements. Third-party service agencies are not permitted.

B. A start-up log shall be furnished by the factory approved start-up technician to document the chiller's start-up date and shall be signed by the owner or his authorized representative prior to commissioning the chillers.

C. Chiller manufacturers shall maintain service capabilities no more than 50 miles from the jobsite.

D. Provide local service agent with direct access to factory support on equipment.

3.03 SCHEDULE

A. Refer to contract documents.

END OF SECTION

8-21-26

SECTION 23 7313 - MODULAR INDOOR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 SUMMARY

A. Section Includes:

1. Constant-air-volume, single zone air-handling units.

1.4 ACTION SUBMITTALS

A. Product Data: For each air-handling unit indicated.

1. Unit dimensions and weight.
2. Cabinet material, metal thickness, finishes, insulation, and accessories.
3. Fans:
    a. Certified fan-performance curves with system operating conditions indicated.
    b. Certified fan-sound power ratings.
    c. Fan construction and accessories.
    d. Motor ratings, electrical characteristics, and motor accessories.
4. Certified coil-performance ratings with system operating conditions indicated.
5. Dampers, including housings, linkages, and operators.
6. Filters with performance characteristics.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Mechanical-room layout and relationships between components and adjacent structural and mechanical elements.
2. Support location, type, and weight.
3. Field measurements.

B. Operation and Maintenance Data: For air-handling units to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set for each air-handling unit.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NFPA Compliance: Comply with NFPA 90A for design, fabrication, and installation of air-handling units and components.

C. ARI Certification: Air-handling units and their components shall be factory tested according to ARI 430, "Central-Station Air-Handling Units," and shall be listed and labeled by ARI

D. Comply with NFPA 70.

1.8 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

B. Coordinate sizes and locations of structural-steel support members, if any, with actual equipment provided.

1.9 WARRANTY

A. The complete unit shall be covered by a parts warranty issued by the manufacturer covering the first year of operation. This warranty period shall start at the date of substantial completion. Contractor to extend manufacturer warranties to start from this date.

B. The installing contractor shall provide labor warranty during the unit's first year of operation, from date of substantial completion.

PART 2 - PRODUCTS

2.0 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Trane
2. Daikin
3. Carrier
4. JCI (York)

2.01 GENERAL DESCRIPTION

A. Units shall ship in the number of sections necessary to meet project requirements and shall ship in as many splits as specified in selection software. Split options as follows:

1. Shipped in sections — shipping split.
2. Shipped assembled.

B. Unit shall be factory-supplied, central station air handler. The air-handling unit may consist of a fan with the factory-installed components as indicated on the equipment schedule & details.

2.02 CASING

A. Construction:

1. Unit shall be constructed of a complete frame with easily removable panels. Removal of any panel shall not affect the structural integrity of the unit.
2. All units shall be supplied with 14-gage or heavier, G-90 galvanized steel base rails. Bolton legs are NOT acceptable. Perimeter lifting lugs for overhead lifting shall be provided on each shipping section. Slinging units in place of lifting lugs shall not be acceptable.
   a. Base rail to be 10" height as to properly trap condensate drain piping.
3. Unit shall be thermally broken to minimize the conduction path from the inside of the casing to the outside.
4. Casing panels (top, sides, and bottom) shall be constructed of galvanized steel, and shall have one of the following exterior finishes as specified:
   a. Pre-painted with a baked enamel finish passing 500-hour salt spray test (ASTM B-117) for pre-painted steel and 125-hour marine level 1 prohesion test (ASTM G-85.A5) for pre-painted steel.
5. Casing panels (top, sides, and bottom) shall be constructed of galvanized steel, and shall have one of the following interior finishes as specified:
   a. Pre-coated with a silver zeolite antimicrobial material registered by the US EPA for use in HVAC applications.
6. Casing panels (top, sides, and bottom) shall be one piece, double-wall construction with insulation sealed between the inner and outer panels. Panel assemblies shall not carry an R-value of less than 13.
7. Casing deflection shall not exceed a 1:200 ratio when subject to an internal pressure of ± 8-in. wg. Casing leakage rate shall be less than 1% at 8 in. wg of nominal unit airflow or 50 cfm, whichever is greater. Leakage rate shall be tested and documented on a routine basis on

random production units. Optionally, factory witness leak testing and/or test reports shall be available.

8. Side panels shall be easily removable for access to unit and shall seal against a full perimeter automotive style gasket to ensure a tight seal.
9. The panel retention system shall comply with UL 1995 which states all moving parts (for example, fan blades, blower wheels, pulleys, and belts) that, if accidentally contacted, could cause bodily injury, shall be guarded against accidental contact by an enclosure requiring tools for removal.
10. Accessibility options shall be as follows:
    a. Hinged double-wall access door on either side with removable access panel(s) on the other side.
11. Fan supports, structural members, panels, or flooring shall not be welded, unless aluminum, stainless steel, or other corrosion-resistant material is used. Painted welds on unit exterior steel or galvanized steel are not acceptable.
13. All coil sections shall be double-wall construction with insulation sealed between the inner and outer panels. Panel assemblies shall not carry an R-value of less than 13. Single height coil sections shall have removable frame sections to facilitate vertical coil extraction.
14. Blow-thru sections shall have a diffuser plate as an integral part of the fan section.

B. Access Doors:

Access doors shall be one piece, double-wall construction with insulation sealed between the inner and outer panels. Panel assemblies shall not carry an R-value of less than 13.

C. Drain Pans:

Drain pans shall be insulated double-wall stainless steel construction. The pan shall be sloped toward the drain connection. Drain pan shall have 11/2-in. MPT connection exiting through the hand side or opposite side of the casing as specified. One drain outlet shall be supplied for each cooling coil section. Drain pan shall allow no standing water and comply with ASHRAE Standard 62.1-2010. Where 2 or more coils are stacked in a coil bank, intermediate drain pans shall be provided and the condensate shall be piped to the bottom drain pan. The bottom coil shall not serve as a drain path for the upper coil.

2.03 FANS

A. General:

1. Direct drive plenum fan sections shall have TWO single width single inlet (SWSI) airfoil fan wheel. Airfoil blades shall be double thickness design continuously welded to the back plate and the front plate. Fan wheel shall be constructed of aluminum. Airfoil blades shall be aluminum extrusions and shall be top welded to the back plate and front plate of the wheel. Fan wheel shall be dynamically balanced per ISO standard 1940 quality grade G6.3.
2. Fan assembly vibration shall not exceed 0.248 in. per second when mounted on active isolators. Vibration shall be measured in both vertical and horizontal directions at the specified fan operating speed using specified motor. Accelerometers shall be mounted on the motor near the bearing locations.
3. All fan sled components shall provide corrosion protection to pass 100-hour salt spray test per ASTM B-117.
4. Fan wheels shall be keyed to the shaft and shall be designed for continuous operation at maximum rated fan speed and motor horsepower. Fan wheels and shafts shall be selected with a maximum operating speed 25% below the first critical.

B. Performance Ratings:

Fan performance shall be rated and certified in accordance with AHRI Standard 430, latest edition.

C. Sound Ratings:

Manufacturer shall submit first through eighth octave sound power for fan discharge and casing radiated sound. Sound ratings shall be tested in accordance with AHRI 260.

D. Mounting:

Fan scroll, wheel, shaft, bearings, drives, and motor shall be mounted on a common base assembly. The base assembly is isolated from the outer casing with factory-installed isolators and rubber vibration absorbent fan discharge seal. A canvas style duct connection between fan discharge and cabinet is not acceptable. Units shall use 2-in. deflection spring isolators.

E. Fan Accessories:

1. Direct Drive Plenum Fans:
    a. Variable frequency drives.
    b. Motor protection box for motor current protection with a single VFD driving multiple motors.
    c. Airflow measuring piezo ring.
    d. Piezo ring transducer.
    e. Motor shaft grounding ring.
    f. Inlet guard.
    g. Outlet guard.

F. Flexible Connection:

The base assembly is isolated from the outer casing with factory-installed isolators and rubber vibration absorbent fan discharge seal. A canvas style duct connection between fan discharge and cabinet is not acceptable.

2.04 BEARINGS AND DRIVES

A. BEARINGS

All plenum fans shall be direct drive.

B. Shafts:

Fan shafts shall be solid steel, turned, ground, polished and coated with a rust inhibitor.

2.05 COILS

A. Coils section header end panel shall be removable to allow for removal and replacement of coils without impacting the structural integrity of the unit.

B. Install coils such that headers and return bends are enclosed by unit casing to ensure that if condensate forms on the header or return bends, it is captured by the drain pan under the coil.

C. Coils shall be manufactured with plate fins to minimize water carryover and maximize airside thermal efficiency. Fin tube holes shall have drawn and belled collars to maintain consistent fin spacing to ensure performance and air pressure drop across the coil as scheduled. Tubes shall be mechanically expanded and bonded to fin collars for maximum thermal conductivity. Use of soldering or tinning during the fin-to-tube bonding process is not acceptable due to the inherent thermal stress and possible loss of bonding at that joint.

D. Construct coil casings of 16GA stainless steel. End supports and tube sheets shall have belled tube holes to minimize wear of the tube wall during thermal expansion and contraction of the tube.

E. When two or more cooling coils are stacked in the unit, an intermediate drain pan shall be installed between each coil. The intermediate drain pan shall be designed being of sufficient size to collect all condensation produced from the coil and sloped to promote positive drainage to eliminate stagnant water conditions. The intermediate drain pan shall be constructed of the same material as the sections primary drain pan.

F. The intermediate drain pan shall begin at the leading face of the water-producing device and be of sufficient length extending downstream to prevent condensate from passing through the air stream of the lower coil.

G. Hydronic Coils

1. Supply and return header connections shall be clearly labeled on unit exterior such that direction of coil water-flow is counter to direction of unit air-flow.

2. Coils shall be proof-tested to 300 psig and leak-tested to 200 psig air pressure under w ter.
3. Headers shall be constructed of round copper pipe or cast iron.
4. Tubes shall be 1/2-inch .016 copper, with aluminum fins.
5. Hydronic coils shall be supplied with factory installed drain and vent piping to the unit exterior.

H. Refrigerant Coils:
1. Headers shall be constructed of copper with brazed joints.
2. Standard circuiting selections include:
A. Row split intertwined, multiple distributor arrangement for sizes 03-110.
3. Replaceable nozzle, brass refrigerant distributors and seamless copper distribution tubes are supplied to ensure uniform flow.
4. Submittals must include a DX coil and condensing unit cross plot to show that the coil and condensing unit capacity match at the rated design conditions.

2.06 FILTER SECTIONS

A. Angle filter sections shall accept either 2-in. or 4-in. filters of standard sizes, arranged in a horizontal V formation.

B. Magnehelic Gages:
1. Housing shall be constructed of a die cast aluminum case and bezel with acrylic cover. Exterior finish shall be coated gray to withstand 168 hr salt spray corrosion test.
2. Accuracy shall be ±2% of full scale throughout range at 70 F (21.1 C).
3. Pressure limits shall be –20 in. Hg to 15 psig (0.677 bar to 1.034 bar).
4. Overpressure relief plugs shall open at approximately 25 psig (1.72 kPa).
5. Temperature limits shall be 20 to 140 F (–6.67 to 60 C).
6. Diameter of dial face shall be 4 in. (101.6 mm).
7. Process connections shall be 1/8-in. female NPT duplicate high and low pressure taps — one pair side and one pair back.

2.07 DAMPERS

Factory-supplied dampers shall be warranted to be free from defects in material and workmanship for a period of 12 months after being installed or placed in service, but in no instance shall the period of warranty be longer than 18 months from the date of the original shipment by the manufacturer.

A. Mixing boxes, filter-mixing boxes, and exhaust boxes shall have parallel or opposed blades and interconnecting outside-air and return-air dampers.
1. Premium Dampers:

Damper blades shall be constructed of galvanized steel with a double-skin airfoil design, with blade seals and stainless steel jamb seals. Blades shall be mechanically fastened to axle rods rotating in self-lubricating synthetic bearings. Maximum leakage rate shall be 2 cfm/ft2 at 1 in. wg (0.25 kPa) differential pressure.

2.08 FACTORY MOUNTED MOTOR REMOVAL TROLLEY SYSTEM

1. All direct drive & belt drive plenum fan sections shall have a factory provided/mounted motor removal trolley system to facilitate fan motor replacement and maintenance. The trolley system shall be suspended from the ceiling of the fan section and be rated to handle the maximum total weight of the fan motor and trolley system.

2.09 DISCHARGE PLENUM

A. Units to be equipped with discharge plenum, same construction as unit casing. Provide factory opening with unit mounted electric heater.

2.10 ELECTRIC HEATING SECTION

A. Not used.

2.11 ULTRAVIOLET (UV-C) LIGHTS

A. UV-C light fixtures and lamps shall be provided by the air handler manufacturer. The UV-C fixtures shall be factory-assembled and tested in the air handler. Field-installed fixtures shall not be allowed.

B. Design of the UV-C light array shall assure that the UV-C energy striking the intended coil and drain pan surfaces shall not be less than 200 microwatts per square centimeter and provide not less than 99 percent surface disinfection efficiency. The minimum intensity at any point on the surface plane of the coil must exceed 50 microwatts per square centimeter. Energy consumption at the design intensity shall be no more than 13 watts for each square foot of treated, cross sectional plane.

C. Lamps and Fixtures

1. UV-C lamps and fixtures shall be positioned to provide an equal distribution of UV-C energy and to minimize shadowed areas. The fixture assembly shall be designed and installed such that the sum of the lamp arc lengths in a row is a minimum of 90% of the irradiated surface's total width. The lamps shall not produce ozone.

2. Each lamp shall be high-output, hot cathode, T8 diameter, medium bi-pin type that produces UVGI of 254 nanometers. Lamps shall contain no more than 5.5 milligrams of mercury while producing the specified UV-C output when installed in an environment with 500 fpm air velocity and subjected to temperatures of 55-135 degrees F. Lamp life shall be 9,000 hours minimum with no more than a 20 percent loss of output after two years of continuous use.

3. The UV-C fixtures and lamps shall be coupled end-to-end and mounted on a slide-out rack to enable complete replacement and/or maintenance of the bulbs from the unit exterior.

4. Fixtures shall meet the UL drip-proof design criteria and be constructed of stainless steel to resist corrosion. Racks for fixtures shall be constructed of galvanized steel as AHU interior. Fixtures shall have been independently tested and recognized by UL/C-UL under Category Code ABQK (Accessories, Air Duct Mounted), UL Standards 153, 1598 and 1995.

D. Protection of Polymeric Materials

1. All polymeric materials that come into direct or indirect (reflected) contact with UV-C light shall be tested and certified as UV-C tolerant. Any polymeric material in direct or indirect contact with UV-C light not certified as UV-C tolerant shall be completely shielded from the UV-C light using a certified UV-C tolerant material such as metal. UV-C tolerance is defined as being capable of performing its intended duty for a minimum of 20 years.

E. Safety

1. Access doors shall be provided at the location of each UV-C light as indicated on the plans and schedule. All sections of the air handler with access doors where the UV-C lights may pose a risk for direct exposure shall have a mechanical interlock switch that disconnects power to the lights when the door is opened.

2. In addition to the mechanical interlock switch, each unit shall be equipped with an externally mounted on-off/disconnect/shut off switch that disconnects power to the UV-C lights. The switch shall be equipped with a lock-out/tag-out to prevent unwanted operation of the UV-C lights.

3. A view port with cover shall be provided in each UV section to allow viewing of the UV-C light array confirming operation. The view port and other AHU windows shall be treated to assure the UV-C energy emitted through it is below the threshold limits specified by NIOSH and ACGIH.

4. Units shall have a safety warning label applied to the exterior of each section containing UV-C lights.

5. Complete safety, maintenance and servicing instructions for the UV-C lights and fixtures shall be incorporated into the air handler manufacturer's standard installation, operating and maintenance manuals.

2.12 ELECTRICAL ACCESSORIES:

A. Disconnects:

1. Fused and non-fused disconnects shall have the following characteristics:
   a. Visible blades.
   b. Quick-make, quick-break operating mechanism.
   c. Cover padlock hasp and handle lock "OFF."
   d. 240 vac maximum.
   e. Factory supplied and installed class RK5 fuses (fused disconnects only).
   f. Up to 100,000 rms symmetrical amperes SCCR, utilizing appropriately rated, factory-supplied Class R fuses.
   g. Horsepower rated for motor applications.
   h. Tangential combination knockouts for field wiring.
   i. Spring reinforced plated copper fuse clips.
   j. NEMA type 1 enclosures.
   k. Insulated, bondable solid neutral assemblies.
   l. UL listed, File E2875.
   m. Meet or exceed NEMA KS1-1990.

B. Variable Frequency Drives (unit mounted):

1. Refer to specification 23 05 14 "Variable Frequency Drives".

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine casing insulation materials and filter media before air-handling unit installation. Reject insulation materials and filter media that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for refrigerant and condensate drainage piping systems and electrical services to verify actual locations of connections before installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Equipment Mounting:

1. Install air-handling units on 1" neoprene waffle pads on auxiliary drain pan directly on mechanical room/mezzanine floor.

3.3 CONNECTIONS

B. Comply with requirements for piping specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

C. Install piping adjacent to air-handling unit to allow service and maintenance.

D. Connect piping to air-handling units mounted on vibration isolators with flexible connectors.

E. Connect condensate drain pans using, ASTM B 88, Type L copper tubing. Extend to nearest equipment or floor drain. Construct deep trap at connection to drain pan and install cleanouts at changes in direction.

F. Refrigerant Piping: Comply with applicable requirements in Section 232300 "Refrigerant Piping". Install refrigerant piping in strict accordance with manufacturer's recommendations.

G. Connect duct to air-handling units with flexible connections. Comply with requirements in Section 233300 "Air Duct Accessories."

3.4 FIELD QUALITY CONTROL

H. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

I. Tests and Inspections:

1. Leak Test: After installation, fill water and steam coils with water, and test coils and connections for leaks.
2. Fan Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Filter Operational Test: Pressurize housing to a minimum of 6-inch wg or to designed operating pressure, whichever is higher; test housing joints, door seals, and sealing edges of filter with soapy water to check for air leaks.

J. Air-handling unit or components will be considered defective if unit or components do not pass tests and inspections.

K. Prepare test and inspection reports.

3.5 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Verify that shipping, blocking, and bracing are removed.
3. Verify that unit is secure on mountings and supporting devices and that connections to piping, ducts, and electrical systems are complete. Verify that proper thermal-overload protection is installed in motors, controllers, and switches.
4. Verify proper motor rotation direction, free fan wheel rotation, and smooth bearing operations. Reconnect fan drive system, align belts, and install belt guards.
5. Verify that bearings, pulleys, belts, and other moving parts are lubricated with factory-recommended lubricants.
6. Verify that zone dampers fully open and close for each zone.
7. Verify that face-and-bypass dampers provide full face flow.
8. Verify that outdoor- and return-air mixing dampers open and close, and maintain minimum outdoor-air setting.
9. Comb coil fins for parallel orientation.
10. Verify that proper thermal-overload protection is installed for electric coils.
11. Install new, clean filters.
12. Verify that manual and automatic volume control and fire and smoke dampers in connected duct systems are in fully open position.

B. Starting procedures for air-handling units include the following:

1. Energize motor; verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated rpm.
2. Measure and record motor electrical values for voltage and amperage.
3. Manually operate dampers from fully closed to fully open position and record fan performance.

3.6 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing" for air-handling system testing, adjusting, and balancing.

3.7 CLEANING

A. After completing system installation and testing, adjusting, and balancing air-handling unit and air-distribution systems and after completing startup service, clean air-handling units internally to remove foreign material and construction dirt and dust. Clean fan wheels, cabinets, dampers, coils, and filter housings, and install new, clean filters.

3.8 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain air-handling units.

3.9 The Mechanical Contractor shall verify that the following items have been completed prior to scheduling the AHU manufacturer's final inspection and start up:

1. All spring-isolated components have had their shipping restraints removed and the components have been leveled.
2. On all field-joined units, that all interconnections have been completed, i.e., electrical and control wiring, piping, casing joints, bolting, welding, etc.
3. All refrigerant/water/steam piping connections have been completed and hydrostatically tested and all water flow rates have been set in accordance with the capacities scheduled on the Drawings.
4. All ductwork connections have been completed and all ductwork has been pressure tested for its intended service.
5. All power wiring, including motor starters and disconnects, serving the unit has been completed.
6. All automatic temperature and safety controls have been completed.
7. All dampers are fully operational.
8. All shipping materials have been removed.

3.10 LEVELING

1. The Mechanical Contractor shall level all unit sections in accordance with the unit manufacturer’s instructions. The Mechanical Contractor shall provide and install all necessary permanent shim material to ensure individual sections and entire assembled units are level.

END OF SECTION

8-21-26

SECTION 23 8127 - DUCTLESS SPLIT SYSTEM AIR CONDITIONERS

PART 1 - GENERAL

1.1 W ORK INCLUDED

A. Ductless Split Air Conditioning Unit

B. Refrigeration Cooling Coil

C. Controls

1.2 RELATED W ORK

A. Section 200100: General Provisions

1.3 QUALITY ASSURANCE

A. Conform to requirements of AGA, UL and applicable codes.

B. B. Cooling system tested and rated to ARI Standard 210.

1.4 SUBMITTALS

A. Submit manufacturer's installation instructions.

B. Submit manufacturer's descriptive literature, operating instructions, and maintenance and repair data.

PART 2 - PRODUCTS

2.1 DUCTLESS SPLIT SYSTEM AIR CONDITIONER(S)

A. General: Indoor, direct-expansion, wall mounted fan coil or ceiling cassette, as noted on schedulel. Unit shall be complete with cooling/heating coil, fan, fan motor, piping connectors, electrical controls, microprocessor control system, and integral temperature sensing. Unit shall be furnished with integral wall-mounting bracket, mounting hardware, and thermistor interconnection cable .

B. Unit Cabinet: Cabinet discharge and inlet grilles shall be attractively styled, high-impact polystyrene. Cabinet shall be fully insulated for improved thermal and acoustic performance.

C. Fans: Fan shall be tangential direct-drive blower type with air intake at the upper front face of the unit and discharge at the bottom front. Automatic, motor-driven vertical air sweep shall be provided standard. Air sweep operation shall be user selectable. Horizontal direction may be manually adjusted (using remote controller) and vertical air sweep may be manually set.

D. Coil: Coil shall be copper tube with aluminum fins and galvanized steel tube sheets. Fins shall be bonded to the tubes by mechanical expansion. A drip pan under the coil shall have a drain connection for hose attachment to remove condensate. Condensate pan shall have internal trap and auxiliary drip pan under coil header. NOTE: The units use the accessory AccuRatert piston refrigerant metering device in the indoor unit (for cooling) and at the outdoor unit liquid lineservice valve for heating.

E. Motors: Motors shall be open drip-proof, permanently lubricated ball bearing with inherent overload protection. Fan motors shall be 3-speed.

F. Controls: Controls shall consist of a microprocessor-based control system which shall control space temperature, determine optimum fan speed, and run self diagnostics. The temperature control range shall be from 64 F to 84 F. The unit shall have the following functions as a minimum:

1. An automatic restart after power failure at the same operating conditions as at failure.
2. A timer function to provide a minimum 24-hour timer cycle for system Auto Start/Stop.
3. Temperature-sensing controls shall sense return-air temperature. Indoor-air high discharge temperature shutdown shall be provided.

4. Indoor coil freeze protection.
5. W ireless infrared remote control to enter set points and operating conditions.
6. Auto Stop features shall have integral setback control.
7. Automatic airsweep control to provide on or off activation of airsweep louvers.
8. Dehumidification mode shall provide increased latent removal capability by modulating system operation and set point temperature.
9. Fan-only operation to provide room air circulation when no cooling is required.
10. Diagnostics shall provide continuous checks of unit operation and warn of possible malfunctions. Error messages shall be displayed at the unit and at the remote controller.
11. An indoor to outdoor thermistor connection cable shall be provided with the fan coil unit.
12. Fan speed control shall be user-selectable: high, medium, low, or microprocessor automatic operation during all operating modes.
13. A time delay shall prevent compressor restart in less than 3 minutes.
14. Automatic heating-to-cooling changeover to provide automatic heating and cooling operation. Control shall include deadband to prevent rapid mode cycling.
15. Demand defrost shall be provided and shall minimize defrost cycles by internally adjusting defrost timing based on frost accumulation.
16. Indoor coil high temperature protection shall be provided to detect excessive indoor discharge temperature when unit is in heat pump mode.
17. Refrigerant to be R-410a.

G. Filters: Unit shall have filter trac k with factory-supplied cleanable filters.

H. Electrical Requirements: Refer to schedule on drawings.

I. Refrigerant Lines: All units shall have rotatable refrigerant lines for penetration through the wall using flare connections. All units shall have flare connections.

1. All refrigerant lines material & installation shall be in accordance with manufacturers recommendation.
    a. Refrigerant piping shall be Type "ACR" hard drawn copper tubing (ASTM B280 compliant) attached with wrought copper fittings, utilizing 1000-degree silver solder and a non-corrosive flux. Refrigerant piping shall be sized and installed in strict accordance with the air conditioning unit manufacturer's recommendations and directions and shall be submitted to the Engineer for prior approval before installation. Pressure drops shall not exceed the equivalent of 2-psi. Refrigerant piping system shall be evacuated, charged with refrigerant holding charge. The refrigerant lines to be tested with nitrogen to a test pressure of not less than 450 psi and proved before final charge of refrigerant. Compressor shall not be subject to the 450 psi pressure test.

J. Special Features (Field Installed):

1. Condensate Pump: The condensate pump shall remove condensate from the drain pan when gravity drainage cannot be used. Pump shall be designed for quiet operation. Pump shall consist of two parts: an internal reservoir/sensor assembly, and a remote sound-shielded pump assembly. The lift capability of the condensate pump shall be 1 to 10 ft (009 size unit) or 3 to 25 ft (012-024 size units). A level sensor on the condensate pan shall stop cooling operation if the level in the condensate pan is unacceptable.
2. Not used.

K. Warranty: Unit to include five year warranty, compressor along with all parts, including labor and refrigerant.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in strict accordance with manufacturer's recommendations.

B. Pipe condensate drain as shown on the drawings or to nearest plumbing bent if not shown with "P" trap.

C. System(s) shall be installed according to manufacturer’s instructions & recommendations, as well as, all governing local & national codes. System(s), as well as the infrared remote controller, shall be mounted & placed as shown on plans within all minimum clearances as specified by manufacturer’s instructions, & secured to provide for safe operation. Refrigerant tubing size shall not vary from manufacturer’s specifications, and shall be properly secured & insulated. Installer shall insulate both liquid & suction lines individually on Low Ambient specified system(s). High voltage & low voltage communication wiring between indoor & outdoor unit(s) shall be run separately from each other in their own enclosures per manufacturer’s instructions. Outdoor condensers shall be mounted & secured to accommodate for extreme weather conditions. Distance between indoor & outdoor unit(s) shall not exceed manufacturer’s recommendations.

END OF SECTION

8-21-26

SECTION 260100 - ELECTRICAL GENERAL CONDITIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. The General Conditions and all pertinent sections are a part of this specification and the Contractor shall consult them in detail for instructions pertaining to his work. He shall consult all other sections of the specifications to determine if he is required to perform any work relative to that particular section.

1.2 SCOPE OF WORK

A. The work contemplated under this specification comprises the furnishing of all labor and materials required and necessary for the complete installation of electrical wiring in conduit for lighting control and power from the various panelboards to each ultimate outlet hereinafter specified and/or shown on the accompanying drawings. Said work shall be done in accordance with the latest edition of the National Electrical Code and all local codes and ordinances. The specifications are intended to describe a complete workable system and bidders shall report any discrepancies or omissions preventing such workability prior to the time their bids are submitted.

B. The work covered by this specification shall be as shown on the plans and called for herein, and shall be comprised generally of the following:

1. Furnish and install all conduit and wiring raceways, conductors, disconnects, panels, etc
2. Furnish and install feeders and branch circuits.
3. Furnish and install service to all mechanical devices.
4. Furnish and install fire alarm wiring and devices.
5. Furnish and install light fixtures.
6. Furnish and install data/voice cabling systems.
7. Furnish and install generator, automatic transfer switches, and fuel components
8. Provide all electrical studies

C. All equipment installed by this contractor shall be installed in strict accordance with instructions of the manufacturer.

D. He shall install his work to meet existing conditions as found at the building site.

E. The Electrical contractor is referred to the Architectural and Structural details for information in regards to the Architectural details. His work shall be done in strict accordance with local and state ordinances governing this class of work.

1.3 REJECTED WORK AND MATERIALS

A. Should contractor introduce any materials different from those called for and described in specifications or shown on plans, it must on notification from the engineers, be immediately removed from building or premises.

1.4 SHOP DRAWINGS

A. Before proceeding with work and/or within thirty (30) days award of the General Contract for this work, the Electrical Contractor shall furnish to the Architect/Engineer, complete shop and working drawings of such apparatus, equipment, controls, insulation, etc. to be provided in this project. These drawings shall give dimensions, weights, mounting data, performance curves, and other pertinent information. Shop drawings to be submitted as listed below.

1. Panels/Panelboards
2. Disconnects.
3. Lighting Fixtures.
4. Conduit & Fittings.
5. Electrical devices.
6. Voice and Data Cabling
7. Generator and Emergency Power Components

B. The contractor may be required to submit shop drawings on any other material he supplies in construction of this project. These drawings shall be submitted at time requested by Architect/Engineer.

1.5 ADDITIONS AND CHANGES

A. The accompanying drawings show approximate location of feeders, branch circuits, light and power circuits, etc. Complete and accurate details in regard to location of outlets, apparatus, etc. from location shown shall be made before roughing-in and without additional cost to the owner.

1.6 STANDARDS OF MATERIALS AND WORKMANSHIP

A. All materials shall be new and listed by UL as conforming to its standards. Work shall be executed in a workmanlike manner and present a neat finished appearance when completed.

1.7 PRIOR APPROVAL AND DRAWINGS

A. Whenever manufacturers or trade names are mentioned in these plans or specifications,

the words "or approved equivalent" shall be assumed to follow whether or not so stated. Manufacturers or trade names are used to establish a standard of quality only and should not in any way be construed to infer a preference. Equivalent products which meet the Engineer`s approval will be accepted, however these products must be submitted to the Engineer a minimum of ten (10) days prior to bid date. Submission shall include manufacturer's name, model number, rating table and construction features. Upon receipt and checking of this submittal, the Architect will issue an addendum listing items which are approved as equivalent to those specified. Prior approval of a particular piece of equipment does not mean automatic final acceptance and will not relieve the Contractor of the responsibility of assuring himself that this equipment is in complete accord with plans and specifications and will fit into the space provided. Submit shop drawings on all items of equipment for approval as hereinafter specified. The Engineer's approval of shop drawings shall not relieve the Contractor from the responsibility of incorrectly figured dimensions or any other errors that may be contained in these drawings. The omissions from the shop drawings, or specifications, even though approved by the Engineer, shall not relieve this Contractor from furnishing and erecting same. Prior Approvals submitted electronically are not preferred.

1.8 GUARANTEE

A. The Contractor for this work shall be required to keep the work installed by him in repair and perfect working order for one year from date of completion and final acceptance; said guarantee shall be based on defective materials and substandard workmanship. Contractor shall furnish, free of cost to owner, all materials and labor necessary to comply with this guarantee.

1.9 LAWS, PERMITS AND INSPECTIONS

A. This contractor shall at his own cost obtain all necessary permits, pay all legal fees and charges, and comply with all building and safety laws, ordinances and regulations relating to the building and the public health and safety, including NEC, NFPA, IBC and OSHA.

1.10 TESTS

A. After installation is complete and at such time as the Engineers may direct, Contractor shall conduct an operating test for approval. Equipment shall be demonstrated to operate in accordance with requirements of this specification. The test shall be performed in the presence of Engineers. Contractor shall furnish all instruments and personnel required for the test.

1.11 CUTTING AND PATCHING

A. Contractor shall do all cutting and patching where necessary at his own expense with approval of the Engineers as to cutting of any structural beams or joists, but all patching shall be done by crafts whose work is involved. After initial surfacing has been done, all further cutting, patching, and painting shall be done at this contractor's expense.

1.12 SAFETY PRECAUTIONS

A. Contractor shall furnish and place proper guards for prevention of accidents. He shall provide and maintain any other necessary construction required to secure safety of life or property, including maintenance of sufficient lights during all night hours to secure such protection.

B. Temporary electrical services shall be provided by electrical contractor during construction and shall be maintained in perfect condition. Frayed, loose or opened connections shall not be used for temporary services. The Electrical Contractor shall use only equipment in first class working conditions for construction services.

1.13 SUPERVISION

A. Contractor shall personally, or through an authorized and competent representative, constantly supervise the work done from beginning to completion and final acceptance. To the best of his ability he shall keep the same foreman and workmen throughout the project duration. During the progress of the work, it shall be subject to inspection by the representatives of the Engineers, and at these times, the contractor shall furnish the required information.

1.14 INSERTS AND OPENINGS

A. Contractor shall furnish and install all inserts and hangers required to support conduit, cables, wireways, disconnect switches, etc.

1.15 OPENINGS THROUGH WALLS AND FLOORS

A. Provide all slots, sleeved holes and other openings necessary through walls and floors, and through any other parts of the structure. Where conduits pass through walls which are intended as rated fire walls, leave-outs, penetrations or sleeves shall be sealed so as not to interfere with the rating of the wall.

1.16 BACKFILLING

A. Contractor shall be responsible to backfill any trenches for electrical runs under the building, paving, or any area of the site by backfilling the bottom of the trench-up to the top of the conduit with sand, then placing compacted fill in 4" layers using power tamping equipment.

1.17 RECORD DRAWINGS

A. The Contractor shall be provided with a set of prints of the original bidding documents by the Architect. The Contractor shall then have a set of sepia (reproducible plans) made.

B. If the Contractor elects to vary from the contract documents and secures prior approval from the architect for any phase of the work, he shall record in a neat and readable manner, ALL such variances on the print in red. These changes shall then be transferred to the permanent set (sepia) at the completion of the job. Both the sepia and the original print shall be returned to the Engineer for documentation.

C. All deviations from sizes, locations and from all other features of the installations shown in the Contract Documents shall be recorded.

D. In addition, it shall be possible using these drawings to correctly and easily locate, identify and establish sizes of all piping, directions, and the like, as well as other features of work which will be concealed underground and/or in the finished building. Locations of underground work shall be established by dimensions to columns, lines or walls, locating all turns, etc. and by properly referenced centerline.

E. For work concealed in the building, sufficient information shall be given so it can be located with reasonable accuracy and ease. In some cases this may be by dimension. In others, it may be sufficient to illustrate the work on the drawings in relation to the spaces in the building near which it was actually installed. Architect's/Engineer's decision in this matter will be final.

F. The following requirements apply to all “record” drawings:

1. They shall be maintained at the contractor's expense.
2. All such drawings shall be done carefully and neatly and in a form approved by the Engineer.
3. Additional drawings shall be provided as necessary for clarification.
4. They shall be kept up-to-date during the entire course of the work and shall be available upon request for examination by Engineer and when necessary, to establish clearances for other parts of the work.
5. "Record" drawings shall be returned to the Architect upon completion of the work and are subject to approval of the Engineer.
6. The Contractor shall refer to the Architectural section under "RECORD DRAWINGS" for further requirements and procedures.

END OF SECTION 260100

PRELIMINARLY NOT FOR CONSTRUCTION
This document shall not be used for construction, bidding, recordation, conveyance, sales or as the basis for the issuance of a permit.
Angie Doré LA32844 Thomassee and Associates, LLC.

SECTION 260500 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Raceways.
2. Building wire and connectors.
3. Supporting devices for electrical components.
4. Electrical identification.
5. Electricity-metering components.
6. Concrete equipment bases.
7. Electrical demolition.
8. Cutting and patching for electrical construction.
9. Touchup painting.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. FMC: Flexible metal conduit.

C. IMC: Intermediate metal conduit.

D. LFMC: Liquidtight flexible metal conduit.

E. RNC: Rigid nonmetallic conduit.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70, most recent addition.

1.5 COORDINATION

A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.

1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.

C. Coordinate electrical service connections to components furnished by utility companies.

1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.
2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.

D. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces. Access doors and panels are specified in Division 8 Section "Access Doors."

E. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

F. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

PART 2 - PRODUCTS

2.1 RACEWAYS

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A. EMT: ANSI C80.3, zinc-coated steel, with set-screw or compression fittings.

B. FMC: Zinc-coated steel.

C. IMC: ANSI C80.6, zinc-coated steel, with threaded fittings.

D. LFMC: Zinc-coated steel with sunlight-resistant and mineral-oil-resistant plastic jacket.

E. RNC: NEMA TC 2, Schedule 40 PVC, with NEMA TC3 fittings.
F. Raceway Fittings: Specifically designed for the raceway type with which used.

2.2 CONDUCTORS

A. Conductors, No. 10 AWG and Smaller: Solid copper.

B. Conductors, Larger Than No. 10 AWG: Stranded copper.

C. Insulation: Thermoplastic, rated at 75 deg C minimum.

D. Wire Connectors and Splices: Units of size, ampacity rating, material, type, and class suitable for service indicated.

2.3 SUPPORTING DEVICES

A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.

B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.

C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch-diameter slotted holes at a maximum of 2 inches o.c., in webs.

D. Slotted-Steel Channel Supports: Comply with Division 5 Section "Metal Fabrications" for slotted channel framing.

1. Channel Thickness: Selected to suit structural loading.
2. Fittings and Accessories: Products of the same manufacturer as channel supports.

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E. Nonmetallic Channel and Angle Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- diameter holes at a maximum of 8 inches o.c., in at least one surface.

1. Fittings and Accessories: Products of the same manufacturer as channels and angles.
2. Fittings and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.

F. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

G. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

H. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.

I. Expansion Anchors: Carbon-steel wedge or sleeve type.

J. Toggle Bolts: All-steel springhead type.

K. Powder-Driven Threaded Studs: Heat-treated steel.

2.4 ELECTRICAL IDENTIFICATION

A. Identification Devices: A single type of identification product for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and these Specifications.

B. Raceway and Cable Labels: Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and minimum length of color field for each raceway and cable size.

1. Type: Pretensioned, wraparound plastic sleeves. Flexible, preprinted, color-coded, acrylic band sized to suit the diameter of the item it identifies.
2. Type: Preprinted, flexible, self-adhesive, vinyl. Legend is overlaminated with a clear, weather- and chemical-resistant coating.
3. Color: Black letters on orange background.
4. Legend: Indicates voltage.

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C. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape, not less than 1 inch wide by 3 mils thick.

D. Underground Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape with the following features:

1. Not less than 6 inches wide by 4 mils thick.
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.
4. Printed legend that indicates type of underground line.

E. Tape Markers for Wire: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

F. Color-Coding Cable Ties: Type 6/6 nylon, self-locking type. Colors to suit coding scheme.

G. Engraved-Plastic Labels, Signs, and Instruction Plates: Engraving stock, melamine plastic laminate punched or drilled for mechanical fasteners 1/16-inch minimum thickness for signs up to 20 sq. in. and 1/8-inch minimum thickness for larger sizes. Engraved legend in black letters on white background.

H. Interior Warning and Caution Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145. Preprinted, aluminum, baked-enamel-finish signs, punched or drilled for mechanical fasteners, with colors, legend, and size appropriate to the application.

I. Exterior Warning and Caution Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch, galvanized-steel backing, with colors, legend, and size appropriate to the application. 1/4-inch grommets in corners for mounting.

J. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.

2.5 TOUCHUP PAINT

A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.

B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

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PART 3 – EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.

B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

D. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 RACEWAY APPLICATION

A. Use the following raceways for outdoor installations:

1. Exposed: IMC or Rigid Steel.
2. Concealed: IMC or Rigid Steel.
3. Underground, Single Run: RNC.
4. Underground, Grouped: RNC.
5. Connection to Vibrating Equipment: LFMC.
6. Boxes and Enclosures: NEMA 250, Type 3R or Type 4.

B. Use the following raceways for indoor installations:

1. Exposed: EMT.
2. Concealed: EMT.
3. Connection to Vibrating Equipment: FMC; except in wet or damp locations, use LFMC.
4. Damp or Wet Locations: IMC.
5. Boxes and Enclosures: NEMA 250, Type 1, unless otherwise indicated.

3.3 RACEWAY AND CABLE INSTALLATION

A. Conceal raceways and cables, unless otherwise indicated, within finished walls, ceilings, and floors.

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B. Install raceways and cables at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Locate horizontal raceway runs above water and steam piping.

C. Use temporary raceway caps to prevent foreign matter from entering.

D. Make conduit bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.

E. Use raceway and cable fittings compatible with raceways and cables and suitable for use and location.

F. Install raceways below slabs and leave at least 4-inch concrete cover.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
2. Space raceways laterally to prevent voids in concrete.
3. Transition from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.
4. Make bends in exposed parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for exposed parallel raceways.

G. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of the pull wire.

H. Install telephone and signal system raceways, 2-inch trade size and smaller, in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements, in addition to requirements above.

I. Connect motors and equipment subject to vibration, noise transmission, or movement with a maximum of 72-inch flexible conduit. Install LFMC in wet or damp locations. Install separate ground conductor across flexible connections.

J. Set floor boxes level and trim after installation to fit flush to finished floor surface.

3.4 WIRING METHODS FOR POWER, LIGHTING, AND CONTROL CIRCUITS

A. Feeders: Type THHN/THWN insulated conductors in raceway.

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B. Underground Feeders and Branch Circuits: Type THWN or single-wire conductors in raceway.

C. Branch Circuits: Refer to Spec 260519.

D. Remote-Control Signaling and Power-Limited Circuits: Type THHN/THWN insulated conductors in raceway for Classes 1, 2, and 3, unless otherwise indicated.

3.5 WIRING INSTALLATION

A. Install splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

B. Install wiring at outlets with at least 12 inches of slack conductor at each outlet.

C. Connect outlet and component connections to wiring systems and to ground. Tighten electrical connectors and terminals, according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

3.6 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.

B. Dry Locations: Steel materials.

C. Support Clamps for PVC Raceways: Click-type clamp system.

D. Selection of Supports: Comply with manufacturer's written instructions.

E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb design load.

3.7 SUPPORT INSTALLATION

A. Install support devices to securely and permanently fasten and support electrical components.

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B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.

E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.

F. Install 1/4-inch- diameter or larger threaded steel hanger rods, unless otherwise indicated.

G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.

H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

I. Simultaneously install vertical conductor supports with conductors.

J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.

K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.

L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:

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1. Wood: Fasten with wood screws or screw-type nails.
2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
3. New Concrete: Concrete inserts with machine screws and bolts.
4. Existing Concrete: Expansion bolts.
5. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.
6. Steel: Welded threaded studs or spring-tension clamps on steel.

    a. Field Welding: Comply with AWS D1.1.

7. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
8. Light Steel: Sheet-metal screws.
9. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.8 IDENTIFICATION MATERIALS AND DEVICES

A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.

C. Self-Adhesive Identification Products: Clean surfaces before applying.

D. Identify raceways and cables with color banding as follows:

1. Bands: Pretensioned, snap-around, colored plastic sleeves or colored adhesive marking tape. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.
2. Band Locations: At changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
3. Colors: As follows:
    a. Fire Alarm System: Red.

E. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.

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F. Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power and communication lines. Locate 6 to 8 inches below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches, overall, use a single line marker.

G. Color-code 208/120-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:

1. Phase A: Black.
2. Phase B: Red.
3. Phase C: Blue.
4. Neutral: White.

H. Color-code 480/277-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:

1. Phase A: Brown.
2. Phase B: Orange.
3. Phase C: Yellow.
4. Neutral: Gray.

I. Install warning, caution, and instruction signs where required to comply with 29 CFR, Chapter XVII, Part 1910.145, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.

J. Install engraved-laminated emergency-operating signs with white letters on red background with minimum 3/8-inch- high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

3.9 FIRESTOPPING

A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Firestopping."

3.10 CONCRETE BASES

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A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated. Use 4000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

3.11 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.12 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work, including the following:

1. Raceways.
2. Building wire and connectors.
3. Supporting devices for electrical components.
4. Electrical identification.
5. Electricity-metering components.
6. Concrete bases.
7. Electrical demolition.
8. Cutting and patching for electrical construction.
9. Touchup painting.

3.13 REFINISHING AND TOUCHUP PAINTING

A. Refinish and touch up paint. Paint materials and application requirements are specified in Division 9 Section "Painting."

1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.

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2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.14 CLEANING AND PROTECTION

A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION 260500

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SECTION 260519 - CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.2 SUBMITTALS

A. Field quality-control test reports.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 CONDUCTORS AND CABLES

A. Manufacturers:

1. American Insulated Wire Corp.; a Leviton Company.

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2. General Cable Corporation.
3. Southwire Company.

B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.

C. Conductor Material: Copper; solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.

D. Conductor Insulation Types: Type THHN-THWN, and XHHW complying with NEMA WC 5 or 7.

2.3 CONNECTORS AND SPLICES

A. Manufacturers:

1. AFC Cable Systems, Inc.
2. AMP Incorporated/Tyco International.
3. Hubbell/Anderson.
4. O-Z/Gedney; EGS Electrical Group LLC.
5. 3M Company; Electrical Products Division.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

A. Service Entrance: Type THHN-THWN, single conductors in raceway.

B. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

C. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspaces: Type THHN-THWN, single conductors in raceway.

D. Exposed Branch Circuits, including in Crawlspaces: Type THHN-THWN, single conductors in raceway.

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E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: .

F. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.

G. Cord Drops and Portable Appliance Connections: Type SO, hard service cord.

H. Fire Alarm Circuits: Type THHN-THWN, in raceway.

I. Class 1 Control Circuits: Type THHN-THWN, in raceway.

J. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.2 INSTALLATION

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Division 26 Section "Basic Electrical Materials and Methods."

F. Seal around cables penetrating fire-rated elements according to Division 7 Section "Through-Penetration Firestop Systems."

G. Identify and color-code conductors and cables according to Division 26 Section "Basic Electrical Materials and Methods Electrical Identification."

H. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

I. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

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3.3 FIELD QUALITY CONTROL

A. Testing: Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.

B. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

END OF SECTION 260519

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SECTION 260526 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Data: For the following:

1. Ground rods.

B. Qualification Data: For firms and persons specified in "Quality Assurance" Article.

C. Field Test Reports: Submit written test reports to include the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association to supervise on-site testing specified in Part 3.

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B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1. Comply with UL 467.

C. Comply with NFPA 70; for overhead-line construction and medium-voltage underground construction, comply with IEEE C2.

D. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Grounding Conductors, Cables, Connectors, and Rods:

a. Apache Grounding/Erico Inc.
b. Boggs, Inc.
c. Chance/Hubbell.
d. Copperweld Corp.
e. Dossert Corp.
f. Erico Inc.; Electrical Products Group.
g. Framatome Connectors/Burndy Electrical.
h. Galvan Industries, Inc.
i. Ideal Industries, Inc.
j. ILSCO.
k. Kearney/Cooper Power Systems.
l. Korns: C. C. Korns Co.; Division of Robroy Industries.
m. Lyncole XIT Grounding.
n. O-Z/Gedney Co.; a business of the EGS Electrical Group.
o. Raco, Inc.; Division of Hubbell.
p. Salisbury: W. H. Salisbury & Co.
q. Superior Grounding Systems, Inc.
r. Thomas & Betts, Electrical.

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2.2 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Division 26 Section "Conductors and Cables."

B. Material: Copper.

C. Equipment Grounding Conductors: Insulated with green-colored insulation.

D. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.

D. Grounding Electrode Conductors: Stranded cable.

E. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.

F. Bare Copper Conductors: Comply with the following:

1. Solid Conductors: ASTM B 3.
2. Assembly of Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.

G. Copper Bonding Conductors: As follows:

1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4 inch in diameter.
2. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
4. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

H. Ground Conductor and Conductor Protector for Wood Poles: As follows:

1. No. 4 AWG minimum, soft-drawn copper conductor.
2. Conductor Protector: Half-round PVC or wood molding. If wood, use pressure-treated fir, or cypress or cedar.

I. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

2.3 CONNECTOR PRODUCTS

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A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.

C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

2.4 GROUNDING ELECTRODES

A. Ground Rods: Sectional type; **copper-clad** steel.

1. Size: 3/4 by 120 inches in diameter.

PART 3 - EXECUTION

3.1 APPLICATION

A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.

B. In raceways, use insulated equipment grounding conductors.

C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells.

D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

E. Ground Rod Clamps at Test Wells: Use bolted pressure clamps with at least two bolts.

F. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Use insulated spacer; space 1 inch from wall and support from wall 6 inches above finished floor, unless otherwise indicated.
2. At doors, route the bus up to the top of the door frame, across the top of the doorway, and down to the specified height above the floor.

G. Underground Grounding Conductors: Use copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches below grade or bury 12 inches above duct bank when installed as part of the duct bank.

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3.2 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Install equipment grounding conductors in all feeders and circuits.

C. Install insulated equipment grounding conductor with circuit conductors for the following items, in addition to those required by NEC:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.

D. Busway Supply Circuits: Install insulated equipment grounding conductor from the grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

E. Computer Outlet Circuits: Install insulated equipment grounding conductor in branch-circuit runs from computer-area power panels or power-distribution units.

F. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

G. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate equipment grounding conductor. Isolate equipment grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

H. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

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I. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.
2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

J. Metal Poles Supporting Outdoor Lighting Fixtures: Provide a grounding electrode in addition to installing a separate equipment grounding conductor with supply branch-circuit conductors.

3.3 COUNTERPOISE

A. Ground the steel framework of the building with a driven ground rod at the base of every corner column and at intermediate exterior columns at distances not more than 60 feet apart. Provide a grounding conductor (counterpoise), electrically connected to each ground rod and to each steel column, extending around the perimeter of the building. Use tinned-copper conductor not less than No. 2/0 AWG for counterpoise and for tap to building steel. Bury counterpoise not less than 18 inches below grade and 24 inches from building foundation.

3.4 INSTALLATION

A. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.

1. Drive ground rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.
2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.

B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

C. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use

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exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

D. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

E. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.

F. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.

G. Install one test well for each service at the ground rod electrically closest to the service entrance. Set top of well flush with finished grade or floor.

Propose location by contractor for engineer review in counterpoise shop drawings.

3.5 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

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C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

E. Connections at Test Wells: Use compression-type connectors on conductors and make bolted- and clamped-type connections between conductors and ground rods.

F. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

G. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

H. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.6 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.
3. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the

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record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

a. Equipment Rated 500 kVA and Less: 10 ohms.
b. Equipment Rated 500 to 1000 kVA: 5 ohms.
c. Equipment Rated More Than 1000 kVA: 3 ohms.
d. Substations and Pad-Mounted Switching Equipment: 5 ohms.
e. Manhole Grounds: 10 ohms.

4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

3.7 GRADING AND PLANTING

A. Restore surface features, including vegetation, at areas disturbed by Work of this Section. Reestablish original grades, unless otherwise indicated. If sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include application of topsoil, fertilizer, lime, seed, sod, sprig, and mulch. Comply with Division 2 Section "Landscaping." Maintain restored surfaces. Restore disturbed paving as indicated.

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SECTION 260533 - RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Related Sections include the following:

1. Division 26 Section "Basic Electrical Materials and Methods" for supports, anchors, and identification products.
2. Division 26 Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. ENT: Electrical nonmetallic tubing.

C. FMC: Flexible metal conduit.

D. IMC: Intermediate metal conduit.

E. LFMC: Liquidtight flexible metal conduit.

F. LFNC: Liquidtight flexible nonmetallic conduit.

G. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

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A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
B. Shop Drawings: Show fabrication and installation details of components for raceways, fittings, boxes, enclosures, and cabinets.

C. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:

1. Ceiling suspension assembly members.
2. Method of attaching hangers to building structure.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

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2.2 METAL CONDUIT AND TUBING

A. Manufacturers:

1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Anamet Electrical, Inc.; Anaconda Metal Hose.
4. Electri-Flex Co.
5. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
6. LTV Steel Tubular Products Company.
7. Manhattan/CDT/Cole-Flex.
8. O-Z Gedney; Unit of General Signal.
9. Wheatland Tube Co.

B. Rigid Steel Conduit: ANSI C80.1.

C. Aluminum Rigid Conduit: ANSI C80.5.

D. IMC: ANSI C80.6.

E. Plastic-Coated Steel Conduit and Fittings: NEMA RN 1.

F. Plastic-Coated IMC and Fittings: NEMA RN 1.

G. EMT and Fittings: ANSI C80.3.

1. Fittings: Compression type.

H. FMC: Zinc-coated steel.

I. LFMC: Flexible steel conduit with PVC jacket.

J. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

2.3 NONMETALLIC CONDUIT AND TUBING

A, Manufacturers:

1. American International.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corp.
4. Cantex Inc.
5. Certainteed Corp.; Pipe & Plastics Group.

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6. Condux International.
7. ElecSYS, Inc.
8. Electri-Flex Co.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT/Cole-Flex.
11. RACO; Division of Hubbell, Inc.
12. Spiralduct, Inc./AFC Cable Systems, Inc.
13. Thomas & Betts Corporation.

B. ENT: NEMA TC 13.

C. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.

D. ENT and RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.

E. LFNC: UL 1660.

2.4 METAL WIREWAYS

A. Manufacturers:

1. Hoffman.
2. Square D.

B. Material and Construction: Sheet metal sized and shaped as indicated, NEMA 3R.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

E. Wireway Covers: Screw-cover type.

F. Finish: Manufacturer's standard enamel finish.

2.5 NONMETALLIC WIREWAYS

A. Manufacturers:

1. Hoffman.

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2. Lamson & Sessions; Carlon Electrical Products.

B. Description: Fiberglass polyester, extruded and fabricated to size and shape indicated, with no holes or knockouts. Cover is gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections are flanged, with stainless-steel screws and oil-resistant gaskets.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

2.6 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating.

B. Manufacturers:

1. Airey-Thompson Sentinel Lighting; Wiremold Company (The).
2. Thomas & Betts Corporation.
3. Walker Systems, Inc.; Wiremold Company (The).
4. Wiremold Company (The); Electrical Sales Division.

C. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

2.7 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. Emerson/General Signal; Appleton Electric Company.
3. Erickson Electrical Equipment Co.
4. Hoffman.
5. Hubbell, Inc.; Killark Electric Manufacturing Co.
6. O-Z/Gedney; Unit of General Signal.
7. RACO; Division of Hubbell, Inc.
8. Robroy Industries, Inc.; Enclosure Division.
9. Scott Fetzer Co.; Adalet-PLM Division.

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10. Spring City Electrical Manufacturing Co.
11. Thomas & Betts Corporation.
12. Walker Systems, Inc.; Wiremold Company (The).
13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.

D. Floor Boxes: Cast metal, fully adjustable, rectangular.

E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

F. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

G. Hinged-Cover Enclosures: EMA 250, Type 1, with continuous hinge cover and flush latch.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

H. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

2.8 FACTORY FINISHES

A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard prime-coat finish ready for field painting.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors:

1. Exposed: Rigid steel or IMC.
2. Concealed: Rigid steel or IMC.
3. Underground, Single Run: RNC.

4. Underground, Grouped: RNC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Boxes and Enclosures: NEMA 250, Type 3R.

B. Indoors:

1. Exposed: EMT.
2. Concealed: EMT.
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
4. Damp or Wet Locations: Rigid steel conduit.
5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:

    a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.

C. Minimum Raceway Size: 1/2-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.

E. Do not install aluminum conduits embedded in or in contact with concrete.

3.2 INSTALLATION

A. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

B. Complete raceway installation before starting conductor installation.

C. Support raceways as specified in Division 26 Section "Basic Electrical Materials and Methods."

D. Install temporary closures to prevent foreign matter from entering raceways.

E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.

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F. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

1. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.

H. Raceways Below Slabs: Do not install raceways embedded in slabs.

1. **Secure raceways to reinforcing rods to prevent sagging or shifting, using stainless steel straps.**

2. Space raceways laterally to prevent voids in concrete.
3. Run conduit larger than 1-inch trade size parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
4. Change from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above the floor.

I. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.

1. Run parallel or banked raceways together on common supports.
2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

J. Join raceways with fittings designed and approved for that purpose and make joints tight.

1. Use insulating bushings to protect conductors.

K. Tighten set screws of threadless fittings with suitable tools.

L. Terminations:

1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.

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2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.

M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.

N. Telephone and Signal System Raceways, 2-Inch Trade Size and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

O. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where otherwise required by NFPA 70.

P. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.

Q. Flexible Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures, install jbox above each fixture to transition from conduit to flex; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.

R. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.

S. Set floor boxes level and flush with finished floor surface.

T. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.3 PROTECTION

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A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.4 CLEANING

A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

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SECTION 260553 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes electrical identification materials and devices required to comply with ANSI C2, NFPA 70, OSHA standards, and authorities having jurisdiction.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Schedule of Nomenclature: An index of electrical equipment and system components used in identification signs and labels.

C. Samples: For each type of label and sign to illustrate color, lettering style, and graphic features of identification products.

1.4 QUALITY ASSURANCE

A. Comply with ANSI C2.

B. Comply with NFPA 70.

C. Comply with ANSI A13.1 and NFPA 70 for color-coding.

PART 2 - PRODUCTS

2.1 RACEWAY AND CABLE LABELS

A. Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

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1. Color: Black letters on orange field.
2. Legend: Indicates voltage and service.

B. Adhesive Labels: Preprinted, flexible, self-adhesive vinyl with legend overlaminated with a clear, weather- and chemical-resistant coating.

C. Underground-Line Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape.

1. Not less than 6 inches wide by 4 mils thick.
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.
4. Printed legend indicating type of underground line.

D. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

E. Aluminum, Wraparound Marker Bands: Bands cut from 0.014-inch- thick aluminum sheet, with stamped or embossed legend, and fitted with slots or ears for permanently securing around wire or cable jacket or around groups of conductors.

F. Plasticized Card-Stock Tags: Vinyl cloth with preprinted and field-printed legends. Orange background, unless otherwise indicated, with eyelet for fastener.

2.2 NAMEPLATES AND SIGNS

A. Safety Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145.

B. Engraved Plastic Nameplates and Signs: Engraving stock, melamine plastic laminate, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.

C. Exterior, Metal-Backed, Butyrate Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for the application. 1/4-inch grommets in corners for mounting.

D. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32, stainless-steel machine screws with nuts and flat and lock washers.

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2.3 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking, Type 6/6 nylon cable ties.
   1. Minimum Width: 3/16 inch.
   2. Tensile Strength: 50 lb minimum.
   3. Temperature Range: Minus 40 to plus 185 deg F.
   4. Color: According to color-coding.

B. Paint: Formulated for the type of surface and intended use.

   1 Primer for Galvanized Metal: Single-component acrylic vehicle formulated for galvanized surfaces.
   2. Primer for Concrete Masonry Units: Heavy-duty-resin block filler.
   3. Primer for Concrete: Clear, alkali-resistant, binder-type sealer.
   4. Enamel: Silicone-alkyd or alkyd urethane as recommended by primer manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations in the Contract Documents or with those required by codes and standards. Use consistent designations throughout Project.

C. Sequence of Work: If identification is applied to surfaces that require finish, install identification after completing finish work.

D. Install painted identification according to manufacturer's written instructions and as follows:

   1. Clean surfaces of dust, loose material, and oily films before painting.
   2. Prime surfaces using type of primer specified for surface.
   3. Apply one intermediate and one finish coat of enamel.

E. Color Banding Raceways and Exposed Cables: Band exposed and accessible raceways of the systems listed below:

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1. Bands: Pretensioned, wraparound plastic sleeves; colored adhesive tape; or a combination of both. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.
2. Band Locations: At changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

F. Caution Labels for Indoor Boxes and Enclosures for Power and Lighting: Install pressure-sensitive, self-adhesive labels identifying system voltage with black letters on orange background. Install on exterior of door or cover.

G. Circuit Identification Labels on Boxes: Install labels externally.

1. Exposed Boxes: Pressure-sensitive, self-adhesive plastic label on cover.
2. Concealed Boxes: Plasticized card-stock tags.
3. Labeling Legend: Permanent, waterproof listing of panel and circuit number or equivalent.

H. Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communication lines, install continuous underground plastic line marker located directly above line at 6 to 8 inches below finished grade. Where width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches overall, use a single line marker. Install line marker for underground wiring, both direct-buried cables and cables in raceway.

I. Color-Coding of Secondary Phase Conductors: Use the following colors for service, feeder and branch-circuit phase conductors:

1. 208/120-V and 240/120-V Conductors:

   a. Phase A: Black.
   b. Phase B: Red.
   c. Phase C: Blue.
   d. Neutral: White.

2. 480/277-V Conductors:

   a. Phase A: Brown
   b. Phase B: Orange
   c. Phase C: Yellow
   d. Neutral: Gray.

3. Factory apply color the entire length of conductors, except the following field-applied, color-coding methods may be used instead of factory-coded wire for sizes larger than No. 10 AWG:

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a. Colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Use 1-inch- wide tape in colors specified. Adjust tape bands to avoid obscuring cable identification markings.
b. Colored cable ties applied in groups of three ties of specified color to each wire at each terminal or splice point starting 3 inches from the terminal and spaced 3 inches apart. Apply with a special tool or pliers, tighten to a snug fit, and cut off excess length.

J. Power-Circuit Identification: Metal tags or aluminum, wraparound marker bands for cables, feeders, and power circuits in vaults, pull and junction boxes, manholes, and switchboard rooms.

1. Legend: 1/4-inch- steel letter and number stamping or embossing with legend corresponding to indicated circuit designations.
2. Tag Fasteners: Nylon cable ties.
3. Band Fasteners: Integral ears.

K. Apply identification to conductors as follows:

1. Conductors to Be Extended in the Future: Indicate source and circuit numbers.
2. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color-coding to identify circuits' voltage and phase.
3. Multiple Control and Communication Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color-coding, or cable marking tape.

L. Apply warning, caution, and instruction signs as follows:

1. Warnings, Cautions, and Instructions: Install to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
2. Emergency Operation: Install engraved laminated signs with white legend on red background with minimum 3/8-inch- high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

M. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment, including central or master unit of each system. This includes power, lighting, communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Unless otherwise indicated, provide a single line

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of text with 1/2-inch- high lettering on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high. Use white lettering on black field. Apply labels for each unit of the following categories of equipment using mechanical fasteners:

1. Panelboards, electrical cabinets, and enclosures.
2. Access doors and panels for concealed electrical items.
3. Electrical switchgear and switchboards.
4. Emergency system boxes and enclosures.
5. Motor-control centers.
6. Disconnect switches.
7. Enclosed circuit breakers.
8. Motor starters.
9. Push-button stations.
10. Power transfer equipment.
11. Contactors.
12. Remote-controlled switches.
13. Dimmers.
14. Control devices.
15. Transformers.
16. Rectifiers.
17. Frequency converters.
18. Battery racks.
19. Power-generating units.
20. Telephone switching equipment.
21. Clock/program master equipment.
22. Call system master station.
23. TV/audio-monitoring master station.
24. Fire alarm master station or control panel.
25. Security-monitoring master station or control panel.

END OF SECTION 260553

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SECTION 260572 – OVERCURRENT PROTECTIVE DEVICE SHORT-CIRCUIT STUDIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes a computer-based, fault-current study to determine the minimum interrupting capacity of circuit protective devices required for all new electrical system branches.

1.3 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed and salvaged, or removed and reinstalled. Existing to remain items shall remain functional throughout the construction period.

B. Field Adjusting Agency: An independent electrical testing agency with full-time employees and the capability to adjust devices and conduct testing indicated and that is a member company of NETA.

C. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

D. Power System Analysis Software Developer: An entity that commercially develops, maintains, and distributes computer software used for power system studies.

E. Power Systems Analysis Specialist: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located.

F. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion of the circuit from the system.

G. SCCR: Short-circuit current rating.

H. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

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I. Single-Line Diagram: See "One-Line Diagram."

1.4 ACTION SUBMITTALS

A. Product Data:

1. For computer software program to be used for studies.
2. Submit the following after the approval of system protective devices submittals. Submittals may be in digital form.

    a. Short-circuit study input data, including completed computer program input data sheets.
    b. Short-circuit study and equipment evaluation report; signed, dated, and sealed by a qualified professional engineer.

        1) Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.
        2) Revised one-line diagram, reflecting field investigation results and results of short-circuit study.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Power Systems Analysis Software Developer.
2. For Power System Analysis Specialist.
3. For Field Adjusting Agency.

B. Product Certificates: For short-circuit study software, certifying compliance with IEEE 399.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. For overcurrent protective devices to include in emergency, operation, and maintenance manuals.
2. The following are from the Short-Circuit Study Report:

    a. Final one-line diagram.

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b. Final Short-Circuit Study Report.
c. Short-circuit study data files.
d. Power system data.

1.7 QUALITY ASSURANCE

A. Study shall be performed using commercially developed and distributed software designed specifically for power system analysis.

B. Software algorithms shall comply with requirements of standards and guides specified in this Section.

C. Manual calculations are unacceptable.

1. Power System Analysis Software Qualifications: Computer program shall be designed to perform short-circuit studies or have a function, component, or add-on module designed to perform short-circuit studies.
2. Computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

D. Power Systems Analysis Specialist Qualifications: Professional engineer licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

E. Short-Circuit Study Certification: Short-Circuit Study Report shall be signed and sealed by Power Systems Analysis Specialist.

F. Field Adjusting Agency Qualifications:

1. Employer of a NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification responsible for all field adjusting of the Work.
2. A member company of NETA.
3. Acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 POWER SYSTEM ANALYSIS SOFTWARE DEVELOPERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. SKM Systems Analysis, Inc. or prior approved equal

B. Comply with IEEE 399 and IEEE 551.

1. Analytical features of power systems analysis software program shall have capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

C. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output.

2.2 SHORT-CIRCUIT STUDY REPORT CONTENTS

A. Executive summary of study findings.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.

C. One-line diagram of modeled power system, showing the following:

1. Protective device designations and ampere ratings.
2. Conductor types, sizes, and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center, and panelboard designations and ratings.
6. Derating factors and environmental conditions.
7. Any revisions to electrical equipment required by the study.

D. Comments and recommendations for system improvements or revisions in a written document, separate from one-line diagram.

E. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to available short-circuit currents. Verify that equipment withstand ratings exceed available short-circuit current at equipment installation locations.
2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
3. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
4. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in standards to 1/2-cycle symmetrical fault current.
5. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding

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electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

F. Short-Circuit Study Input Data:

1. One-line diagram of system being studied.
2. Power sources available.
3. Manufacturer, model, and interrupting rating of protective devices.
4. Conductors.
5. Transformer data.

G. Short-Circuit Study Output Reports:

1. Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

    a. Voltage.
    b. Calculated fault-current magnitude and angle.
    c. Fault-point X/R ratio.
    d. Equivalent impedance.

2. Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

    a. Voltage.
    b. Calculated symmetrical fault-current magnitude and angle.
    c. Fault-point X/R ratio.
    d. Calculated asymmetrical fault currents:

        1) Based on fault-point X/R ratio.
        2) Based on calculated symmetrical value multiplied by 1.6.
        3) Based on calculated symmetrical value multiplied by 2.7.

3. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

    a. Voltage.
    b. Calculated symmetrical fault-current magnitude and angle.
    c. Fault-point X/R ratio.
    d. No AC Decrement (NACD) ratio.
    e. Equivalent impedance.
    f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.

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g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

PART 3 - EXECUTION

3.1 POWER SYSTEM DATA

A. Obtain all data necessary for conduct of the study.

1. Verify completeness of data supplied on one-line diagram. Call any discrepancies to Architect's attention.
2. For equipment included as Work of this Project, use characteristics submitted under provisions of action submittals and information submittals for this Project.
3. For equipment which is new and installed, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers. Qualifications of technicians and engineers shall be as defined by NFPA 70E.

B. Gather and tabulate the required input data to support the short-circuit study. Comply with requirements in Section 017839 "Project Record Documents" for recording circuit protective device characteristics. Record data on a Record Document copy of one-line diagram. Comply with recommendations in IEEE 551 as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification. Data include, but are not limited to, the following:

1. Product Data for Project's overcurrent protective devices involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance at the service.
3. Power sources and ties.
4. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
5. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
6. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip, SCCR, current rating, and breaker settings.
7. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.

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8. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
9. Motor horsepower and NEMA MG 1 code letter designation.
10. Conductor sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).
11. Derating factors.

3.2 SHORT-CIRCUIT STUDY

A. Perform study following the general study procedures contained in IEEE 399.

B. Calculate short-circuit currents according to IEEE 551.

C. Base study on device characteristics supplied by device manufacturer.

D. Extent of electrical power system to be studied is indicated on Drawings.

E. Begin short-circuit current analysis at the service, extending down to system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 10 kA or less.
2. Exclude equipment rated 240 V ac or less when supplied by a single transformer rated less than 125 kVA.
3. Refer to Sheet E7.3 for electrical system branches for short circuit analysis requirements.

F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

G. Include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and apply to low- and medium-voltage, three-phase ac systems. Also account for the fault-current dc decrement to address asymmetrical requirements of interrupting equipment.

H. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and a single line-to-ground fault at each equipment indicated on one-line diagram.

1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

I. Include in the report identification of any protective device applied outside its capacity.

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SECTION 260573 - OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes computer-based, overcurrent protective device coordination studies to determine overcurrent protective devices and to determine overcurrent protective device settings for selective tripping.

1. Study results shall be used to determine coordination of series-rated devices.

1.3 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled. Existing to remain items shall remain functional throughout the construction period.

B. Field Adjusting Agency: An independent electrical testing agency with full-time employees and the capability to adjust devices and conduct testing indicated and that is a member company of NETA.

C. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

D. Power System Analysis Software Developer: An entity that commercially develops, maintains, and distributes computer software used for power system studies.

E. Power System Analysis Specialist: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located.

F. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion of the circuit from the system.

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G. SCCR: Short-circuit current rating.

H. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

I. Single-Line Diagram: See "One-Line Diagram."

1.4 ACTION SUBMITTALS

A. Product Data:

1. For computer software program to be used for studies.
2. Submit the following after the approval of system protective devices submittals. Submittals may be in digital form.

    a. Coordination-study input data, including completed computer program input data sheets.
    b. Study and equipment evaluation reports.

3. Overcurrent protective device coordination study report; signed, dated, and sealed by a qualified professional engineer.

    a. Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Power System Analysis Software Developer.
2. For Power Systems Analysis Specialist.
3. For Field Adjusting Agency.

B. Product Certificates: For overcurrent protective device coordination study software, certifying compliance with IEEE 399.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For overcurrent protective devices to include in emergency, operation, and maintenance manuals.

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1. The following are from the Coordination Study Report:

    a. Final one-line diagram.
    b. Final protective device coordination study.
    c. Coordination study data files.
    d. List of all protective device settings.
    e. Time-current coordination curves.
    f. Power system data.

1.7 QUALITY ASSURANCE

A. Studies shall be performed using commercially developed and distributed software designed specifically for power system analysis.

B. Software algorithms shall comply with requirements of standards and guides specified in this Section.

C. Manual calculations are unacceptable.

D. Power System Analysis Software Qualifications:

1. Computer program shall be designed to perform coordination studies or have a function, component, or add-on module designed to perform coordination studies.
2. Computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

E. Power Systems Analysis Specialist Qualifications: Professional engineer licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

F. Field Adjusting Agency Qualifications:

1. Employer of a NETA ETT-Certified Technician Level III responsible for all field adjusting of the Work.
2. A member company of NETA.
3. Acceptable to authorities having jurisdiction.

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PART 2 - PRODUCTS

2.1 POWER SYSTEM ANALYSIS SOFTWARE DEVELOPERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. SKM Systems Analysis, Inc. or prior approved equal

B. Comply with IEEE 242 and IEEE 399.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

D. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.

   1. Optional Features:

      a. Arcing faults.
      b. Simultaneous faults.
      c. Explicit negative sequence.
      d. Mutual coupling in zero sequence.

2.2 COORDINATION STUDY REPORT CONTENTS

A. Executive summary of study findings.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.

C. One-line diagram of modeled power system, showing the following:

   1. Protective device designations and ampere ratings.
   2. Conductor types, sizes, and lengths.
   3. Transformer kilovolt ampere (kVA) and voltage ratings.
   4. Motor and generator designations and kVA ratings.
   5. Switchgear, switchboard, motor-control center, and panelboard designations.
   6. Any revisions to electrical equipment required by the study.
   7. Study Input Data: As described in "Power System Data" Article. (Section 3.2 below)

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a. Short-Circuit Study Output: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260572 Overcurrent Protection Short-Circuit Study

D. Protective Device Coordination Study:

1. Report recommended settings of protective devices, ready to be applied in the field. Use manufacturer's data sheets for recording the recommended setting of overcurrent protective devices when available.

a. Phase and Ground Relays:

1) Device tag.
2) Relay current transformer ratio and tap, time dial, and instantaneous pickup value.
3) Recommendations on improved relaying systems, if applicable.

b. Circuit Breakers:

1) Adjustable pickups and time delays (long time, short time, and ground).
2) Adjustable time-current characteristic.
3) Adjustable instantaneous pickup.
4) Recommendations on improved trip systems, if applicable.

c. Fuses: Show current rating, voltage, and class.

E. Time-Current Coordination Curves: Determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:

1. Device tag and title, one-line diagram with legend identifying the portion of the system covered.
2. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.
3. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
4. Plot the following listed characteristic curves, as applicable:

a. Power utility's overcurrent protective device.
b. Medium-voltage equipment overcurrent relays.

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c. Medium- and low-voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
d. Low-voltage equipment circuit-breaker trip devices, including manufacturer's tolerance bands.
e. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves.
f. Cables and conductors damage curves.
g. Ground-fault protective devices.
h. Motor-starting characteristics and motor damage points.
i. Generator short-circuit decrement curve and generator damage point.
j. The largest feeder circuit breaker in each motor-control center and panelboard.

5. Maintain selectivity for tripping currents caused by overloads.
6. Maintain maximum achievable selectivity for tripping currents caused by overloads on series-rated devices.
7. Provide adequate time margins between device characteristics such that selective operation is achieved.
8. Comments and recommendations for system improvements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance of the Work. Devices to be coordinated are indicated on Drawings.

1. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to coordination study may not be used in study.

3.2 POWER SYSTEM DATA

A. Obtain all data necessary for conduct of the overcurrent protective device study.

1. Verify completeness of data supplied in one-line diagram on Drawings. Call any discrepancies to Architect's attention.
2. For equipment included as Work of this Project, use characteristics submitted under provisions of action submittals and information submittals for this Project.
3. For equipment which is existing to remain, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians

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and engineers. Qualifications of technicians and engineers shall be as defined by NFPA 70E.

B. Gather and tabulate all required input data to support the coordination study. List below is a guide. Comply with recommendations in IEEE 551 for the amount of detail required to be acquired in the field. Field data gathering shall be under direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification. Data include, but are not limited to, the following:

1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Electrical power utility impedance at the service.
3. Power sources and ties.
4. Short-circuit current at each system bus (three phase and line to ground).
5. Full-load current of all loads.
6. Voltage level at each bus.
7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
8. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
9. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
10. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
11. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
12. Maximum demands from service meters.
13. Busway manufacturer and model designation, current rating, impedance, lengths, size, and conductor material.
14. Motor horsepower and NEMA MG 1 code letter designation.
15. Low-voltage cable sizes, lengths, number, conductor material, and conduit material (magnetic or nonmagnetic).
16. Medium-voltage cable sizes, lengths, conductor material, cable construction, metallic shield performance parameters, and conduit material (magnetic or nonmagnetic).
17. Data sheets to supplement electrical distribution system one-line diagram, cross-referenced with tag numbers on diagram, showing the following:

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a. Special load considerations, including starting inrush currents and frequent starting and stopping.
b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
d. Generator thermal-damage curve.
e. Ratings, types, and settings of utility company's overcurrent protective devices.
f. Special overcurrent protective device settings or types stipulated by utility company.
g. Time-current-characteristic curves of devices indicated to be coordinated.
h. Manufacturer, frame size, interrupting rating in amperes root mean square (rms) symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
j. Switchgear, switchboards, motor-control centers, and panelboards ampacity, and SCCR in amperes rms symmetrical.
k. Identify series-rated interrupting devices for a condition where the available fault current is greater than the interrupting rating of downstream equipment. Obtain device data details to allow verification that series application of these devices complies with NFPA 70 and UL 489 requirements.

3.3 COORDINATION STUDY

A. Comply with IEEE 242 for calculating short-circuit currents and determining coordination time intervals.

B. Comply with IEEE 399 for general study procedures.

C. Base study on device characteristics supplied by device manufacturer.

D. Extent of electrical power system to be studied is indicated on Drawings.

E. Begin analysis at the service, extending down to system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 10 kA or less.
2. Exclude equipment rated 240 V ac or less when supplied by a single transformer rated less than 125 kVA.

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3. Refer to Sheet E7.3 for electrical branches required for Coordination Study.

F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

G. Transformer Primary Overcurrent Protective Devices:

1. Device shall not operate in response to the following:

   a. Inrush current when first energized.
   b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
   c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.

2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.

H. Motor Protection:

1. Select protection for low-voltage motors according to IEEE 242 and NFPA 70.
2. Select protection for motors served at voltages more than 600 V according to IEEE 620.

I. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and protection recommendations in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

J. Generator Protection: Select protection according to manufacturer's written instructions and to IEEE 242.

K. Include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and apply to low- and medium-voltage, three-phase ac systems. Also account for fault-current dc decrement, to address asymmetrical requirements of interrupting equipment.

L. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and a single line-to-ground fault at each equipment indicated on one-line diagram.

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1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

M. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to short-circuit ratings.
2. Adequacy of switchgear, motor-control centers, and panelboard bus bars to withstand short-circuit stresses.
3. Any application of series-rated devices shall be recertified, complying with requirements in NFPA 70.
4. Include in the report identification of any protective device applied outside its capacity.

3.4 FIELD ADJUSTING

A. Adjust relay and protective device settings according to recommended settings provided by the coordination study. Field adjustments shall be completed by the engineering service division of equipment manufacturer under the "Startup and Acceptance Testing" contract portion.

B. Make minor modifications to equipment as required to accomplish compliance with overcurrent protective device coordination studies and short circuit studies.

C. Testing and adjusting shall be by a full-time employee of the Field Adjusting Agency, who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification.

1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters. Perform NETA tests and inspections for all adjustable overcurrent protective devices.

3.5 DEMONSTRATION

A. Engage Power Systems Analysis Specialist to train Owner's maintenance personnel in the following:

1. Acquaint personnel in fundamentals of operating the power system in normal and emergency modes.
2. Hand-out and explain the coordination study objectives, study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpreting time-current coordination curves.

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3. For Owner's maintenance staff certified as NETA ETT-Certified Technicians Level III or NICET Electrical Power Testing Level III Technicians, teach how to adjust, operate, and maintain overcurrent protective device settings.

END OF SECTION 260573

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SECTION 260574 – OVERCURRENT PROTECTIVE DEVICE ARC-FLASH STUDY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes a computer-based, arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment for all new panelboards installed under this project.

1.3 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

B. Field Adjusting Agency: An independent electrical testing agency with full-time employees and the capability to adjust devices and conduct testing indicated and that is a member company of NETA.

C. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

D. Power System Analysis Software Developer: An entity that commercially develops, maintains, and distributes computer software used for power system studies.

E. Power Systems Analysis Specialist: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located.

F. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

G. SCCR: Short-circuit current rating.

H. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

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I. Single-Line Diagram: See "One-Line Diagram."

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Study Submittals: Submit the following submittals after the approval of system protective devices submittals. Submittals may be in digital form:

1. Arc-flash study input data, including completed computer program input data sheets.
2. Arc-flash study report; signed, dated, and sealed by Power Systems Analysis Specialist.
3. Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Power Systems Analysis Software Developer.
2. For Power System Analysis Specialist.
3. For Field Adjusting Agency.

B. Product Certificates: For arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. Provide maintenance procedures in equipment manuals according to requirements in NFPA 70E.
2. Operation and Maintenance Procedures: In addition to items specified in Section 017823 "Operation and Maintenance Data," provide maintenance procedures for use by Owner's personnel that comply with requirements in NFPA 70E.

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1.7 QUALITY ASSURANCE

A. Study shall be performed using commercially developed and distributed software designed specifically for power system analysis.

B. Software algorithms shall comply with requirements of standards and guides specified in this Section.

C. Manual calculations are unacceptable.

D. Power System Analysis Software Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. Computer program shall be designed to perform arc-flash analysis or have a function, component, or add-on module designed to perform arc-flash analysis.
2. Computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

E. Power Systems Analysis Specialist Qualifications: Professional engineer in charge of performing the arc-flash study, analyzing the arc flash, and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

F. Arc-Flash Study Certification: Arc-Flash Study Report shall be signed and sealed by Power Systems Analysis Specialist.

G. Field Adjusting Agency Qualifications:

1. Employer of a NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification responsible for all field adjusting of the Work.
2. A member company of NETA.
3. Acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
1. SKM Systems Analysis, Inc. or prior approved equal

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B. Comply with IEEE 1584 and NFPA 70E.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

2.2 ARC-FLASH STUDY REPORT CONTENT

A. Executive summary of study findings.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.
2. Conductor types, sizes, and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings, including derating factors and environmental conditions.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center, panelboard designations, and ratings.

D. Study Input Data: As described in "Power System Data" Article.

E. Short-Circuit Study Output Data: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260573.13 "Short-Circuit Studies."

F. Protective Device Coordination Study Report Contents: As specified in "Coordination Study Report Contents" Article in Section 260573.16 "Coordination Studies."

G. Arc-Flash Study Output Reports:

1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each equipment location included in the report:

a. Voltage.
b. Calculated symmetrical fault-current magnitude and angle.
c. Fault-point X/R ratio.
d. No AC Decrement (NACD) ratio.
e. Equivalent impedance.
f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.

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g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

H. Incident Energy and Flash Protection Boundary Calculations:

1. Arcing fault magnitude.
2. Protective device clearing time.
3. Duration of arc.
4. Arc-flash boundary.
5. Restricted approach boundary.
6. Limited approach boundary.
7. Working distance.
8. Incident energy.
9. Hazard risk category.
10. Recommendations for arc-flash energy reduction.

I. Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of computer printout.

2.3 ARC-FLASH WARNING LABELS

A. Comply with requirements in Section 260553 "Electrical Identification" for self-adhesive equipment labels. Produce a 3.5-by-5-inch self-adhesive equipment label for each work location included in the analysis.

B. Label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:

1. Location designation.
2. Nominal voltage.
3. Protection boundaries.

a. Arc-flash boundary.
b. Restricted approach boundary.
c. Limited approach boundary.

4. Arc flash PPE category.
5. Required minimum arc rating of PPE in Cal/cm squared.
6. Available incident energy.
7. Working distance.
8. Engineering report number, revision number, and issue date.

C. Labels shall be machine printed, with no field-applied markings.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals. Proceed with arc-flash study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.

3.2 ARC-FLASH HAZARD ANALYSIS

A. Comply with NFPA 70E and its Annex D for hazard analysis study.

B. Preparatory Studies: Perform the Short Circuit and Coordination Study prior to starting the Arc-Flash Study.

1. Short-Circuit Study Output: As specified in "Short-Circuit Study Output Reports" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260572 "Overcurrent Protective Device Short Circuit Study."
2. Coordination Study Report Contents: As specified in "Coordination Study Report Contents" Article in Section 260573 "Overcurrent Protection Coordination Studies."

C. Calculate maximum and minimum contributions of fault-current size.

1. Maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.
2. Calculate arc-flash energy at 85 percent of maximum short-circuit current according to IEEE 1584 recommendations.
3. Calculate arc-flash energy at 38 percent of maximum short-circuit current according to NFPA 70E recommendations.
4. Calculate arc-flash energy with the utility contribution at a minimum and assume no motor contribution.

D. Calculate the arc-flash protection boundary and incident energy at locations in electrical distribution system where personnel could perform work on energized parts.

E. Include medium- and low-voltage equipment locations, except equipment rated 240 V ac or less fed from transformers less than 125 kVA.

F. Calculate the limited, restricted, and prohibited approach boundaries for each location.

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G. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:

1. Fault contribution from induction motors shall not be considered beyond three to five cycles.
2. Fault contribution from synchronous motors and generators shall be decayed to match the actual decrement of each as closely as possible (for example, contributions from permanent magnet generators will typically decay from 10 per unit to three per unit after 10 cycles).

H. Arc-flash energy shall generally be reported for the maximum of line or load side of a circuit breaker. However, arc-flash computation shall be performed and reported for both line and load side of a circuit breaker as follows:

1. When the circuit breaker is in a separate enclosure.
2. When the line terminals of the circuit breaker are separate from the work location.

I. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

3.3 POWER SYSTEM DATA

A. Obtain all data necessary for conduct of the arc-flash hazard analysis.

1. Verify completeness of data supplied on one-line diagram on Drawings and under Prepartory Studies paragraph in “Arc Flash Study” Article. Call discrepancies to Architect's attention.
2. For new equipment, use characteristics from approved submittals under provisions of action submittals and information submittals for this Project.
3. For existing equipment, whether or not relocated, obtain required electrical distribution system data by field investigation and surveys conducted by qualified technicians and engineers.

B. Electrical Survey Data: Gather and tabulate the following input data to support study. Comply with recommendations in IEEE 1584 and NFPA 70E as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification. Data include, but are not limited to, the following:

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1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance or available short circuit current at the service.
3. Power sources and ties.
4. Short-circuit current at each system bus (three phase and line to ground).
5. Full-load current of all loads.
6. Voltage level at each bus.
7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
8. For reactors, provide manufacturer and model designation, voltage rating and impedance.
9. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
10. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
11. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
12. Busway manufacturer and model designation, current rating, impedance, lengths, size, and conductor material.
13. Motor horsepower and NEMA MG 1 code letter designation.
14. Low-voltage conductor sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).
15. Medium-voltage conductor sizes, lengths, conductor material, conductor construction and metallic shield performance parameters, and conduit material (magnetic or nonmagnetic).

3.4 LABELING

A. Apply arc-flash label on the front cover of each section of equipment included in the study. Base arc-flash label data on highest values calculated at each location.

B. Each piece of equipment listed below shall have an arc-flash label applied to it:

1. Panelboard and safety switch over 250 V.
2. Applicable panelboard and safety switch under 250 V.
3. Control panel.

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C. Note on record Drawings the location of equipment where the personnel could be exposed to arc-flash hazard during their work.

1. Indicate arc-flash energy.
2. Indicate protection level required.

3.5 APPLICATION OF WARNING LABELS

A. Install arc-flash warning labels under the direct supervision and control of Power System Analysis Specialist.

3.6 DEMONSTRATION

A. Engage Power Systems Analysis Specialist to train Owner's maintenance personnel in potential arc-flash hazards associated with working on energized equipment and the significance of arc-flash warning labels.

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SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following lighting control devices:

1. Time switches.
2. Outdoor and indoor photoelectric switches.
3. Switch-box occupancy sensors.
4. Indoor occupancy sensors.
5. Outdoor motion sensors.
6. Multipole contactors.

B. Related Sections include the following:

1. Division 26 Section "Wiring Devices" for wall-box dimmers and manual light switches.
2. Division 26 Section "Dimming Controls" for architectural dimming system equipment.

1.3 DEFINITIONS

A. LED: Light-emitting diode.

B. PIR: Passive infrared.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show installation details for occupancy and light-level sensors.

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1. Lighting plan showing location, orientation, and coverage area of each sensor.
2. Interconnection diagrams showing field-installed wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.6 COORDINATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 GENERAL LIGHTING CONTROL DEVICE REQUIREMENTS

A. Line-Voltage Surge Protection: An integral part of the devices for 120- and 277-V solid-state equipment. For devices without integral line-voltage surge protection, field-mounting surge protection shall comply with IEEE C62.41 and with UL 1449.

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2.3 TIME SWITCHES

A. Manufacturers:

1. Area Lighting Research, Inc.
2. Fisher Pierce.
3. Grasslin Controls Corporation.
4. Intermatic, Inc.
5. Leviton Mfg. Company Inc.
6. Lightolier Controls; a Genlyte Company.
7. Lithonia Lighting.
8. Paragon Electric Co.
9. Square D.
10. TORK.
11. Touchplate Technologies, Inc.
12. Watt Stopper (The).

B. Digital Time Switches: Electronic, solid-state programmable units with alphanumeric display complying with UL 917.

1. Contact Configuration: As indicated.
2. Contact Rating: As indicated.
3. Program: Single channel, 2 on-off set points on a 24-hour schedule with skip-a-day weekly schedule.
4. Circuitry: Allow connection of a photoelectric relay as substitute for on and off function of a program.
5. Astronomical Time: All channels.
6. Battery Backup: For schedules and time clock.

2.4 OUTDOOR PHOTOELECTRIC SWITCHES

A. Manufacturers:

1. Area Lighting Research, Inc.
2. Fisher Pierce.
3. Grasslin Controls Corporation.
4. Intermatic, Inc.
5. Lithonia Lighting.
6. Novitas, Inc.
7. Paragon Electric Co.
8. Square D.
9. TORK.

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10. Touchplate Technologies, Inc.
11. Watt Stopper (The).

B. Description: Solid state, with DPST dry contacts rated for 1800-VA tungsten or 1000-VA inductive, to operate connected relay, contactor coils, microprocessor input, and complying with UL 773A.

1. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of photocell to prevent fixed light sources from causing turn-off.
2. Time Delay: 15-second minimum, to prevent false operation.
3. Surge Protection: Metal-oxide varistor type, complying with IEEE C62.41 for Category A1 locations.
4. Mounting: Twist lock complying with IEEE C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the North sky exposure.

2.5 INDOOR PHOTOELECTRIC SWITCHES

A. Manufacturers:

1. Allen-Bradley/Rockwell Automation.
2. Area Lighting Research, Inc.
3. Cutler-Hammer; Eaton Corporation.
4. Fisher Pierce.
5. Grasslin Controls Corporation.
6. Intermatic, Inc.
7. Lithonia Lighting.
8. MicroLite Corporation.
9. Novitas, Inc.
10. Paragon Electric Co.
11. Square D.
12. TORK.
13. Touchplate Technologies, Inc.
14. Watt Stopper (The).

B. Ceiling-Mounting Photoelectric Switch: Solid-state, light-level sensor unit, with separate relay unit mounted on luminaire, to detect changes in lighting levels that are perceived by the eye. Cadmium sulfide photoresistors are not acceptable.

1. Sensor Output: Contacts rated to operate the associated relay, complying with UL 773A. Sensor shall be powered from the relay unit.

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2. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
3. Light-Level Monitoring Range: 10 to 200 fc, with an adjustment for turn-on and turn-off levels within that range.
4. Time Delay: Adjustable from 5 to 300 seconds to prevent cycling, with deadband adjustment.
5. Indicator: Two LEDs to indicate the beginning of on and off cycles.

C. Skylight Photoelectric Sensors: Solid-state, light-level sensor; housed in a threaded, plastic fitting for mounting under skylight, facing up at skylight; with separate relay unit mounted on luminaire, to detect changes in lighting levels that are perceived by the eye. Cadmium sulfide photoresistors are not acceptable.

1. Sensor Output: Contacts rated to operate the associated relay, complying with UL 773A. Sensor shall be powered from the relay unit.
2. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
3. Light-Level Monitoring Range: 1000 to 10,000 fc, with an adjustment for turn-on and turn-off levels within that range.
4. Time Delay: Adjustable from 5 to 300 seconds to prevent cycling, with deadband adjustment.
5. Indicator: Two LEDs to indicate the beginning of on and off cycles.

2.6 SWITCH-BOX OCCUPANCY SENSORS

A. Manufacturers:

1. Bryant Electric; a Hubbell Company.
2. Hubbell Lighting Inc.
3. Leviton Mfg. Company Inc.
4. Lightolier Controls; a Genlyte Company.
5. Lithonia Lighting.
6. MYTECH Corporation.
7. Novitas, Inc.
8. RAB Electric Manufacturing, Inc.
9. Sensor Switch, Inc.
10. TORK.
11. Unenco Electronics; a Hubbell Company.
12. Watt Stopper (The).

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B. Description: PIR type with integral power-switching contacts rated for 800 W at 120-V ac, suitable for incandescent light fixtures, flourescent light fixtures with magnetic or electronic ballasts, or 1/6-hp motors; and rated for 1000 W at 277-V ac, suitable for incandescent light fixtures, flourescent light fixtures with magnetic or electronic ballasts, or 1/3-hp motors, minimum.

2.7 INDOOR OCCUPANCY SENSORS

A. Manufacturers:

1. Hubbell Lighting Inc.
2. Leviton Mfg. Company Inc.
3. Lithonia Lighting.
4. MYTECH Corporation.
5. Novitas, Inc.
6. RAB Electric Manufacturing, Inc.
7. Sensor Switch, Inc.
8. TORK.
9. Unenco Electronics; a Hubbell Company.
10. Watt Stopper (The).

B. General Description: Wall- or ceiling-mounting, solid-state units with a separate relay unit.

1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
4. Mounting:

    a. Sensor: Suitable for mounting in any position on a standard outlet box.
    b. Relay: Externally mounted though a 1/2-inch knockout in a standard electrical enclosure.
    c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
6. Bypass Switch: Override the on function in case of sensor failure.

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7. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; keeps lighting off when selected lighting level is present.
8. FailSafe: In case of sensor failure, lighting fixtures shall remain on.

C. Dual-Technology Type: Ceiling mounting; detect occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage. Particular technology or combination of technologies that controls on and off functions shall be selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6-inch minimum movement of any portion of a human body that presents a target of at least 36 sq. in., and detect a person of average size and weight moving at least 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.

2.8 OUTDOOR MOTION SENSORS (PIR)

A. Manufacturers:

1. Bryant Electric; a Hubbell Company.
2. Hubbell Lighting Inc.
3. Lithonia Lighting.
4. Paragon Electric Co.
5. RAB Electric Manufacturing, Inc.
6. TORK.
7. Watt Stopper (The).

B. General Description: Suitable for operation in ambient temperatures ranging from minus 40 deg F to 130 deg F, UL 773A rated as raintight.

1. Operation: Turn lights on when sensing infrared energy changes between background and moving body in area of coverage; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
2. Sensor Output: Suitable for switching 300 W of tungsten load at 120- or 277-V ac. Lampholders shall comply with UL 1571 for wet locations.
3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
4. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.

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5. Mounting:

    a. Sensor: Suitable for mounting in any position on a standard outdoor junction box.
    b. Relay: Internally mounted in a standard weatherproof electrical enclosure.
    c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

6. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
7. Bypass Switch: Override the on function in case of sensor failure.
8. Automatic Light-Level Sensor: Adjustable from 1 to 20 fc; keeps lighting off during daylight hours.

C. Detector Sensitivity: Detect occurrences of 6-inch minimum movement of any portion of a human body that presents a target of at least 36 sq. in.

2.9 MULTIPOLE CONTACTORS

A. Manufacturers:

1. Allen-Bradley/Rockwell Automation.
2. ASCO Power Technologies, LP; a division of Emerson Electric Co.
3. Cutler-Hammer; Eaton Corporation.
4. Fisher Pierce.
5. GE Industrial Systems; Total Lighting Control.
6. Grasslin Controls Corporation.
7. Hubbell Lighting Inc.
8. Lithonia Lighting.
9. MicroLite Corporation.
10. TORK.
11. Touchplate Technologies, Inc.
12. Watt Stopper (The).

B. Description: Electrically operated and electrically held, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
2. Control-Coil Voltage: Match control power source.

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2.10 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG, complying with Division 26 Section" Conductors and Cables."

B. Install unshielded, twisted-pair cable for control and signal transmission conductors, complying with Division 26 Section "Voice and Data Communication Cabling."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. Install and aim sensors in locations to achieve at least 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 WIRING INSTALLATION

A. Wiring Method: Comply with Division 26 Section "Conductors and Cables." Minimum conduit size shall be ½ inch.

B. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Install field-mounting transient voltage suppressors for lighting control devices in Category A locations that do not have integral line-voltage surge protection.

D. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.

E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

F. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 IDENTIFICATION

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A. Identify components and power and control wiring according to Division 26 Section "Electrical Identification."

B. Label time switches and contactors with a unique designation.

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
2. Operational Test: Verify actuation of each sensor and adjust time delays.

B. Remove and replace lighting control devices where test results indicate that they do not comply with specified requirements.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.5 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to site outside normal occupancy hours for this purpose.

END OF SECTION 260923

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SECTION 26 22 01 - DRY-TYPE TRANSFORMERS (600 V AND LESS)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following types of dry-type transformers rated 600 V and less, with capacities up to 1000 kVA:
   1. Control and signal transformers.

1.3 SUBMITTALS

A. Product Data Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer indicated.

B. Shop Drawings: Wiring and connection diagrams.

C. Source quality-control test reports.

D. Output Settings Reports: Record of tap adjustments specified in Part 3.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with IEEE C 57.12.91.

C. Energy-Efficient Transformers Rated 15 kVA and Larger: Certified as meeting NEMA TP 1, Class 1 efficiency levels when tested according to NEMA TP 2.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

1.6 COORDINATION

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A. Coordinate size and location of concrete bases.

B. Coordinate installation of wall-mounting and structure-hanging supports.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton
   2. Square D/Groupe Schneider NA.
   3. GE

2.2 MATERIALS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

B. Cores: Grain-oriented, non-aging silicon steel.

C. Coils: Continuous windings without splices, except for taps.
   1. Internal Coil Connections: Brazed or pressure type.
   2. Coil Material: Copper.

2.3 DISTRIBUTION TRANSFORMERS

A. Comply with NEMA ST 20, and list and label as complying with UL 1561.

B. Cores: One leg per phase.

C. Enclosure: Ventilated, raintight, NEMA 250, Type 3R.
   1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.

D. Indoor Transformer Enclosure Finish: Comply with NEMA 250 for "Indoor Corrosion Protection."
   1. Finish Color: Gray.

E. Outdoor Transformer Enclosure Finish: Comply with NEMA 250 for "Outdoor Corrosion Protection."
   1. Finish Color: Gray.

F. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 115 deg C rise above 40 deg C ambient temperature.

G. Taps for Transformers Smaller Than 3 kVA: None.

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H. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.

I. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.

J. K-Factor Rating: Transformers indicated to be K-factor rated shall comply with UL 1561 requirements for nonsinusoidal load current-handling capability to the degree defined by designated K-factor.
   1. Unit shall not overheat when carrying full-load current with harmonic distortion corresponding to designated K-factor.
   2. Indicate value of K-factor on transformer nameplate.

K. Wall Brackets: Manufacturer's standard brackets.

L. Fungus Proofing: Permanent fungicidal treatment for coil and core.

M. Low-Sound-Level Requirements: Minimum of 3 dBA less than NEMA ST 20 standard sound levels when factory tested according to IEEE C57.12.91.

2.4 BUCK-BOOST TRANSFORMERS

A. Description: Self-cooled, two-winding dry type, rated for continuous duty and with wiring terminals suitable for connection as autotransformer. Transformers shall comply with NEMA ST 1 and shall be listed and labeled as complying with UL 506 or UL 1561.

B. Enclosure: Ventilated, NEMA 250, Type 2.
   1. Finish Color: Gray.

2.5 SOURCE QUALITY CONTROL

A. Test and inspect transformers according to IEEE C57.12.91.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.

B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.

C. Examine walls and floors for suitable mounting conditions where transformers will be installed.

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D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.

B. Install floor-mounting transformers level on concrete bases. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit and 4 inches high.

3.3 CONNECTIONS

A. Ground equipment according to Division 26 Section "Grounding and Bonding."

B. Connect wiring according to Division 26 Section "Electrical Power Conductors and Cables."

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 ADJUSTING

A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower than nameplate voltage minus 5 percent. Submit recording and tap settings as test results.

B. Adjust buck-boost transformers to provide nameplate voltage of equipment being served, plus or minus 5 percent, at secondary terminals.

C. Output Settings Report: Prepare a written report recording output voltages and tap settings.

END OF SECTION 26 22 01

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SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. RFI: Radio-frequency interference.

D. RMS: Root mean square.

E. SPDT: Single pole, double throw.

1.4 SUBMITTALS

A. Product Data: For each type of panelboard, overcurrent protective device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:

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a. Enclosure types and details for types other than NEMA 250, Type 1.
b. Bus configuration, current, and voltage ratings.
c. Short-circuit current rating of panelboards and overcurrent protective devices.
d. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

2. Wiring Diagrams: Power, signal, and control wiring.

C. Field quality-control test reports including the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

D. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

E. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals.

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of panelboards and are based on the specific system indicated

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

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1.6 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:

1. Ambient Temperature: Not exceeding 104 deg F.
2. Altitude: Not exceeding 6600 feet.

1.7 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Six spares for each type of panelboard cabinet lock.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:

a. ABB General Electric Co.; Electrical Distribution & Protection Div.
b. Square D.
c. Eaton

2.2 MANUFACTURED UNITS

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A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Division 26 Section "Seismic Controls for Electrical Work."

B. Enclosures: Flush- and surface-mounted cabinets. NEMA PB 1, Type 1.

1. Rated for environmental conditions at installed location.

    a. Outdoor Locations: NEMA 250, Type 3R.
    b. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
    d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
4. Directory Card: With transparent protective cover, mounted in metal frame, inside panelboard door.

C. Phase and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.
3. Isolated Equipment Ground Bus: Adequate for branch-circuit equipment ground conductors; insulated from box.

D. Conductor Connectors: Suitable for use with conductor material.

1. Main and Neutral Lugs: Compression type.
2. Ground Lugs and Bus Configured Terminators: Compression type.

E. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.

2.3 PANELBOARD SHORT-CIRCUIT RATING

A. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.4 DISTRIBUTION PANELBOARDS

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A. Doors: Secured with vault-type latch with tumbler lock; keyed alike. Omit for fused-switch panelboards.

B. Main Overcurrent Protective Devices: Circuit breaker.

C. Branch Overcurrent Protective Devices:

1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.5 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

B. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.6 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip-unit circuit breakers shall have RMS sensing; field-replaceable rating plug; and with the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long- and short-time time adjustments.
    d. Ground-fault pickup level, time delay, and I^2t response.

4 Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.

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6. GFCI Circuit Breakers: Single- and two-pole configurations with 5-mA trip sensitivity.

B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.

1. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
4. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at [**55**] [**75**] percent of rated voltage.
5. Multipole units enclosed in a single housing or factory-assembled to operate as a single unit.

2.7 ACCESSORY COMPONENTS AND FEATURES

A. Furnish accessory set including tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

2.8 REFER TO 264313 FOR TVSS REQUIREMENTS

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Mount top of trim 74 inches above finished floor, unless otherwise indicated.

C. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.

D. Install overcurrent protective devices and controllers.

1. Set field-adjustable switches and circuit-breaker trip ranges.

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E. Install filler plates in unused spaces.

F. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.

G. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

H. **ALL panel cans and covers with-in the same space shall be the same height**.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Electrical Identification."

B. Create a directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable. Provide room being served identification for each circuit.

C. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.3 CONNECTIONS

A. Ground equipment according to Division 26 Section "Grounding and Bonding."

B. Connect wiring according to Division 26 Section "Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:

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C. Perform the following field tests and inspections and prepare test reports:

1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.

1. Measure as directed during period of normal system loading.
2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

E. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scanning of each panelboard. Remove panel fronts so joints and connections are accessible to portable scanner.

1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
3. Record of Infrared Scanning: Prepare a certified report that identifies panelboards checked and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 CLEANING

A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

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SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Single and duplex receptacles, ground-fault circuit interrupters, integral surge suppression units, and isolated-ground receptacles.
2. Single- and double-pole snap switches and dimmer switches.
3. Device wall plates.
4. Pin and sleeve connectors and receptacles.
5. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. PVC: Polyvinyl chloride.

D. RFI: Radio-frequency interference.

E. TVSS: Transient voltage surge suppressor.

F. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

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B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

D. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

1.6 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Wiring Devices:

a. Bryant Electric, Inc./Hubbell Subsidiary.
b. Eagle Electric Manufacturing Co., Inc.
c. Hubbell Incorporated; Wiring Device-Kellems.
d. Leviton Mfg. Company Inc.
e. Pass & Seymour/Legrand; Wiring Devices Div.

2. Wiring Devices for Hazardous (Classified) Locations:

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a. Crouse-Hinds/Cooper Industries, Inc.; Arrow Hart Wiring Devices.
b. EGS/Appleton Electric Company.
c. Killark Electric Manufacturing Co./Hubbell Incorporated.

3. Multioutlet Assemblies:
   a. Hubbell Incorporated; Wiring Device-Kellems.
   b. Wiremold Company (The).

2.2 RECEPTACLES

A. Straight-Blade-Type Receptacles: Comply with NEMA WD 1, NEMA WD 6, DSCC W-C-596G, and UL 498.

B. Straight-Blade and Locking Receptacles: Heavy-Duty grade.

C. GFCI Receptacles: Straight blade, non-feed-through type, Heavy-Duty grade, with integral NEMA WD 6, Configuration 5-20R duplex receptacle; complying with UL 498 and UL 943. Design units for installation in a 2-3/4-inch- deep outlet box without an adapter. (Leviton Model # GFNT2 or approved equal)

D. Isolated-Ground Receptacle: Straight blade, Heavy-Duty grade, duplex receptacle, with equipment grounding contacts connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. (Leviton Model # 5362-IG or approved equal)

1. Devices: Listed and labeled as isolated-ground receptacles.
2. Isolation Method: Integral to receptacle construction and not dependent on removable parts.

E. TVSS Receptacles: Straight blade, NEMA WD 6, Configuration 5-20R, with integral TVSS in line to ground, line to neutral, and neutral to ground.

1. TVSS Components: Multiple metal-oxide varistors; with a nominal clamp level rating of 500 volts and minimum single transient pulse energy dissipation of 140 J line to neutral, and 70 J line to ground and neutral to ground.
2. Active TVSS Indication: Visual only with light visible in face of device to indicate device is "active" or "no longer in service.
3. Identification: Distinctive marking on face of device to denote TVSS-type unit.

F. Industrial Heavy-Duty Pin and Sleeve Devices: Comply with IEC 309-1.

G. Hazardous (Classified) Location Receptacles: Comply with NEMA FB 11.

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H. Hospital Grade/GFI: Leviton Model GFNL2-HGI, GFNL2-HGR or approved equal.

I. Hospital Grade: Leviton Model 8300-HI, Leviton Model 8300-HLR or approved equal.

J. USB/Hospital Grade: Leviton T5832-HGI.

2.3 CORD AND PLUG SETS

A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.

1. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.
2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.4 SWITCHES (Leviton Models 1221-2,1222-2,1223-2 and 1224-2 or approved equal)

A. Single- and Double-Pole Switches: Comply with DSCC W-C-896F and UL 20.

B. Snap Switches: Heavy-Duty grade, quiet type.

C. Combination Switch and Receptacle: Both devices in a single gang unit with plaster ears and removable tab connector that permit separate or common feed connection.

1. Switch: 20 A, 120/277-V ac.
2. Receptacle: NEMA WD 6, Configuration 5-15R.

D. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on/off switches and audible frequency and EMI/RFI filters.
1. Control: Continuously adjustable toggle switch; with single-pole or three-way switching to suit connections.
2. Incandescent Lamp Dimmers: Modular, 120 V, 60 Hz with continuously adjustable rotary knob, toggle switch, or slider; single pole with soft tap or other quiet switch; EMI/RFI filter to eliminate interference; and 5-inch wire connecting leads.

1.Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.

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2.5 WALL PLATES (Hubbell or approved equal)

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
3. Material for Unfinished Spaces: Galvanized steel.
2. Material for Wet Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

2.6 FLOOR SERVICE FITTINGS

A. Type: Modular, flush-type, dual-service units suitable for wiring method used.

B. Compartments: Barrier separates power from voice and data communication cabling.

C. Service Plate: Rectangular, with satin finish.

D. Power Receptacle: NEMA WD 6, Configuration 5-20R, gray finish, unless otherwise indicated.

E. Voice and Data Communication Outlet: Two modular, keyed, color-coded, RJ-45 Category 6 jacks for UTP cable.

2.7 MULTIOUTLET ASSEMBLIES

A. Components of Assemblies: Products from a single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.

B. Raceway Material: Metal, with manufacturer's standard finish.

C. Wire: No. 12 AWG.

2.8 FINISHES

A. Color:

1. Wiring Devices Connected to Normal Power System: **As selected by Architect, unless otherwise indicated or required by NFPA 70.**
2. TVSS Devices: Blue.

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3. Isolated-Ground Receptacles: As specified above, with orange triangle on face.
4. Emergency (life safety branch, critical branch, equipment branch): Red

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install devices and assemblies level, plumb, and square with building lines.

B. Install wall dimmers to achieve indicated rating after derating for ganging according to manufacturer's written instructions.

C. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' written instructions.

D. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

E. Remove wall plates and protect devices and assemblies during painting.

F. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

A. Comply with Division 26 Section "Electrical Identification."

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 CONNECTIONS

A. Ground equipment according to Division 26 Section "Grounding and Bonding."

B. Connect wiring according to Division 26 Section "Conductors and Cables."

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C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.

B. Remove malfunctioning units, replace with new units, and retest as specified above.

END OF SECTION 262726

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SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following individually mounted, enclosed switches and circuit breakers:

1. Fusible switches.
2. Nonfusible switches.
3. Molded-case circuit switches.
4. Molded-case switches.
5. Enclosures.

1.3 DEFINITIONS

A. GD: General duty.

B. GFCI: Ground-fault circuit interrupter.

C. HD: Heavy duty.

D. RMS: Root mean square.

E. SPDT: Single pole, double throw.

1.4 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

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1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current rating.
4. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
2. Time-current curves, including selectable ranges for each type of circuit breaker.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
2. Altitude: Not exceeding 6600 feet.

1.7 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces.

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Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Spares: For the following:

a. Potential Transformer Fuses: 1% but not less than one of each type.
b. Control-Power Fuses: 1% but not less than one of each type.
c. Fuses and Fusible Devices for Fused Circuit Breakers: 1% but not less than one of each type.
d. Fuses for Fusible Switches: 1% but not less than one of each type.
e. Fuses for Fused Power Circuit Devices: 1% but not less than one of each type.

2. Spare Indicating Lights: Six of each type installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FUSIBLE AND NONFUSIBLE SWITCHES

A. Manufacturers:

1. ABB, General Electric Co.; Electrical Distribution & Control Division.
2. Square D/Group Schneider.

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B. Fusible Switch, 1200 A and Smaller: NEMA KS 1, Type HD, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Nonfusible Switch, 1200 A and Smaller: NEMA KS 1, Type HD, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

D. Accessories:
   1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
   2. Neutral Kit: Internally mounted; insulated, capable of being grounded, and bonded; and labeled for copper and aluminum neutral conductors.
   3. Auxiliary Contact Kit: Auxiliary set of contacts arranged to open before switch blades open.

2.3 FUSED POWER CIRCUIT DEVICES

A. Bolted-Pressure Contact Switch: UL 977; operating mechanism shall use a rotary-mechanical-bolting action to produce and maintain high-clamping pressure on the switch blade after it engages the stationary contacts.

   1. Manufacturers:

      a. Boltswitch, Inc.
      b. Pringle Electrical Mfg. Co.
      c. Square D/Group Schneider.

B. High-Pressure, Butt-Type Contact Switch: UL 977; operating mechanism shall use butt-type contacts and a spring-charged mechanism to produce and maintain high-contact pressure when switch is closed.

   1. Manufacturers:

      a. General Electric Co.; Electrical Distribution & Control Division.
      b. Square D/Group Schneider.

   2. Main Contact Interrupting Capability: Twelve times the switch current rating, minimum.
   3. Operating Mechanism: Manual handle operation to close switch stores energy in mechanism for closing and opening.

      a. Electrical Trip: Operation of lever or push-button trip switch, or trip signal from ground-fault relay or remote-control device, causes switch to open.

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b. Mechanical Trip: Operation of mechanical lever or push button or another device causes switch to open.

4. Auxiliary Switches: Factory installed, SPDT, with leads connected to terminal block, and including one set more than quantity required for functional performance indicated.

5.Service-Rated Switches: Labeled for use as service equipment.

6.Ground-Fault Relay: Comply with UL 1053. Self-powered type with mechanical ground-fault indicator, test function, tripping relay with internal memory, and three-phase current transformer/sensor.

a. Configuration: Remote-mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground fault indicator.
b. Internal Memory: Integrates the cumulative value of intermittent arcing ground-fault currents and uses the effect to initiate tripping.
c. No-Trip Relay Test: Operation of "no-trip" test control permits ground-fault simulation test without tripping switch.
d. Test Control: Simulates ground fault to test relay and switch (or relay only if "no-trip" mode is selected).

7. Open-Fuse Trip Device: Arranged to trip switch open if a phase fuse opens.

2.4 MOLDED-CASE CIRCUIT BREAKERS AND SWITCHES

A. Manufacturers:

1. General Electric Co.; Electrical Distribution & Control Division.
2. Square D/Group Schneider.

B. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic Trip-Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:

a. Instantaneous trip.
b. Long- and short-time pickup levels.
c. Long- and short-time time adjustments.
d. Ground-fault pickup level, time delay, and I^2t response.

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4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller and let-through ratings less than NEMA FU 1, RK-5.
5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.
6. GFCI Circuit Breakers: Single- and two-pole configurations with **5**-mA trip sensitivity.

C. Molded-Case Circuit-Breaker Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical style suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
4. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
5. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
6. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
7. Auxiliary Switch: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
8. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
9. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.

D. Molded-Case Switches: Molded-case circuit breaker with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.

E. Molded-Case Switch Accessories:

1. Lugs: Mechanical style suitable for number, size, trip ratings, and material of conductors.
2. Application Listing: Type HACR for heating, air-conditioning, and refrigerating equipment.
3. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage. Provide "dummy" trip unit where required for proper operation.

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4. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay. Provide "dummy" trip unit where required for proper operation.
5. Auxiliary Switch: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
6. Key Interlock Kit: Externally mounted to prohibit operation; key shall be removable only when switch is in off position.

2.5 ENCLOSURES

A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.

1. Outdoor Locations: NEMA 250, Type 3R.
2. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
4. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CONCRETE BASES

A. Coordinate size and location of concrete bases. Verify structural requirements with structural engineer.

B. Concrete base is specified in Division 26 Section "Basic Electrical Materials and Methods", and concrete materials and installation requirements are specified in Division 3.

3.3 INSTALLATION

A. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.

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B. Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated. Anchor floor-mounting switches to concrete base.

C. Comply with mounting and anchoring requirements specified in Division 26 Section "Seismic Controls for Electrical Work".

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

3.4. IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Electrical Identification".

B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate as specified in Division 26 Section "Electrical Identification",

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including connections. Report results in writing.

1. Inspect mechanical and electrical connections.
2. Verify switch and relay type and labeling verification.
3. Verify rating of installed fuses.

B. Perform the following field tests and inspections and prepare test reports:

1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Infrared Scanning:

    a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Open or remove doors or panels so connections are accessible to portable scanner.
    b. Follow-Up Infrared Scanning: Perform an additional follow-up infrared scan of each unit 11 months after date of Substantial Completion.
    c. Instruments, Equipment and Reports:

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1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
2) Prepare a certified report that identifies enclosed switches and circuit breakers included and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.7 CLEANING

A. On completion of installation, vacuum dirt and debris from interiors; do not use compressed air to assist in cleaning.

B. Inspect exposed surfaces and repair damaged finishes.

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SECTION 263213 - GENERATOR SET

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 SUMMARY:

A. Extent of generator set work is indicated by drawings and schedules, and is hereby defined to include, but not by way of limitation, electrical generator, engine starting system including batteries, instrument control panel, weather-protective housing, transfer switch, annunciator panel, exhaust silencer, and accessories.

B. Type of generator set required for the project is the following:

1. Diesel engine-driven generator, 150mph enclosure, 48 hour dual wall sub-based tank and Automatic Transfer Switches.

Commented [COMMENT1]: ADD OTHER TYPES OF PRIME MOVERS IN PARAGRAPH BELOW IF PROJECT-REQUIRED, E.G., GAS-TURBINES, GENERATOR SETS, GASOLINE AND PROPANE ENGINE-DRIVEN SETS, ETC. USING MORE THAN ONE TYPE OF FUEL PER LOCATION COULD PRESENT PROBLEMS SUCH AS REDUNDANT PIPING AND STORAGE UNITS. ALSO UTILIZING MANUFACTURED GAS AS FUEL IS USUALLY UNSATISFACTORY BECAUSE OF ITS LOW CALORIC CONTENT (BTU/CU FT), THUS CAUSING DERATING OF UNIT'S CAPACITY. SEE EVALUATIONS FOR TYPES OF PRIME MOVERS AND FUELS AVAILABLE.

1.3 SUBMITTALS:

A. Product Data: Submit manufacturer's data on engine-driven generator sets and components. Include manufacturer's standard product warranty, for duration of not less than one-year, for replacement of materials and equipment used in generator systems.

B. Shop Drawings: Submit layout drawings of engine-driven generator unit and accessories including, but not limited to, automatic transfer switch, fuel line piping, remote start-stop stations, and instrumentation. In addition, show generator set unit and its spatial relationship to associated equipment. Allow adequate clearance space for removal of engine generator elements for maintenance purposes.

1. Contractor to submit generator fuel storage tank fire marshal application to the state fire marshal’s office through engineer’s office. Pay any and all fees for submittal preparation and approval. Same shall be in bid.
2. Contractor to provide ¼ scale drawing showing generator size and include all other mechanical and electrical equipment (including utility transformer) in mechanical yard for coordination.

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C. Wiring Diagrams: Submit wiring diagrams for engine-driven generator units showing connections to electrical power panels, feeders, automatic transfer switch, and ancillary equipment. Differentiate between portions of wiring that are manufacturer-installed and portions that are field-installed.

D. Agreement to Maintain: Prior to time of final acceptance, the Installer shall submit 4 copies of an agreement for continued service and maintenance of engine-driven generator sets, for Owner's possible acceptance. Offer terms and conditions for furnishing parts and providing continued testing and servicing, including replacement of materials and equipment, for one-year period with option for renewal of Agreement by Owner.

E. Certifications: Provide engine-drive generator sets certified test record of the following final production testing:

1. Single-step load pickup.
2. Transient and steady-state governing.
3. Safety shutdown device testing.
4. Voltage regulation.
5. Rated power.
6. Maximum power.

F. Provide certified test record prior to engine-driven generator set being shipped from factory to project location.

1.4 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of engine-driven generator units and ancillary equipment, of types, ratings and characteristics required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with engine-driven generator units similar to that required for this project.

1. Agreement to Maintain: Engage Installer who is willing to execute with the Owner, required agreement for continued maintenance of engine-driven generator units.

C. Codes and Standards:

1. Electrical Code Compliance: Comply with applicable local code requirements

of the authority having jurisdiction and NEC Articles 517, 700, 701, and 702 pertaining to construction and installation of emergency and standby systems.

1.5 DELIVERY, STORAGE AND HANDLING:

A. Deliver engine-driven generator properly packaged and mounted on pallet, or skid to facilitate handling of heavy items. Utilize factory-fabricated type containers or wrappings for engine-generator and components which protect equipment from damage.

B. Store engine-driven generator equipment in original packaging and protect from weather and construction traffic. Wherever possible, store indoors; where necessary to store outdoors, store above grade and enclose with watertight wrapping.

C. Handle engine-driven generator equipment carefully to prevent physical damage to equipment and components. Do not install damaged equipment; remove from site and replace damaged equipment with new.

PART 2 – PRODUCTS

2.1 ENGINE GENERATOR SET

A. Generator Sets: Cummins C500D6 with PMG, Caterpillar or prior approved equal

1. General: Except as otherwise indicated, provide manufacturer's standard engine-driven generator set and auxiliary equipment as indicated by published product information, and as required for a complete installation.
2. Engine-Driven Generator: Provide packaged electrical power engine-driven generator assembly unit as indicated, at a governed speed of 1800 RPM, and rated **500 kw** at 80 percent power factor for continuous operation, voltage as indicated on the drawings (277/480 volts 3 phase 4 wire), 60 Hz. Equip generator with 4-cycle, 1800 RPM; liquid cooled engine, turbocharged and CAC. Provide unit-mounted radiator, blower fan, water pump, thermostat, and radiator duct flange capable of cooling engine with up to 0.5 inches water static pressure on fan. Connect engine drive directly to 4-pole revolving-field type single, maintenance-free, bearing generator through semi-flexible steel disk coupling; equip set with associated control equipment to automatically start engine, transfer load to standby power upon failure of normal power source, transfer load back to normal power upon its restoration, and stop engine. Cushion-mount engine-generator on heavy steel base with vibration isolators to reduce possibility of tortional vibration. Provide water-cooled type engine with

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unit mounted radiator. Equip engine with low-oil pressure, high-water temperature, and automatic overspeed safety shutdown devices. Equip generator with excitor and voltage regulator to maintain voltage within 2 percent of rated value. Direct-connect generator to fly wheel by semi-flexible steel disk coupling. Provide unit capable of voltage recovery, within regulated range, of 7 seconds following sudden load increase from 0 to 100 percent of rated load, and with voltage dip not to exceed 20 percent upon application of rated load at rated power factor. Construct unit in compliance with applicable standards; and with additional construction features as indicated:

a. Starting System: Provide engine-generator unit with 12-volt (24 volt), 3-wire, negative ground, starting system including 12-volt (24 volt) positive engagement solenoid shift-starting motor, batteries and automatic battery charging alternator with solid-state voltage regulation.

b. Instrument Control Panel: Provide engine-generator unit with engine oil-pressure and water-temperature indicators, battery charge-rate ammeter, START - STOP switch for manual operation of unit, reset circuit breaker, static voltage regulator, voltage-adjusting rheostat, voltmeter, ammeter with phase selector switch with an OFF position, and with running time indicator and frequency meters. Select type circuitry of plug-in design capable of quick replacement, and of accepting a plug-in device which allows maintenance to test control panel performance without operating the engine.

c. Generator mounted circuit breakers; 800Amp 3P electronic trip, field adjustable rating.

d. System shall have load shredding control.

2.2 ENGINE-GENERATOR SET ACCESSORIES:

A. Provide rust-resistant weather-protective housing for generator unit made of heavy gage reinforced steel; mate and match to the unit enclosed, which permits proper cooling, and access to both controller and service points. **Housing shall be rated for 150 mph winds. Enclosure to include sound attenuation of <70 decibels at 25' distance.**

B. Provide factory-fabricated wall-mounted NEMA-1 3 pole automatic load-transfer switch control (4 total- see plans for amperage) (Brand: Cummins, Caterpillar, or prior approved equal) of types and capacities indicated, to automatically start generator unit when line voltage drops to 70 percent normal value, transfer load to generator, and transfer load back to normal source when voltage is restored to 90 percent normal.

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Equip electrically operated, mechanically held, and electrically and mechanically interlocked, transfer switch with limiter which open starting circuit after 45 seconds when engine fails to start. Also provide time-delay features to prevent excessive transfer and retransfer operation during momentary line voltage dips, load retransfer, and engine shutdown. Equip unit with trickle-charger, and with indicator for starting battery, test switch for manual simulation of power outages including standby unit operation and load transfer, and time-clock exerciser circuit for automatic periodic exercise of engine-generator unit. Provide NEMA Type 1 enclosure with door locks. Coat enclosure with manufacturer's standard color acrylic enamel finish over a corrosion-resistive primer. Provide selector switch to provide owner with options of running load/no load during exercise periods.

a. ATSs to all shall have isolation bypass.

C. Provide engine block heater with thermostatic controls to maintain engine coolant at proper temperature to fulfill start-up requirements of NFPA 99.

D. Provide 16-light remote annunciator panel with visual and audible alarms to monitor and warn of emergency operating conditions affecting line and generator power sources, locate at nurses station, as directed by engineer.

1. Alarms to include intrusion detection and leak detection, low fuel, etc.

E. Provide anchor bolts of galvanized steel, of types and sizes required.

1. Secure generator to concrete slab. Provide diesel dual wall sub base fuel tank complete with leak detection system (locate alarm next to annunciator).

F. Provide battery charger to maintain batteries using trickle charger.

G. Provide dual wall tank and piping sized to handle generator at 100% full load for 48 hours.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine areas and conditions under which engine-driven generator unit will be installed and notify Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

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3.2 INSTALLATION OF ENGINE-DRIVEN GENERATOR SETS:

A. Install engine-driven generator units as indicated, in accordance with the equipment manufacturer's written instructions, and with recognized industry practices, to ensure that engine-generator units fulfill requirements. Comply with NFPA and NEMA standards pertaining to installation of engine-generator sets and accessories.

B. Coordinate with other work, including raceways, electrical boxes and fittings, piping and accessories, as necessary to interface installation of engine-generator equipment work with other work.

C. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds 486A, B and the National Electrical Code.

D. Connect fuel piping to alternative generator, and comply with manufacturer's installation instructions.

E. Align shafts of engine and generator within tolerances recommended by engine-generator unit manufacturer.

3.3 GROUNDING:

A. Provide equipment grounding connections for engine-driven generator units two #6 conductors to two ¾" x 10' ground rod or as otherwise stated.

3.4 FIELD QUALITY CONTROL:

A. Start-up Testing:

1. Engage local equipment manufacturer's representative to perform start-up and building load tests upon completion of installation, with the Architect/Engineer in attendance; provide certified test record. Tests are to include the following:

a. Check fuel, lubricating oil, and antifreeze in liquid cooled models for conformity to the manufacturer's recommendations under environmental conditions present.
b. Test prior to cranking engine for proper operation, accessories that normally function while the set is in a standby mode. Accessories include:

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engine heaters, battery charger, generator strip heater, remote annunciator.

c. Check, during start-up test mode, for exhaust leaks, path of exhaust gases outside the building, cooling air flow, movement during starting and stopping, vibration during running, normal and emergency line-to-line voltage and phase rotation.

d. Test, by means of simulated power outage, automatic start-up by remote-automatic starting, transfer of load, and automatic shut-down. Prior to this test adjust, for proper system coordination, transfer switch timers. Monitor throughout the test, engine temperature, oil pressure, battery charge level, generator voltage, amperes, and frequency.

e. Provide a 4 hour load bank test, increase load in 15 minute increments for one hour, run fully loaded for two hours, decrease load in 15 minute increments. Provide written report to engineer.

2. Upon completion of installation demonstrate capability and compliance of system with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting. Initial testing and retesting shall be at no cost to Owner.

3. Prior to final acceptance fill tank with fuel.

3.5 PERSONNEL TRAINING:

A. Building Operating Personnel Training: Train Owner's building personnel in procedures for starting-up, testing and operating engine-driven generator sets. In addition, train Owner's personnel in periodic maintenance of batteries.

4.0 WARRANTY:

A. Provide two year special warranty; warranty to be all inclusive with no deductions, or limitations. Warranty to begin two years from startup of generator on site by manufacturer rep.

END OF SECTION 263213

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SECTION 264113 - LIGHTNING PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes lightning protection for structures.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For air terminals and mounting accessories.

1. Layout of the lightning protection system, along with details of the components to be used in the installation.
2. Include indications for use of raceway, data on how concealment requirements will be met, and calculations required by NFPA 780 for bonding of grounded and isolated metal bodies.

C. Field quality-control reports.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Certified by UL, trained and approved for installation of units required for this Project.

B. System Certificate:

1. UL Master Label.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 780, "Definitions" Article.

PART 2 - PRODUCTS

2.1 LIGHTNING PROTECTION SYSTEM COMPONENTS

A. Comply with UL 96 and NFPA 780.

B. Roof-Mounted Air Terminals: NFPA 780, Class I copper unless otherwise indicated.

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1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Lightning Elimination System.
   b. Bonded Lightning Protection.

2. Air Terminals More than 24 Inches Long: With brace attached to the terminal at not less than half the height of the terminal.

C. Main and Bonding Conductors: Copper.

D. Ground Loop Conductor: The same size and type as the main conductor except tinned.

E. Ground Rods: Copper-clad steel, sectional type; 3/4 inch in diameter by 10 feet long.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install lightning protection components and systems according to UL 96A and NFPA 780.

B. Cable Connections: Use crimped or bolted connections for all conductor splices and connections between conductors and other components. Use exothermic-welded connections in underground portions of the system.

C. Cable Connections: Use exothermic-welded connections for all conductor splices and connections between conductors and other components.

1. Exception: In single-ply membrane roofing, exothermic-welded connections may be used only below the roof level.

D. Air Terminals on Single-Ply Membrane Roofing: Comply with roofing membrane and adhesive manufacturer's written instructions.

E. Bond extremities of vertical metal bodies exceeding 60 feet (18 m) in length to lightning protection components.

F. Ground Loop: Install ground-level, potential equalization conductor and extend around the perimeter of structure.

1. Bury ground ring not less than 24 inches from building foundation.
2. Bond ground terminals to the ground loop.
3. Bond grounded building systems to the ground loop conductor within 12 feet of grade level.

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G. Bond lightning protection components with intermediate-level interconnection loop conductors to grounded metal bodies of building at 60-foot intervals.

H. Include in lightning protection system:
   1. Flagpole which is attached to building.
   2. Provisions for future owner provided antennae. See Site Plan.
   3. Generator enclosure.
   4. CB radio antennae structure near generator.

3.2 CORROSION PROTECTION

A. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture unless moisture is permanently excluded from junction of such materials.

B. Use conductors with protective coatings where conditions cause deterioration or corrosion of conductors.

3.3 FIELD QUALITY CONTROL

A. Notify Engineer at least 48 hours in advance of inspection before concealing lightning protection components.

B. UL Inspection: Meet requirements to obtain a UL Master Label for system.

C. Visual Inspection: Contractor to include first year visual inspection and schedule with owner 11 months following substantial completion.

D. Contractor to provide photo report of connections with certificate of UL Master Label.

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SECTION 264313 - TRANSIENT VOLTAGE SUPPRESSION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes transient voltage surge suppressors for low-voltage power, control, and communication equipment.

B. Related Sections include the following:

1. Division 26 Section "Panelboards" and Section “Switchboards” for factory-installed transient voltage surge suppressors.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

B. Maintenance Data: For transient voltage suppression devices to include in maintenance manuals specified in Division 1.

C. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain suppression devices and accessories through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 PROJECT CONDITIONS

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A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two weeks in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

B. Service Conditions: Rate surge protective devices for continuous operation under the following conditions, unless otherwise indicated:

1. Maximum Continuous Operating Voltage: Not less than 115 percent of nominal system operating voltage.
2. Operating Temperature: 30 to 120 deg F.
3. Humidity: 0 to 85 percent, noncondensing.
4. Altitude: Less than 20,000 feet above sea level.

1.6 COORDINATION

A. Coordinate location of field-mounted surge suppressors to allow adequate clearances for maintenance.

1.7 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Replaceable Protection Modules: One of each size and type installed.

PART 2 - PRODUCTS

2.1 SERVICE ENTRANCE SUPPRESSORS:

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A. Surge Protective Device Description: Modular design with field-replaceable modules and the following features and accessories:

1. Fabrication using bolted compression lugs for internal wiring.
2. Integral disconnect switch.
3. Redundant suppression circuits.
4. Redundant replaceable modules.
5. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
6. Red and green LED indicator lights for power and protection status.
7. Audible alarm, with silencing switch, to indicate when protection has failed.
8. One set of dry contacts rated at 5 A and 250-V ac, for remote monitoring of protection status. Coordinate with building power monitoring and control system.
9. Surge-event operations counter.

B. Peak Single-Impulse Surge Current Rating: 400 kA per phase (or unless noted otherwise on panel schedules Sheet E7.1).

C. Connection Means: Permanently wired.

D. Protection modes clamping voltage for grounded wye circuits with voltages of 480Y/277 and 208Y/120; 3-phase, 4-wire circuits, shall be as follows:

1. Line to Neutral: 800 V for 480Y/277 and 400 V for 208Y/120.
2. Line to Ground: 800 V for 480Y/277 and 400 V for 208Y/120.
3. Neutral to Ground: 800 V for 480Y/277 and 400 V for 208Y/120.

2.2 CONTROL AND DATA TERMINALS

A. Protectors for copper data and telephone conductors entering the building from the outside shall be as recommended by the manufacturer for the type of line being protected.

2.3 ENCLOSURES

A. NEMA 250, with type matching the enclosure of panel or device being protected.

PART 3 - EXECUTION

3.1 INSTALLATION OF SURGE PROTECTIVE DEVICES

A. Install devices at service entrance on load side, with ground lead bonded to service entrance ground.

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B. Install devices for panelboard and auxiliary panels with conductors between suppressor and points of attachment as short and straight as possible. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

1. Provide multipole, 15-A circuit breaker as a dedicated disconnect for the suppressor, unless otherwise indicated or recommended by the suppressor manufacturer.

3.2 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values

3.3 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing surge protective devices, but before electrical circuitry has been energized, test for compliance with requirements.
2. Complete startup checks according to manufacturer's written instructions.
3. Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.19. Certify compliance with test parameters.

B. Repair or replace malfunctioning units. Retest after repairs or replacements are made.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.

1. Verify that electrical wiring installation complies with manufacturer's installation requirements.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain surge protective devices.

1. Train Owner's maintenance personnel on procedures and schedules for maintaining suppressors.
2. Review data in maintenance manuals. Refer to Specification Section "Contract Closeout".
3. Review data in maintenance manuals. Refer to Specification Section "Operation and Maintenance Data".

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4. Schedule training with Owner, through Architect, with at least seven days' advance notice.

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SECTION 271400 - VOICE AND DATA COMMUNICATION CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

B. This Section includes the following items for wiring systems used as signal pathways for voice and high-speed data transmission:

1. Mounting elements.
2. Unshielded twisted-pair cabling.
3. Fiber-optic cabling.
4. Multiuser telecommunications outlet assemblies.
5. Workstation outlets.
6. Backboards.
7. Identification products.

1.3 DEFINITIONS

A. Backbone: A facility (e.g., pathway, cable, or conductors) between telecommunications rooms or floor distribution terminals, the entrance facilities, and the equipment rooms within or between buildings.

B. BICSI: Building Industry Consulting Service International.

C. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

D. EMI: Electromagnetic interference.

E. Horizontal Cabling: Cabling between and including the telecommunications outlet/connector and the horizontal cross-connect. Also the cabling between and including the building automation system outlet or the first mechanical terminations on the horizontal connection point and the horizontal cross-connect.

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F. IDC: Insulation displacement connector.

G. LAN: Local area network.

H. RCDD: Registered Communications Distribution Designer.
I. RMC: Rigid metallic conduit.

J. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

A. Product Data: For features, ratings, and performance of each component specified.

B. Shop Drawings:

1. Include dimensioned plan and elevation views of telecommunications equipment rooms, labeling each individual component. Show equipment rack assemblies, method of field assembly, workspace requirements, and access for cable connections.
2. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
3. Cabling Administration Drawings.
4. Wiring diagrams to show typical wiring schematics including the following:

    a. Workstation outlets, jacks, and jack assemblies.
    b. Patch cords.
    c. Patch panels.
    d. Fiber-optic boxes.
    e. Distribution racks.
    f. Terminal racks.

C. Samples: For workstation outlets, jacks, jack assemblies, in specified finish, one for each size and outlet configuration and faceplates for color selection and evaluation of technical features.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Cabling installer must have on staff personnel certified by BICSI or prior approval equal.

1. Layout Responsibility: Preparation of Shop Drawings and Cabling Administration Drawings by a Cabling Contractor.

2. Installation Supervision: Installation shall be under the direct supervision of a Registered Technician, who shall be present at all times when Work of this Section is performed at Project site.

B. Source Limitations: Obtain all products except cables through one source from a single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with NFPA 70, "National Electrical Code."

1.6 COORDINATION

A. Coordinate layout and installation of voice and data communication cabling with Owner's telecommunications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local exchange carrier.

1. Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.
2. Record agreements reached in meetings and distribute to other participants.
3. Adjust arrangements and locations of distribution frames and cross-connect and patch panels in equipment rooms and wiring closets to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SYSTEM REQUIREMENTS

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A. Coordinate the features of materials and equipment so they form an integrated system. Match components and interconnections for optimum future performance.

B. Expansion Capability: Unless otherwise indicated, provide spare fibers and conductor pairs in cables, positions in cross-connect and patch panels, and terminal strips to accommodate 20 percent future increase in the number of workstations shown on Drawings. This expansion requirement does not apply to horizontal cable from workstation outlet to first terminal board.

2.3 MOUNTING ELEMENTS

A. Manufacturer: Middle Atlantic Products or approved equal.

B. **All Racks and Cabinets shall be 21" in depth, Standard 19" width and height dependent on required layout of rack components. Unless specified otherwise.**

C. Distribution Racks: Freestanding and wall-mounting, modular-steel units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.

1. Module Dimension: Width compatible with EIA 310 standard 19-inch panel mounting.
2. Finish: Baked-polyester powder coat.

D. Power Strips: For mounting in the rack, with 20-A, 120-V ac, NEMA WD 6, Configuration 5-20R receptacles, number as indicated, but in no case fewer than 6, and including the following:

1. LED indicator lights for power and protection status.
2. LED indicator lights for reverse polarity and open outlet ground.
3. Circuit breaker and thermal fusing. When protection is lost, circuit opens and cannot be reset.
4. Cord connected with 15-foot line cord.
5. Rocker-type on-off switch, illuminated when in on position.
6. Peak Single-Impulse Surge Current Rating: 26 kA per phase.
7. Protection modes shall be line-to-neutral, line-to-ground, and neutral-to-ground. UL 1449 clamping voltage for all 3 modes shall be not more than 330 V.
8. One RJ11/12C telephone line protector, suitable for modem connection. Maximum clamping voltage 220 peak on pins No. 3 and No. 4.

E. Wall-Mounting Rack: Aluminum, hinged wall bracket with hinged clear glass door with provisions for power strip mounting. Door shall be lockable.

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F. Cabinets: Steel, freestanding, modular, with removable and lockable side panels, front and rear doors, ventilation openings in rear door and top panel, and the following components:

1. Key all locks alike.

2.4 SHIELDED AND UNSHIELDED TWISTED-PAIR CABLING

A. Cable Manufacturers:

1. Belden Inc.; Electronics Division.
2. General Cable Technologies Corporation.
3. Hubbell Premise Wiring
4. West Penn Wire/CDT; a division of Cable Design Technologies.

B. Terminal and Connector Component and Distribution Rack Manufacturers:

1. Hubbell Premise Wiring.
2. Leviton Voice & Data Division.
3. Panduit Corp.
4. General Cable.

C. 100-Ohm UTP: Comply with UL 444.

D. Horizontal Copper Cable:

1. No. 24 AWG, 100 ohm, four pair.
2. Comply with TIA/EIA-568-B.2, Category 6.
3. NFPA 70, types CMP.
4. Cable Jacket Color: See Plans.

E. Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, using modules designed for punch-down caps or tools.

1. IDC Terminal Block Modules: Integral with connector bodies, including plugs and jacks where indicated.
2. IDC Connecting Hardware: Consistent throughout Project.

F. Patch Panel: Comply with TIA/EIA-568-B.2, meeting or exceeding cable performance. Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.

1. Number of Jacks per Field: One for each four-pair conductor group of indicated cables, plus spares and blank positions adequate to satisfy specified expansion criteria.

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G. Jacks and Jack Assemblies: Modular, color-coded, RJ-45, Cat 6 receptacle units with integral IDC-type terminals. Use keyed jacks for data service.

H. Patch Cords: Factory-made, four-pair cables in 48-inch minimum lengths, see plans for additional cord lengths at classrooms; terminated with RJ-45 plug at each end. Use keyed plugs for data service.

2.5 FIBER-OPTIC CABLING

A. Cable, Terminal, and Connector Product Manufacturers:

1. Berk-Tek; an Alcatel Company.
2. Corning Cable Systems.

B. Singlemode Fiber-Optic Cable: OC2

1. Description: Single mode, 9/125-micrometer, single loose tube, optical fiber cable. See plans for fiber strand count.
2. Maximum Attenuation: .80 dB/km at 1310 nm; .50 dB/km at 1550 nm.
3. Jacket:

    a. Jacket Color: Yellow
    b. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-D.
    c. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

4. Comply with TIA-492CAAB for detailed specifications.
5. Comply with TIA-568-C.3 for performance specifications.
6. Comply with ICEA S-104-696 for mechanical properties.
7. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70.
8. Riser Rated, Nonconductive: Type OFNP or Type OFNR in listed riser or plenum communications raceway. Wet location outdoor rated when installed outside regardless if installed in racways. All fiber cabling shall be installed in plenum innerduct or metal conduit. Refer to plans.

C. Cross-Connect and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.

1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to satisfy specified expansion criteria.

D. Patch Cords: Factory-made, dual fiber cables in 36-inch lengths.

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E. Cable Connecting Hardware:

1. Comply with TIA/EIA-568-B.3.
2. Quick-connect, LC couplers. Insertion loss not more than 0.7 dB.

2.6 MULTIUSER TELECOMMUNICATIONS OUTLET ASSEMBLY

A. Manufacturers:

1. ADC.
2. American Access Technologies, Inc.
3. Ortronics, Inc.

B. Modular unit suitable for terminating single or multiple horizontal cables in one central location, providing an intermediary point between telecommunications closet and workstation.

1. NRTL listed as complying with UL 50 and UL 1863.

a. Unit shall be labeled to include maximum length of work-area cords.
b. When installed in plenums used for environmental air, NRTL listed as complying with UL 2043.

2. Number of Terminals per Field: One for each conductor in assigned cables.
3. Number of Connectors per Field:

a. One for each four-pair conductor group of indicated cables, plus 25 percent spare positions.

2.7 WORKSTATION OUTLETS

A. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, modular, RJ-45. Cat 6. Comply with TIA/EIA-568-B.1.

B. Workstation Outlets: Multi jack-connector assemblies mounted in single or multigang faceplate.

1. Faceplate: High-impact plastic; color as selected by Architect.
2. Mounting: Flush, unless otherwise indicated.
3. Legend: Factory-labeled, by silk-screening or engraving. See plans for workstation Nomenclature.

4. Legend: Machine-printed, adhesive tape label identifying the circuit.

2.8 BACKBOARDS

A. A-C, void-free plywood, 84 inches high and 3/4-inch thick, fire rated treated plywood. Existing backboards to be reused

2.9 GROUNDING AND BONDING

A. Materials: Comply with NFPA 70, TIA/EIA-607, and UL 467.

2.10 IDENTIFICATION PRODUCTS

A. Manufacturers:

1. Brady Worldwide, Inc.
2. HellermannTyton.
3. Kroy LLC.
4. Panduit Corp.

B. Comply with TIA/EIA-606-A and with applicable requirements in Division 26 Section "Electrical Identification."

C. Cable Labels: Self-adhesive vinyl or vinyl-cloth wraparound tape markers, machine printed with alphanumeric cable designations.

PART 3 – EXECUTION

3.1 INSTALLATION STANDARDS

A. Comply with BICSI TCI, TIA/EIA-568-C and TIA/EIA-569-A.

3.2 EXAMINATION

A. Examine pathway elements intended for cables.

1. Verify proposed routes of pathways. Check raceways, cable trays, and other elements for compliance with space allocations, clearances, installation tolerances, hazards to

cable installation, and other conditions affecting installation. Verify that cabling can be installed complying with EMI clearance requirements.

2. Prepare wall penetrations and verify that penetrations of rated fire walls are made using products labeled for type of wall penetrated.
3. Identify plan to support cables and raceways in suspended ceilings. Verify weight of individual types and sizes of cables. Verify that load capacity of cable support structures is adequate for each pathway.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. Comply with NECA 1.

B. Wiring Method: Install cables in raceway and cable tray except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Use UL-listed plenum cable in environmental air spaces, including plenum ceilings. Conceal raceway and cables except in unfinished spaces. Raceways and boxes are specified in Division 26 Section "Raceways and Boxes."

C. Cable Installation:

1. Install cables parallel and perpendicular to surfaces or exposed structural members and follow surface contours where possible.
2. Make splices, taps, and terminations only at indicated outlets, terminals, and cross-connect and patch panels.
3. Pulling Cable: Do not exceed manufacturer's written recommended pulling tensions. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
4. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
5. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
6. Install UTP cables using techniques, practices, and methods that are consistent with Category 6 rating of components and that ensure Category 6 performance of completed and linked signal paths, end to end.
    a. Do not untwist more than ½ inch of Categories 6 cables at connector terminations.

D. Wiring within Wiring Closets and Enclosures:

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1. Install plywood backboards on walls of equipment rooms and wiring closets from floor to ceiling.
2. Mount patch panels, terminal strips, and other connecting hardware on backboards, wall-mounted racks, floor-mounted racks, or cabinets as indicated.
3. Group connecting hardware for cables into separate logical fields.
4. Train conductors to terminal points with no excess.
5. Use lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.

E. Separation from EMI Sources: Comply with BICSI TDM and TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment. Comply with the following minimum separation distances from possible sources of EMI:

1. Separation between unshielded power lines or electrical equipment in proximity to open cables or cables in nonmetallic raceways is as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: 5 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: 12 inches.
    c. Electrical Equipment Rating More Than 5 kVA: 24 inches.

2. Separation between unshielded power lines or electrical equipment in proximity to cables in grounded metallic raceways is as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: 2-1/2 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: 6 inches.
    c. Electrical Equipment Rating More Than 5 kVA: 12 inches.

3. Separation between power lines and electrical equipment located in grounded metallic conduits or enclosures in proximity to cables in grounded metallic raceways is as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
    b. Electrical Equipment Rating between 2 and 5 kVA: 3 inches.
    c. Electrical Equipment Rating More Than 5 kVA: 6 inches.

4. Electrical Motors and Transformers, 5 kVA or HP and Larger: 48 inches.
5. Fluorescent Fixtures: 5 inches.

F. Conduit:

1. Comply with TIA/EIA-569-A for maximum length of conduit and bends between pull points, and for pull-box sizing.
2. Use manufactured conduit sweeps and long-radius ells whenever possible.

3. In telecommunications rooms, position conduit ends adjacent to a corner on backboard (in case of a single piece of plywood) or in the corner of room (where multiple sheets of plywood are installed around perimeter walls of room). Use cable trays to route cables if conduits cannot be located in these positions. Secure conduits to backboard when entering room from overhead. Extend conduits 1 to 3 inches in finished floor.

G. Backboards: Install plywood with 84-inch dimension from floor up toward ceiling. Butt adjacent sheets tightly, and form smooth gap-free corners.

3.4 GROUNDING

A. Comply with Division 26 Section "Grounding and Bonding" and with TIA/EIA 607.

B. Grounding Points:

1. Locate grounding terminals in each equipment room, wiring closet, rack, and cabinet.
2. Telecommunications Grounding Busbars: Mount on wall of telecommunications entrance facility, equipment room, and closet, with standoff insulators.

C. Bonding Conductors:

1. Extend from telecommunications entrance facility to electrical entrance facility and connect to grounding electrode.
2. Where a panelboard for telecommunications is located in same room or space as a grounding busbar, bond to equipment ground bus of electrical panelboard.
3. Extend from telecommunications entrance facility to grounding busbars.
4. Extend from grounding busbars to ground terminals in equipment racks and cabinets.
5. Extend from grounding busbars to building metal frame within room, or to metal frame external to room but readily accessible.

D. Special Requirements:

1. Bonding conductors shall be insulated copper, No. 6 AWG minimum.
2. Install only in nonmetallic conduit, unless specifically required for protection of conductor. Metallic conduit, if used, shall be RMC. For RMC that exceeds 36 inches in length, conductors shall be bonded at each end of conduit.
3. Bonding conductors shall be installed without splices unless approved by Architect because of special circumstances. Where splices are necessary, they shall be accessible and shall be located in telecommunications spaces. Splices shall be by irreversible compression connectors or by exothermic welding.

3.5 IDENTIFICATION

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A. In addition to requirements in this Article, comply with TIA/EIA-606-A and with applicable requirements in Division 26 Section "Electrical Identification."

1. Color-code cross-connect fields. Apply colors to voice and data service backboards, connections, covers, and labels.

B. Cable and Wire Identification:

1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

    a. All wiring conductors connected to terminal strips shall be individually numbered, and each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.
    b. Label each unit and field within distribution racks and frames.

5. Within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
6. At Workstations: Label cables within outlet boxes.

C. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

D. Cabling Administration Drawings: Show building floor plans with cable administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA/EIA-606-A. Furnish electronic record of all drawings, in software and format selected by Owner.

3.6 FIELD QUALITY CONTROL

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A. Perform the following field tests and inspections and prepare test reports:

B. Category 6 UTP Cabling Tests:

1. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-C, Perform tests with a tester that complies with performance requirements in Annex I, complying with measurement accuracy specified in Annex H. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Wire-map test that reports open circuits, short circuits, crossed pairs, reversed pairs, split pairs, and improper terminations.
4. Channel and permanent link tests for cable length, insertion loss, near-end crosstalk loss, power sum near-end crosstalk loss, equal-level far-end crosstalk loss, power sum equal-level far-end crosstalk, return loss, propagation delay, and delay skew. Performance shall comply with minimum criteria in, TIA/EIA-568-C.

C. Fiber-Optic Cable Tests:

1. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-C. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Link End-to-End Attenuation Tests:

    a. Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in 1 direction according to TIA/EIA-526-14-A, Method B, One Reference Jumper.
    b. Attenuation test results for horizontal links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-C.

D. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

E. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

F. Retest and inspect cabling to determine compliance of replaced or additional work with specified requirements.

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3.7 DEMONSTRATION

A. Train Owner's maintenance personnel in cable-plant management operations, including changing signal pathways for different workstations, rerouting signals in failed cables, and keeping records of cabling assignments and revisions when extending wiring to establish new workstation outlets.

END OF SECTION 271400

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Cleaning site of debris, grass, trees, and other plant life in preparation for site or building earthwork.
   2. Protection of existing structures, trees, or vegetation indicated on the Construction Drawings to remain.

B. Related Requirements:
   1. Louisiana Department of Transportation and Development (DOTD) Standards and Specifications (LSSRB), latest edition.
   2. Section 02220 – Site Demolition: Demolition and removal of structures, paving, utilities and other improvements.
   3. Section 02300 – Earthwork: Stripping and removal of topsoil.
   4. Section 02370 - Erosion And Sedimentation Control (Including SWPPP)

1.2 ENVIRONMENTAL REQUIREMENTS

A. Construct temporary erosion and sediment control systems as shown on Construction Drawings and as directed by the "Storm Water Pollution Prevention Plan" (SWPPP) to protect adjacent properties and water resources from erosion and sedimentation.

B. In event that sitework on this project will disturb one or more acres, starting work shall be strictly governed by the sequence of construction as specified in Section 02370 and SWPPP site maps. Contractor shall not begin construction without "National Pollution Discharge Elimination System" (NPDES) permit governing discharge of storm water from site for entire construction period. NPDES permit requires SWPPP to be in place during construction.

C. Contractor shall conduct storm water management practices in accordance with the project SWPPP and applicable NPDES permit and shall enforce action taken or imposed by Federal or State agencies, including cost of fines, construction delays, and remedial actions resulting from Contractor's failure to comply with provisions of NPDES permit.

1.3 PROJECT CONDITIONS

A. Conditions existing at time of inspection for bidding purposes will be maintained by Owner as reasonably practical.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 PREPARATION

A. Identify existing plant life that is to remain and verify clearing limits are clearly tagged, identified, and marked in such manner as to ensure their protection throughout construction operations.

3.2 PROTECTION

A. Locate, identify, and protect existing utilities that are to remain.

B. Protect trees, plant growth, and features designated to remain as part of final landscaping.

C. Conduct operations with minimum interference to public or private accesses and facilities. Maintain ingress and egress at all times and clean or sweep roadways daily as required by SWPPP or governing authority. Dust control shall be provided with sprinkling systems or equipment provided by Contractor.

D. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by a licensed land surveyor and replaced, as necessary, in kind.

E. Provide traffic control as required, in accordance with the US Department of Transportation's "Manual on Uniform Traffic Control Devices" and applicable state highway department requirements.

3.3 EQUIPMENT

A. Material shall be transported to and from the project site using well-maintained and operating vehicles. Transporting vehicles operating on site shall stay on designated haul roads and shall not endanger improvements by rutting, overloading, or pumping.

3.4 CLEARING

A. Clear areas required for access to site and execution of work.

B. Unless otherwise indicated on Construction Drawings, remove trees, shrubs, grass, other vegetation, improvements, or obstructions interfering with installation of new construction. Removal includes digging out stumps and roots. Depressions caused by clearing and grubbing operations shall be filled to subgrade elevation to avoid ponding of water. Satisfactory fill material shall be placed in accordance with Section 02300.

C. Remove grass, trees, plant life, stumps, and other construction debris from site to dump site that is suitable for handling such material according to state laws and regulations.

D. Cut heavy growths of grass from areas before stripping and topsoil removal and remove cuttings with remainder of cleared vegetative material.

END OF SECTION

SECTION 312000 - EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Excavation, filling, and backfilling for structures, pavement, and outparcels.
2. Trenching and backfilling for utilities.
3. Dewatering.
4. Boring under crossings.

B. Related Requirements:
1. Louisiana Department of Transportation and Development (DOTD) Standards and Specifications (LSSRB), latest edition.
2. Section 02318 - Rock Excavation.
3. Section 02340 - Soil Stabilization.
4. Section 02370 - Erosion Control and Sedimentation. Temporary and permanent erosion control.
5. Section 02375 - Stone Protection. Rip-rap stone for slope protection.

1.2 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

B. ASTM International (ASTM)
1. ASTM D422 - Particle Size Analysis of Soil.
2. ASTM D698 - Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN.m/m^3)).
3. ASTM D1557 - Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 Kn.m/m^3)).
4. ASTM D2487 - Classification of Soils for Engineering Purposes (Unified Soil Classification System).
5. ASTM D2488 - Description and Identification of Soils (Visual-Manual Procedures).
6. ASTM D4318 - Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
7. ASTM D6938 – In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

C. American Association of State Highway and Transportation Officials (AASHTO)
1. AASHTO T 88 - Particle Size Analysis of Soils.

D. Louisiana Department of Transportation and Development (DOTD):
1. Louisiana Department of Transportation and Development (DOTD) Standards and Specifications (LSSRB), latest edition.

E. National Fire Protection Association (NFPA)
1. NFPA 70 - National Electrical Code.

F. American Water Works Association (AWWA)
1. AWWA C200 - Standard for Steel Water Pipe - 6 In. (150 mm) and Larger.
2. AWWA C206 - Field Welding Of Steel Water Pipe.
3. Fill material shall further conform to the plasticity index and liquid limits (PI and LL) specified in Paragraph FILLING hereinafter.
4. Satisfactory materials shall be free of rock or gravel larger than allowed for fill or backfill material as specified hereinafter or as shown on the drawings.

5. Satisfactory materials shall contain no debris, waste, frozen materials, vegetation, and other deleterious matter.
6. Unless specifically stated otherwise on the Drawings, the following table stipulates maximum allowable values for plasticity index (PI) and liquid limit (LL) of satisfactory materials to be used as fill in specified areas:

Location	PI	LL
All Building and Parking areas (below upper four feet)	20 (max)	40 (max)

G. Unsatisfactory Materials: Materials which do not comply with the requirements for satisfactory materials are unsatisfactory.
1. Unsatisfactory materials also include man-made fills; trash; refuse; backfills from previous construction; and material classified as satisfactory materials which contains root and other organic matter or frozen material. The CTL shall be notified of any contaminated materials.
2. Unsatisfactory materials also include satisfactory materials not maintained within 2 percent of optimum moisture content at time of compaction.

H. Rock: Rock shall be as defined in Section 02318.

1.3 SUBMITTALS

A. Submit 30-pound sample of each type of off-site fill material that is to be used at the site in airtight containers to the independent testing laboratory or submit gradation and certification of aggregate material that is to be used at the site to the independent testing laboratory for review.

B. Submit name of each material supplier and specific type and source of each material. Change in source throughout project requires approval of Owner.

C. Submit Dewatering Plans upon request by Owner.

D. Shop drawings or details pertaining to excavating and filling are not required unless otherwise shown on the Drawings or if contrary procedures to Construction Documents are proposed.

E. Shop drawings or details pertaining to site utilities are not required unless required by regulatory authorities or unless uses of materials, methods, equipment, or procedures that are contrary to The Drawings or Specifications are proposed. Do not perform work until Owner has accepted required shop drawings.

F. Contact utility companies and determine if additional easements will be required to complete project. Provide written confirmation of the status of all easements to Owner at time of Preconstruction Conference or no later than 90 days prior to project possession date.

PART 2 - PRODUCTS

2.1 SOIL AND ROCK MATERIALS

A. Fill and Backfill. Satisfactory materials excavated from the site.

B. Imported Fill Material: Satisfactory material provided from offsite borrow areas when sufficient satisfactory materials are not available from required excavations.

C. Trench Backfill: ASTM D2321 unless otherwise specified or shown on the drawings.

D. Building Subbase Material: Subbase for building and appurtenances slabs on ground shall be reference the structural fill from the grading plan here..

E. Bedding: Aggregate Type as indicated on the plans or naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No.200 sieve.

F. Drainage Fill: As specified on the plans or granular fill (sand) placed in lifts not exceeding 8 inches and compacted to 95 percent of the dry density as determined by ASTM D698.

G. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No.4 sieve.

H. Topsoil: Topsoil shall consist of stripping material excavated from the site or approved equal. Topsoil shall consist of organic surficial soil found in depth of not more than 6-inches.

2.2 APPURTENANT MATERIALS

A. Stabilization fabrics and geogrids: As specified in Section 02340.

B. Filter and drainage fabrics: As specified in Section 02340.

C. Steel Casing Pipe: Comply with AWWA C200 minimum grade B, size, and wall thickness as indicated on The Drawings.

D. Trench Utility Locator Tape: Heavy duty 6" wide underground warning tape. Tape shall be made from polyethylene material, 3.5 mils thick, with a minimum tensile strength of 1,750 psi. Place the tape at one-half the minimum depth of cover for the utility line or a maximum of 3 feet, whichever is the less, but never above the top of subgrade. Color of tape shall be determined by as follows:
1. Natural Gas or Propane – Yellow.
2. Electric – Red.
3. Telephone – Orange.
4. Water – Blue.
5. Sanitary Sewer – Green.

2.3 EQUIPMENT

A. Transport off-site materials to project using well-maintained and operating vehicles. Once on site, transporting vehicles shall stay on designated haul roads and shall at no time endanger improvements by rutting, overloading, or pumping.

2.4 SOURCE QUALITY CONTROL

A. The Contractor shall provide samples of material obtained off-site.

B. Perform California Bearing Ratio (CBR) or Limerock Bearing Ratio (LBR) tests in outparcels and areas to receive pavement for each type of material that is imported from off-site. CBR or LBR value shall be equal to or above pavement design subgrade CBR or LBR value indicated on Construction Drawings.

C. Following tests shall be performed on each type of on-site or imported soil material used as compacted fill:
1. Moisture and Density Relationship: ASTM D698 or ASTM D1557.
2. Mechanical Analysis: AASHTO T88 or ASTM D422.
3. Plasticity Index: ASTM D4318.

PART 3 - EXECUTION

3.1 PREPARATION

A. Identify required lines, levels, contours, datum, elevations, and grades necessary for construction as shown on the drawings.

B. Notify utility companies to remove or relocate public utilities that are in conflict with proposed improvements.

C. Protect plant life, lawns, fences, existing structures, sidewalks, paving, and curbs, unless otherwise noted on the drawings from excavating equipment and vehicular traffic.

D. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by licensed land surveyor and replaced, as necessary, by same.

E. Remove from site, material encountered in grading operations that is unsatisfactory material or undesirable for backfilling, subgrade, or foundation purposes. Dispose of in manner satisfactory to Owner and local governing agencies. Backfill areas with layers of satisfactory material and compact as specified herein.

F. Prior to placing fill in low areas, such as previously existing creeks, ponds, or lakes, perform following procedures:
   1. Drain water out by gravity with ditch having flow line lower than lowest elevation in low area. If drainage cannot be performed by gravity ditch, use adequate pump to obtain the same results.
   2. After drainage of low area is complete, remove muck, mud, debris, and other unsatisfactory material by using acceptable equipment and methods that will keep natural soils underlying low area dry and undisturbed.
   3. All muck, mud, and other materials removed from low areas shall be dried on-site by spreading in thin layers for observation. Material shall be inspected and, if found to be satisfactory for use as fill material, shall be incorporated into lowest elevation of site filling operation, but not under building subgrade or within 5'-0" of perimeter of building subgrade, paving or outparcel subgrade. If, after observation, material is found to be unsatisfactory, it shall be removed from site.

G. Locate and identify utilities that have previously been installed and protect from damage.

H. Locate and identify existing utilities that are to remain and protect from damage.

I. Maintain in operating condition existing utilities, previously installed utilities, and drainage systems encountered in utility installation. Repair surface or subsurface improvements shown on the Drawings.

J. Verify location, size, elevation, and other pertinent data required making connections to existing utilities and drainage systems as indicated on the Drawings.

K. Over excavate and properly prepare areas of subgrade that are not capable of supporting proposed systems. Stabilize these areas by using acceptable geotextile fabrics or aggregate material placed and compacted as specified in Section 02340.

3.2 DEWATERING

A. General:
   1. Dewatering activities shall conform to applicable provisions in 02370.
   2. Provide dewatering systems as required for excavations.
   3. Design and provide dewatering system using accepted and professional methods consistent with current industry practice to eliminate water entering the excavation under hydrostatic head from the bottom or sides. Design system to prevent differential hydrostatic head, which would result in floating out soil particles in a manner, termed as a “quick” or “boiling” condition. System shall not be dependent solely upon sumps or pumping water from within the excavation where differential head would result in a quick condition, which would continue to worsen the integrity of the excavation’s stability.
   4. Provide dewatering system of sufficient size and capacity to prevent ground and surface water flow into the excavation and to allow Work to be installed in a dry condition.
   5. Control, by acceptable means, all water regardless of source. Contractor shall be responsible for disposal of the water.
   6. Control groundwater in a manner that preserves strength of foundation soils, does not cause instability or raveling of excavation slopes, and does not result in damage to existing structures. Where necessary, lower

water level in advance of excavation utilizing wells, wellpoints, jet educators, or similar positive methods. The water level as measured by piezometers shall be maintained a minimum of 3 feet below prevailing excavation level.

7. Commence dewatering prior to any appearance of water in excavation and continue until Work is complete to the extent that no damage results from hydrostatic pressure, flotation, or other causes.
8. Open pumping with sumps and ditches will be allowed provided it does not result in boils, loss of fines, softening of the ground, or instability of slopes.
9. Install wells or wellpoints, if required, with suitable screens and filters so that continuous pumping of fines does not occur. Arrange discharge to facilitate collection of samples by the Owner. During normal pumping and upon development of wells, levels of fine sand or silt in the discharge water shall not exceed 5 ppm. Install sand tester on discharge of each pump during testing to verify that levels are not exceeded.
10. Control grading around excavations to prevent surface water from flowing into excavation areas.
11. No additional payment will be made for any supplemental measures to control seepage, groundwater, or artesian head.

B. Design:
1. Designate and obtain the services of a qualified dewatering specialist to provide dewatering plan as may be necessary to complete the Work.
2. Contractor shall be responsible for the accuracy of the drawings, design data, and operational records required.
3. Contractor shall be responsible for the design, installation, operation, maintenance, and any failure of any component of the system.

C. Damages:
1. Contractor shall be responsible for and shall repair any damage to work in place, other contractor's equipment, utilities, residences, highways, roads, railroads, private and municipal well systems, adjacent structures, natural resources, habitat, existing wells, and the excavation. Contractor responsibility shall also include, damage to the bottom due to heave and including but not limited to, removal and pumping out of the excavated area that may result from Contractor's negligence, inadequate or improper design and operation of the dewatering system, and any mechanical or electrical failure of the dewatering system.
2. Remove subgrade materials rendered unsatisfactory by excessive wetting and replace with approved backfill material at no additional cost to the Owner.

D. Maintaining Excavation in Dewatering Condition:
1. Dewatering shall be a continuous operation. Interruptions due to power outages or any other reason will not be permitted.
2. Continuously maintain excavation in a dry condition with positive dewatering methods during preparation of subgrade, installation of pipe, and construction of structures until the critical period of construction or backfill is completed to prevent damage of subgrade support, piping, structure, side slopes, or adjacent facilities from flotation or other hydrostatic pressure imbalance.
3. Provide standby equipment on site, installed, wired, and available for immediate operation if required to maintain dewatering on a continuous basis in the event any part of the system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, perform such work as may be required to restore damaged structures and foundation soils at no additional cost to Owner.
4. System maintenance shall include but not be limited to 24-hour supervision by personnel skilled in the operation, maintenance, and replacement of system components and any other work required to maintain excavation in dewatered condition.

E. System Removal: Upon completion of the work, remove dewatering equipment from the site, including related temporary electrical service.

F. Wells shall be removed or cut off a minimum of 3 feet below final ground surface, capped, and abandoned in accordance with regulations by agencies having jurisdiction.

3.3 TOPSOIL EXCAVATION

A. Cut heavy growths of grass from areas before stripping and remove cuttings with remainder of cleared vegetative material.

B. Strip topsoil to a depth of not less than 6 inches from areas that are to be filled, excavated, landscaped, or re-graded to such depth that it prevents intermingling with underlying subsoil or questionable material.

C. Stockpile topsoil in storage piles in areas shown on The Drawings or where directed by Owner. Construct storage piles to freely drain surface water. Cover storage piles as required to prevent windblown dust. Dispose of unsuitable topsoil as specified for waste material, unless otherwise specified by Owner. Remove excess topsoil from site unless specifically noted otherwise on the Drawings.

3.4 GENERAL EXCAVATION

A. Classification of Excavation: The Contractor shall assure himself by site investigation or other necessary means that he is familiar with the type, quantity, quality, and character of excavation work to be performed. Excavation shall be considered unclassified excavation, except as indicated in the Contract Documents.

B. When performing grading operations during periods of wet weather, provide adequate dewatering, drainage and ground water management to control moisture of soils.

C. Shore, brace, and drain excavations as necessary to maintain excavation as safe, secure, and free of water at all times.

D. Excavate building areas to line and grade as shown on the Drawings being careful not to over excavate beyond elevations needed for building subgrades.

E. Place satisfactory excavated material into project fill areas.

F. Unsatisfactory excavated material shall be disposed of in manner and location that is acceptable to Owner and local governing agencies.

G. Perform excavation using capable, well-maintained equipment and methods acceptable to Owner and local governing agencies.

3.5 ROCK EXCAVATION

A. Rock excavation is specified in Section 02318.

3.6 TRENCHING EXCAVATION FOR UTILITIES

A. Contact local utility companies before excavation begins. Dig trench at proper width and depth for laying pipe, conduit, or cable. Cut trench banks vertical, if possible, and remove stones from bottom of trench as necessary to avoid point-bearing. Over-excavate wet or unstable soil, if encountered, from trench bottom as necessary to provide suitable base for continuous and uniform bedding. Replace over-excavation with satisfactory material and dispose of unsatisfactory material.

B. Trench excavation sidewalls shall be sloped, shored, sheeted, braced, or otherwise supported by means of sufficient strength to protect workmen in accordance with applicable rules and regulations established for construction by the Department of Labor, Occupational Safety and Health Administration (OSHA), and by local ordinances. Lateral travel distance to exit ladder or steps shall not be greater than 25 feet in trenches 4 feet or deeper.

C. Perform trench excavation as indicated on the Drawings for specified depths. During excavation, stockpile materials suitable for backfilling in orderly manner far enough from bank of trench to avoid overloading, slides, or cave-ins.

D. Remove excavated materials not required or not satisfactory as backfill or embankments and waste off-site or at on-site locations approved by the Owner and in accordance with governing regulations. Dispose of structures discovered during excavation as specified in Section 02220.

E. Prevent surface water from flowing into trenches or other excavations by temporary grading or other methods, as required. Remove accumulated water in trenches and other excavations as specified.

F. Open cut excavation with trenching machine or backhoe. Where machines other than ladder or wheel-type trenching machines are used, do not use clods for backfill.

G. Accurately grade trench bottom to provide uniform bearing and support for each section of pipe on bedding material at every point along entire length except where necessary to excavate for bell holes, proper sealing of pipe joints, or other required connections. Dig bell holes and depressions for joints after trench bottom has been graded. Dig no deeper, longer, or wider than needed to make joint connection properly.

H. Trench width below top of pipe shall not be less than 12 inches nor more than 18 inches wider than outside surface of pipe or conduit that is to be installed to designated elevations and grades. Other trench width for pipe, conduit, or cable shall be least practical width that will allow for proper compaction of trench backfill.

I. Trench depth requirements measured from finished grade or paved surface shall meet the following requirements or applicable codes and ordinances, whichever is more stringent, unless noted otherwise on the Construction Drawings:
   1. Water Mains: 30 inches to top of pipe barrel or 6 inches below frost line, established by local building official, whichever is deeper.
   2. Sanitary Sewer: Elevations and grades as indicated on the drawings and as specified in Section 02535.
   3. Storm Sewer: Elevations and grades as indicated on the Drawings.
   4. Electrical Conduits: 24 inches minimum to top of conduit or as required by NEC 300-5, NEC 710-36 codes, or local utility company requirements, whichever is deeper.
   5. TV Conduits: 18 inches minimum to top of conduit or as required by local utility company, whichever is deeper.
   6. Telephone Conduits: 18 inches minimum to top of conduit, or as required by local utility company, whichever is deeper.
   7. Gas Mains and Service: 30 inches minimum to top of pipe, or as required by local utility company, whichever is deeper.

3.7 SUBGRADE PREPARATION

A. Scarification and Compaction: Areas exposed by excavation or stripping and on which subgrade preparations are to be performed shall be scarified to minimum depth of 8 inches and compacted as specified hereinafter.

B. Proofrolling: Subgrades shall be proofrolled to detect areas of insufficient compaction and soft pocket, or areas of excess yielding. Proofrolling shall be accomplished by making minimum of two complete passes with fully-loaded tandem-axle dump truck with a minimum weight of 15-20 tons, or approved equal, in each of two perpendicular directions. Limit vehicle speed to three mph. Areas of failure such as soft spots, unsatisfactory soils, and areas of excessive pumping or rutting shall be excavated and re-compacted as specified herein. Continual failure areas shall be stabilized in accordance with Section 02340 at no additional cost to Owner. Subgrade exposed longer than 48 hours or on which precipitation has occurred shall be re-proofrolled. Document proofrolling procedure, specific locations, deficiencies, and corrective measures for review by Owner or Owner's CTL upon request.

3.8 FILLING

A. Fill areas to contours and elevations shown on the Drawings with materials deemed satisfactory.

B. Place fills in continuous lifts specified herein.

C. Fill within proposed building subgrade, paving subgrade, and outparcel subgrades shall not contain rock or stone greater than 6 inches in any dimension.

D. Unless otherwise specified for rock fill, rock or stone less than 6-inches in largest dimension may be used in fill below structures, paving, outparcels, and graded areas, up to 24 inches below surface of proposed subgrade or finish grade of graded areas when mixed with satisfactory material. Rock or stone less than 2 inches in largest dimension

may be used in fill within the upper 24 inches of proposed subgrade or finish grade of graded areas when mixed with satisfactory material.

E. Fill materials used in preparation of subgrade shall be placed in lifts or layers not to exceed 8 inches loose measure and compacted as specified hereinafter.

F. Material imported from off-site shall have CBR or LBR value equal to or above pavement design subgrade CBR or LBR value indicated on The Drawings.

G. Building area subgrade pad shall be that portion of site directly beneath and 5 feet beyond building and appurtenances, including limits of future building expansion areas as shown on the Drawings.

H. Prepare building area subgrade pad in strict accordance with "Foundation Subsurface Preparation" as shown on the Drawings. The Foundation Subsurface Preparation provisions shall take precedence over the provisions of this section whenever duplication or conflict occurs.

3.9 ROCK FILL

A. Rock fill shall include on-site excavated material classified as rock excavation as specified in Section 02318. Rock fill may be utilized in fill up to 48 inches below top of subgrade or finish grade of graded areas outside the proposed building, paving, and outparcel areas. Rock fill shall consist of rock having a maximum dimension not greater than 12 inches in any dimension. Rock fill shall be placed in successive horizontal layers of loose material having a thickness of approximately the maximum size of the larger rock in the lift, but not greater than 12 inches. Each layer of material shall be spread uniformly, completely saturated, and compacted. Shot rock shall not be dumped into place, but shall be distributed in horizontal lifts by blading and dozing in such a manner as to ensure proper placement into final position in the embankment. Voids shall be filled with finer material including shot rock fines and limited soil fines during the spreading operation. Successive layers shall not be placed until all voids of the current lift are filled and the lift is compacted. Each successive layer of material shall adequately bond to the material on which it is placed. Compaction shall be accomplished with vibratory compactors, heavy rubber-tired rollers, or steel-wheeled rollers. Compaction shall be by uniform passes of compaction equipment in sufficient number of passes, but not less than two passes, such that no further consolidation is evident.

3.10 PIPE BEDDING

A. Excavate trenches for pipe or conduit to 4 inches below bottom of pipe and to the width as specified herein. Place 4 inches of bedding material, compact in bottom of trench, and shape to conform to lower portion of pipe barrel, unless noted otherwise on the Construction Drawings.

B. Place geotextile fabric as specified on the Drawings and in accordance with Section 02340.

3.11 TRENCH BACKFILLING

A. Materials used for trench backfill shall comply with requirements as specified herein.

B. Backfill and compact in accordance with fill and compaction requirements in ASTM D2321 unless otherwise shown on the drawings.

C. Do not backfill trenches until required tests are performed and utility systems comply with and are accepted by applicable governing authorities.

D. Backfill trenches to contours and elevations shown on the Drawings.

E. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

3.12 BORINGS AND CASINGS UNDER ROADS, HIGHWAYS, AND RAILROAD CROSSINGS

A. When indicated by the Drawings, street, road, highway, or railroad crossings for utility mains installed by jacking and boring method shall be in accordance with area specifications and governing authorities.

B. Excavation of approach pits and trenches within right-of-way of street, road, highway, or railroad shall be of sufficient distance from paving or railroad tracks to permit traffic to pass without interference. Tamp backfill for approach pits and trenches within right-of-way in layers not greater than 6-inches thick for entire length and depth of trench or pit. Compact backfill to 98 percent of maximum density in accordance with ASTM D698, (or 95 percent of maximum density, in accordance with ASTM D1557) obtained at optimum moisture as determined by AASHTO T180. Mechanical tampers may be used after cover of 6 inches has been obtained over top of barrel of pipe.

C. Accomplish boring operation using commercial type boring rig. Bore hole to proper alignment and grade. Bore hole shall be within 2 inches of same diameter as largest outside joint diameter of pipe installed. Install pipe in hole immediately after bore has been made and in no instance shall hole be left unattended while open.

D. In event subsurface operations result in failure or damage to pavement or railroad tracks within 1 year of construction, make necessary repairs to pavement or railroad tracks. If paving cracks on either side of pipe line or is otherwise disturbed or broken due to construction operations, repair or replace disturbed or broken area.

E. Clean, prime, and line interior and exterior of casing pipe with two coats of asphalt coating in accordance with and governing authorities.

F. Butt weld steel casing. Welds shall be full penetration single butt-welds in accordance with AWWA C206.

G. Install casing and utility pipe with end seals, vent pipe, and other special equipment in accordance with area specifications and governing authorities.

3.13 COMPACTION

A. Compact as follows:

Location	Percent of Maximum Laboratory Density ASTM D698
Subgrade & Fill below Structures, Pavement and Outparcels	95
Subgrade & Fill in All other Areas	95

B. Maintain moisture content of not less than 1 percent below and not more than 3 percent above optimum moisture content of fill materials to attain required compaction density.

C. Exercise proper caution when compacting immediately over top of pipes or conduits. Water jetting or flooding is not permitted as method of compaction.

D. Corrective Measures for Non-Complying Compaction: Remove and recompact deficient areas until proper compaction is obtained. Continual failure areas shall be stabilized in accordance with Section 02340 at no additional cost to Owner.

3.14 MAINTENANCE OF SUBGRADE

A. Verify finished subgrades to ensure proper elevation and conditions for construction above subgrade.

B. Protect subgrade from excessive wheel loading during construction, including concrete trucks, dump trucks, and other construction equipment.

C. Remove areas of finished subgrade found to have insufficient compaction density to depth necessary and replace in manner that will comply with compaction requirements by use of material with CBR or LBR equal to or better than that specified on the drawings. Surface of subgrade after compaction shall be firm, uniform, smooth, stable, and true to grade and cross-section.

D. Construct temporary ditches and perform such grading as necessary to maintain positive drainage away from subgrade at all times.

3.15 BORROW AND SPOIL SITES

A. Comply with NPDES and local erosion control permitting requirements for any and all on-site and off-site, disturbed spoil and borrow areas. Upon completion of spoil or borrow operations, clean up spoil or borrow areas in a neat and reasonable manner to the satisfaction of Owner or off-site property owner, if applicable.

3.16 FINISH GRADING

A. Check grading of building subgrades by string line from grade stakes (blue tops) set at not more than 50-foot centers. Allowable tolerance shall be plus or minus 0.10 feet from plan grade. Provide engineering and field staking as necessary for verification of lines, grades, and elevations.

B. Grade areas where finish grade elevations or contours are indicated on the Drawings, other than paved areas, outparcels, and buildings, including excavated areas, filled and transition areas, and landscaped areas. Graded areas shall be uniform and smooth, free from rock, debris, or irregular surface changes. Ground surfaces shall vary uniformly between indicated elevations. Grade finished ditches to allow for proper drainage without ponding and in manner that will minimize erosion potential. For topsoil, sodding, and seeding requirements refer to Section 02900.

C. Correct settled and eroded areas within 1 year after date of completion at no additional expense to Owner. Bring grades to proper elevation.

3.17 FIELD QUALITY CONTROL

A. Unless noted otherwise on the Construction Drawings, the quality control testing and inspection specified below will be conducted by the Owner's Construction Testing Laboratory (CTL). The Contractor shall perform additional quality control testing and inspections as considered necessary.

B. Classification of Materials: Perform test for classification of materials used and encountered during construction in accordance with ASTM D2488 and ASTM D2487.

C. Laboratory Testing of Materials: Perform laboratory testing of materials (Proctor, Sieve Analysis, Atterberg Limit, Consolidation Test, etc.) as specified,

D. Proof rolling: Document and explain proof rolling inspection procedures and result in the laboratory inspection report.

E. Field Density Test:
   1. Building Subgrade Areas: Including 10'-0" outside of the exterior building lines, in cut areas, not less than 1 compaction test for every 2,500 sq. ft. Fill areas shall have the same rate of testing for each 8-inch lift, measured loose.
   2. Paving Areas and other Areas of Construction Exclusive of Building Subgrade: Contractor shall perform in cut areas not less than 1 compaction test for every 10,000 sq. ft. Fill areas shall have the same rate of testing for each 8-inch lift, measured loose.
   3. Utility Trench Backfill: Intervals not exceeding 200 feet of trench for the first lift and every other 8 inch lift of compacted trench backfill.
   4. Test Method: In-place nuclear density, ASTM D 2922 (Method B-Direct Transmission)
      a. Density tests on top of building or paving subgrade shall be performed within 48 hours prior to placement of overlying materials. If inclement weather occurs after testing, retest prior to placement of overlying materials.

END OF SECTION

SECTION 31 23 12 - EXCAVATION, FILLING AND GRADING FOR BUILDING FOUNDATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all materials and equipment required for site clearing, excavation and backfill and site grading specifically required or implied by Contract Documents.

B. Examine and investigate the building site prior to bid to become fully informed of conditions and problems to be encountered during the Work. No allowance will be made for conditions encountered during construction which were identifiable in nature prior to starting the Work.

C. Contractor shall comply with L.R.S. 40:1749.13 which states that no person shall excavate or demolish without first ascertaining the location of underground utilities by serving telephonic notice to a regional notification program. In the State of Louisiana, the regional notification program is Louisiana One Call (formerly DOTTIE). In order to serve notice of excavation, this program can be reached by calling 1-800-272-3020.

1.2 EARTHWORK SPECIAL INSPECTIONS

A. The Owner shall employ an approved agency (OAA) to test the proposed fill and certify its compliance with these specifications. The approved agency employed by the Owner (OAA) shall be the geotechnical engineer of record for the project.

B. The Contractor shall cooperate fully with the OAA and shall provide the OAA with convenient and safe access to construction activities as necessary for the OAA to conduct its duties.

C. The Contractor has full responsibility to provide competent supervision and adequate quality control to assure that all earthwork, filling and grading installed in the project meets the requirements of these specifications. The activities of the OAA do not, in any way, relieve the Contractor of this responsibility.

D. When quality control tests performed by the OAA show that materials fail to meet the specified requirements, the Contractor shall correct and/or remove and replace all defective work and shall coordinate retesting with the testing laboratory. All costs associated with reinspection and retesting of defective work shall be the sole responsibility of the Contractor.

PART 2 - PRODUCTS

2.1 FILL BENEATH PILE SUPPORTED SLABS AND FOUNDATIONS

A. Fill beneath pile supported slabs and foundations is intended to provide a firm and stable base to act as a form until the concrete reaches its specified 28 day strength. This material shall be sand or silty clay with a Plasticity Index of 20% or less. Fill shall be completely free of debris, organic matter and chlorides. There is no minimum compaction requirement for this fill and no testing is required. Contractor shall assure that the fill is compacted adequately to maintain grade and elevation suitable for the pouring and curing of the structural concrete slab.

PART 3 - EXECUTION

3.1 SITE DRAINAGE

A. Grade and cut trenches on the site as required to assure drainage away from the work area of any free water which collects during the earthwork operations. Use pumps if necessary.

B. Clear the site of all obstructions to the Work, including aboveground and underground utilities.

3.2 EXISTING UTILITIES

A. Locate all existing underground utilities in areas of excavation work. If utilities are to remain in place, provide adequate support and protection during earthwork operations.

B. If uncharted, or incorrectly charted utilities are encountered, contact utility owner immediately before proceeding.

C. Do not interrupt existing utility services without prior notice to the Owner and to the respective utility authorities. All temporary interruption of utility services must be coordinated with utility companies.

3.3 PROTECTION OF PUBLIC

A. Barricade all open excavations and post with warning lights.

3.4 SUBGRADE PREPARATION BENEATH PILE SUPPORTED SLABS AND FOUNDATIONS

A. In the area where fill is to be placed remove all surface vegetation and all organic materials such as grass, roots, tree stumps, etc. Prepare the subgrade as necessary to facilitate placement of the earth fill. No

compaction and testing is required for the subgrade beneath pile supported slabs and foundations.

3.5 EXCAVATION

A. Excavation shall be made to the dimensions and elevations shown on the Drawings. Dimensions may be increased only the minimum required for tolerances of machine excavation or for the placement of edge forms.

B. Bottoms of excavations shall be level, free from loose material and brought to the required elevations in undisturbed earth or compacted fill.

C. Should excavations be oversized because of machine digging tolerances or because of error, such additional volume shall be filled with concrete poured monolithically with the structural section.

3.6 BACKFILL

A. Remove all forms and debris from excavation prior to backfilling.

B. The backfill material and compaction for each excavation shall be identical to the fill used above the excavation.

C. Excavated material may be used as backfill only if it is certified as meeting these specifications.

3.7 SITE GRADING

A. Grade all areas where changes of grade are indicated on the Drawings or where stockpiled materials, equipment, etc. has disturbed the original ground surface.

3.8 TOLERANCES

A. All graded surfaces shall be finished to uniform levels, slopes and texture within the following tolerances:

1. beneath pile-supported slabs: at all points finished surface shall be within plus 1/8 inch or minus ½ inch of required elevation and shall not vary more than ½ inch in any 10 foot length.

3.9 CLEAN UP

A. Remove from the site, all debris resulting from the Work and leave the entire site in neat and clean condition.

B. All surplus material resulting from excavation and grading operations shall be removed from the site and disposed of in a legal manner.

END OF SECTION 31 23 12

SECTION 31 31 16 – TERMITE CONTROL

PART 1 - GENERAL

1.1 SCOPE

A. Work to be done under this heading includes the furnishing of all labor and materials for complete termite treatment of the new construction only hereinafter described.

B. All termite treatment work shall be done by a bonded contractor, licensed by the State of Louisiana, or whose principal business is extermination and who has a record of at least five (5) years of successful operation in this field.

C. Shop drawings shall include treating specifications and detailed drawings (to scale) of each and every building which requires treatment. These drawings shall show the work to be performed and the proper treating specification for building, as indicated in Contract Documents. Each building shall include the following information:
   1. Locations of termite infestation. (if any)
   2. Locations of termite damage. (if any)
   3. Location of moisture conditions that exist. (if any)
   4. Location and amounts in gallons per linear feet and gallon per square feet.

PART 2 - PRODUCTS

2.1 MATERIALS

A. The chemical to be used shall be one which is accepted by the Structural Pest Control Commission or the U.S. Department of Agriculture, Division of Insecticides and Fungicides as having prolonged effectiveness as a toxicant against subterranean termites. In no event shall the anticipated effective duration of the termite chemical be for less than five years. The chemical shall be applied at the dosage rate recommended by the manufacturer and acceptable to the Structural Pest Control Commission.

B. The following chemicals are termiticides and manufacturers approved by the Structural Pest Control Commission for termite control work when applied according to manufacturer's labels and minimum standards. (see listing at the end of this specification section)

2.2 APPLICATION

A. General

   1. The General Contractor shall remove all wood stakes, form boards, leveling pegs and other wood or organic materials from the building area prior to treatment.

   2. Treatment shall not be made when the soil or fill is excessively wet or immediately after heavy rains, to avoid surface flow of the toxicant from application site.

   3. Unless the treated areas are to be immediately covered, precautions shall be taken to prevent disturbance of the treatment by human or animal contact with the treated soil.

   4. All openings around pipes that penetrate concrete floor slabs of filled foundations shall be sealed with a termite resistant mastic or cement grout. The mastic joint sealer shall be hot poured coat tar pitch, or a similar approved material that is equally resistant to penetration by termites. The joint sealer shall be applied in such a way as to provide a termite proof seal between the cement of the floor and the outer surface of the pipe or pipes.

B. Guarantee: The following statements 1, 2, 3, & 4 shall be printed verbatim on the letterhead stationery of the successful soil poisoning subcontractor along with the signature of the person who signs the guarantee. (This shall be provided in a sample form as shop drawings. Refer to Section 01 33 23 - Samples and Shop Drawings.)

1. The cost of this work is to include the issuance of a $300,000 termite control repair and guarantee for an initial period of two years with stipulated renewal rights at the sole option of the Owner for a five year guaranteed renewal on the building. This renewal, in the third year, shall not exceed 18% of the initial treatment price. Renewal insurance in the fourth year and each year thereafter for the life of the building shall be increased no more than the annual 10% per year or more than the annual rate of inflation (as measured by the consumer price index) whichever is greater. No failure on the part of the buyer to request reinspection shall, in any way, effect the buyer's rights under this contract. This contract cannot be cancelled by any other way except the following:

2. The Owner's written request.

3. Failure of Owner to pay insurance premium within 4 months after renewal date. Written notice must be given to the Owner, once a month, within this 4 month period indicating that the premium is due or delinquent.

4. This blanket repair guarantee shall state the responsibility of the termite contractor to apply to the premises any necessary additional treatment and to make repairs or replacements to remedy damaged areas caused by subterranean termite reinfestation at no extra cost to the Owner. If there is more than one building on a project, and these buildings do not connect, the issuance of a separate guarantee shall be provided, but in no event shall the accumulated totals of insurance premiums for the third year exceed 18% of the total price of the initial cost.

2.3 EXISTING SLAB-TYPE CONSTRUCTION

A. Trench and treat the entire perimeter of the slab foundation. Rate of application shall be recommended on manufacturer's label.

B. Treat all traps and other openings in the slab.

C. Treat all expansion joints, cracks and other voids in slab by rodding under or drilling through slab and thoroughly saturating the area beneath the slab where the above stated conditions exist. When the slab is drilled, the holes must not be more than 18" apart along the above stated areas, unless manufacturer’s label requires closer distance.

D. Treat all other obvious points of entry according to the best of the individual operator's ability.

2.4 PRE-TREATMENT OF SLABS

A. Chemical shall be applied to the area under the inside of the foundation of the building after the final grade has been reached but either before or after the gravel fill has been spread at the following rates:

1. Overall treatment of area under slab at the rate as recommended on manufacturers label.

2. Along inside of exterior foundation wall on monolithic slabs at rate as recommended on manufacturer's label.

3. Along outside / perimeter of exterior foundation wall on monolithic slabs at rate indicated on manufacturer’s label. (This means trench and treat or drill and treat around the entire perimeter of structure before substantial completion. Drill and

treat will only be utilized if the contractor pours sidewalks, parking or drives before soil poisoning subcontractor is allowed to spray soil before pouring concrete.)

4. Along all expansion and/or construction joints at the rate as recommended on manufacturer's label.

5. Critical areas under slab such as around plumbing, electrical conduits, air conditioning vents, chimney bases, etc., at the rate as recommended on manufacturer's label.

NOTE: Items 2, 3, and 4 are in addition to overall treatment outlined in item 1.

B. If, during the treatment of any area which will be beneath a slab foundation, the operator must leave the site for any reason prior to the completion of the application as specified in §141.E.1 above, the operator must prominently display a poster, to be furnished by the Louisiana Department of Agriculture and Forestry, which states that the treatment of the area under the slab is not complete.

C. All pre-treatment of slabs must be called or faxed in to the Department of Agriculture and Forestry District Office in which the pretreat occurs, a minimum of one hour prior to beginning the application of termiticides. The information provided shall include a street address, city, parish, directions to the property being pre-treated, and time of beginning the application of termiticides to the property. All pest control operators must keep a log of all pretreats including the information noted. The following is a list of parishes in which the seven Department of Agriculture and Forestry Districts operate. Pre-treatments in those parishes shall be called into the corresponding District Office.

1. Shreveport District - Caddo, Bossier, Webster, Claiborne, Bienville, Red River, and Desoto.

2. Monroe District - Union, Morehouse, West Carroll, East Carroll, Madison, Richland, Ouachita, Lincoln, Jackson, Winn, Caldwell, Franklin, Tensas, Concordia, and Catahoula.

3. Alexandria District - Sabine, Natchitoches, Grant, LaSalle, Avoyelles, Rapides, and Vernon.

4. Crowley District - Beauregard, Allen, Acadia, Jefferson Davis, Cameron, Calcasieu.

5. Opelousas District - Evangeline, St. Landry, St. Martin, Iberia, St. Mary, Vermillion, and Lafayette.

6. Baton Rouge District - Point Coupee, West Feliciana, East Feliciana, St. Helena, Tangipahoa, Washington, St. Tammany, Livingston, St. James, Lafourche, Terrebonne, Assumption, Ascension, Iberville, West Baton Rouge, and East Baton Rouge.

7. New Orleans District - St. John the Baptist, St. Charles, Jefferson, Orleans, St. Bernard, and Plaquemines.

APPROVED TERMITICIDES AND MANUFACTURERS

PRODUCT	PERCENTAGE	MANUFACTURER
AggresZor 75 WSP (Imidacloprid)	0.05% - 0.10%	Speckoz
Baseline (Bifenthrin)	0.06% - 0.12%	FMC
Bifen XTS (Bifenthrin)	0.06% - 0.12%	Control Solutions
Bifen IT (Bifenthrin)	0.06% - 0.12%	Control Solutions
Bifen PT (Bifenthrin)	0.06% - 0.12%	Control Solutions

Bifenthrin Pro Multi-Insecticide (Bifenthrin)	0.06% - 0.12%	BASF
Bifenthrin TC (Bifenthrin)	0.06% - 0.12%	Control Solutions
Bifenthrin Termiticide/Insecticide (Bifenthrin)	0.06% - 0.12%	Speckoz
Biflex TC (Bifenthrin)	0.06% - 0.12%	FMC
Bora-Care (Disodium Octaborate Tetrahydrate)	23%	Nisus
BOR-RAM (Disodium Octoborate Tetrahydrate)	23%	Sostram Corp.
Centerfire 75 WSP (Imidacloprid)	0.05% - 0.10%	Bayer
Cyper TC (Cypermethrin)	0.25% - 1.00%	Control Solutions
Cypermethrin G-Pro (Cypermethrin)	0.25% - 1.00%	GRO-PRO
Demon (Cypermethrin)	0.25% - 1.00%	Zeneca
Demon MAX (Cypermethrin)	0.25% - 1.00%	Syngenta
Dominion 2L (Imidacloprid)	0.05% - 0.10%	Control Solutions
Dominion 75 WSP (Imidacloprid)	0.05% - 0.10%	Control Solutions
Dragnet FT (Permethrin)	0.50% - 2.00%	FMC
Dragnet SFR (Permethrin)	0.50% - 2.00%	FMC
Imida E-Pro 2F (Imidacloprid)	0.05% - 0.10%	Etigra
Imida E-Pro 75 WSP (Imidacloprid)	0.05% - 0.10%	Etigra
Impasse Termite System (Lambda-cyhalothrin)		Syngenta
Impasse Termite Blocker (Lambda-cyhalothrin)		Syngenta
MasterLine (Bifenthrin)	0.06% - 0.12%	Univar
MasterLine I Maxx Pro WSP (Imidacloprid)	0.05% - 0.10%	Bayer
MasterLine I Maxx Pro 2F (Imidacloprid)	0.05% - 0.10%	Bayer
Maxxthor SC (Bifenthrin)	0.06% - 0.12%	Ensystex
Permaster 380 (Permethrin)	0.50% - 2.00%	LG Chemical
Permethrin SFR (Permethrin)	0.50% - 2.00%	Control Solutions
Permethrin TC (Permethrin)	0.50% - 2.00%	Mirco-Flo
Phantom (Chlorfenapyr)	0.063% - 0.25%	BASF
Prelude (Torpedo)(Permethrin)	0.50% - 2.00%	AMVAC
Premise 75 WSP (Imidacloprid)	0.05% - 0.10%	Bayer
Premise 0.5SC (Imidacloprid)	0.05% - 0.10%	Bayer
Premise II (Imidacloprid)	0.05% - 0.10%	Bayer
Premise Pre-construction (Imidacloprid)	0.05% - 0.10%	Bayer
**Premise Gel (Imidacloprid)	0.001%	Bayer
Premise Pro (Imidacloprid)	0.05% - 0.10%	Bayer
Prevail (Cypermethrin)	0.25% - 1.00%	FMC
Prevail TC (Cypermethrin)	0.30% - 0.60%	FMC
Prevail FT (Cypermethrin)_	0.25% - 1.00%	FMC
Prevail Pretreat (Cypermethrin)	0.25% - 1.00%	FMC
Pro-Build TC (Cypermethrin)	0.25% - 1.00%	Sygenta
Prothor SC 2 (Imidacloprid)	0.05% - 0.10%	Ensystex IV
Prothor WP (Imidacloprid)	0.05% - 0.10%	Ensystex III
Prothor WSP (Imidacloprid)	0.05% - 0.10%	Ensystex III
Talstar P (Bifenthrin)	0.06% - 0.12%	FMC
Talstar Pretreat (Bifenthrin)	0.06% - 0.12%	FMC
Talstar (Bifenthrin)	0.06% - 0.12%	FMC
Talstar One Multi-Insecticide (Bifenthrin)	0.06% - 0.12%	FMC
Tengard SFR (Permethrin)	0.50% - 2.00%	United Phosphorus
Termidor (Fipronil)	0.06% - 0.125%	BASF
Termidor 80WG (Fipronil)	0.06% - 0.125%	BASF
Thermidor SC (Fipronil)	0.06% - 0.125%	BASF
Transport (Acetamiprid)(Bifenthrin)	0.11%	FMC
ValueLine Bifenthrin TC (Bifenthrin)	0.06% - 0.12%	FMC
Wisdom TC Flowable (Bifenthrin)	0.06% - 0.12%	AMVAC

NOTES: ** Premise Gel is approved for targeted (spot) application only.

PART 3 - EXECUTION (Not Used)

END OF SECTION 31 31 16

SECTION 313200 - SOIL STABILIZATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Excavation, treatment, and backfilling of subgrade for lime, cement, fly ash, or bridge lift stabilization.
   2. Geotextile fabric and geogrid for stabilization of subgrade.

B. Related Requirements:
   1. Louisiana Department of Transportation and Development (DOTD) Standards and Specifications (LSSRB), latest edition.
   2. Section 02300 – Earthwork

1.2 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

B. ASTM International (ASTM):
   1. ASTM C150 - Portland Cement.
   2. ASTM C618 - Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete.
   3. ASTM C977 - Quicklime and Hydrated Lime for Soil Stabilization.

C. American Association of State Highway and Transportation Officials (AASHTO):
   1. AASHTO M216 - Lime for Soil Stabilization.

D. National Lime Association (NLA):
   1. NLA Bulletin 326 - Lime Stabilization Construction Manual.

E. Louisiana Department of Transportation (LA DOTD):
   1. Louisiana Department of Transportation and Development (DOTD) Standards and Specifications (LSSRB), latest edition.

1.3 ENVIRONMENTAL REQUIREMENTS

A. Do not install mixed materials in wind in excess of 10 mph or when temperature is below 40 degrees Fahrenheit.

B. Minimize dust emissions or provide equipment that suppresses dust.

C. Dispose of construction waste in accordance with the federal, state and local requirements.

1.4 SUBMITTALS

A. Submit 30-pound sample of each material to be used at the site in airtight containers to the Construction Testing Laboratory (CTL) or submit gradation and certification of material that is to be used to the CTL for review.

B. Submit name of each materials supplier and specific type and source of each material. Obtain approval of Owner prior to change in source.

C. Submit mix designs, materials mix ratio, and laboratory test data to the Civil Engineering Consultant of Record 2 weeks prior to beginning stabilization activities. Certify materials and mix ratios will achieve the specified requirements as indicated in the Construction Documents or as specified by state and local agencies for soil stabilization if not stated in the Construction Documents.

D. Submit approved mix designs, materials mix ratio, and laboratory test data to the CTL prior to commencing stabilization activities.

PART 2 PRODUCTS

1.5 MANUFACTURERS

A. Provide products from one of the following manufacturers as specified in the Materials paragraph below:
1. TenCate Geosynthetics North America (Mirafi), Pendergrass, GA., (706) 693-2226, www.tencate.com
2. Hanes Geo Components (WEBTEC), Winston Salem, NC. (336) 747-1600, ~~www.hanesgeo.com~~
3. Tensar International Corp., Atlanta, GA. (888) 828-5126, www.tensarcorp.com
4. Thrace-LINQ Inc., Summerville, SC (843) 873-5800, www.thracelinq.com
5. DuPont (Typar). Summerville, SC (843) 832-6860, www.typargeo.com
6. Synteen Technical Fabrics, Lancaster, SC (800) 796-8336, www.synteen.com

1.6 MATERIALS

A. Soil Treatment Materials:
1. Hydrated Lime: ASTM C977 or AASHTO M216.
2. Portland Cement: ASTM C150, Type I.
3. Fly Ash: ASTM C618.

B. Aggregate:
1. Coarse Aggregate: Crushed carbonate, crushed gravel, crushed air-cooled slag, granulated slag, a mixture of crushed and granulated slag, or other types of suitable material meeting the following gradation requirements:

Sieve Size	Percent Passing
2 inches	100
1 inch	70-100
3/4 inch	50-90
No. 4	30-60
No. 30	7-30
No. 200	0-5

2. Fine Aggregate: Sand – Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter meeting the following gradation requirements:

Sieve Size	Percent Passing
No. 4	90-100
No. 50	7-40
No. 200	0-5

C. Subsoil: Existing to be reused.

D. Bridge Lift Material: Surge stone, granular fill, or shot rock fill.

1.7 ACCESSORIES

A. Curing Seal: Asphalt Emulsion Primer.

B. Geotextile Fabric for Stabilization: Provide one of the following (or approved equal):
1. Mirafi HP 370 or HP 570, by TenCate.
2. SF40 or SF65, by DuPont.
3. GTF-200 or 300, by Thrace-LINQ.
4. TerraTex HD, by Hanes.

C. Geogrid for Stabilization: Provide one of the following (or approved equal):

1. Biaxial Geogrid Type 1 (formerly BX 1100), by Tensar.
2. Biaxial Geogrid Type 2 (formerly BX 1200), by Tensar.
3. Mirafi BXG 11, by TenCate.
4. Mirafi BXG 12, by TenCate.
5. SF 11, by Synteen.
6. SF 12, by Synteen

PART 3 EXECUTION

1.8 PREPARATION

A. Obtain approval of mix design before proceeding with placement.

B. Start stabilization only when weather and soil conditions are favorable for successful application of proposed material.

C. Proofroll subgrade to identify areas in need of stabilization.

1.9 EQUIPMENT

A. Perform operations using suitable, well maintained equipment capable of excavating subsoil, mixing and placing materials, wetting, consolidating, and compacting of material.

1.10 EXCAVATION

A. Excavate subsoil to depth sufficient to accommodate soil stabilization.

B. Remove lumped subsoil, boulders, and rock that interfere with achieving uniform subsoil conditions.

C. Do not excavate within normal 45 degree bearing splay of any foundation.

D. Notify Construction Manager of unexpected subsurface conditions. Discontinue affected work in area until notified to resume work.

E. Correct areas over-excavated in accordance with Section 02300.

F. Remove excess excavated material from site.

1.11 GEOTEXTILE FABRIC AND/OR GEOGRID

A. Place geotextile fabric and/or geogrid over subsoil surface, lap edges and ends in accordance with manufacturer’s recommendations in those areas that are shown on Construction Drawings or in those areas that need additional stabilization prior to placement of base course. Bridge lift sections may require the use of geotextile fabric and/or geogrid for stabilization prior to placement of fill.

B. Place geotextile fabric and/or geogrid in accordance with manufacturer's recommendations.

1.12 SOIL TREATMENT AND BACKFILLING

A. Lime Stabilized Subgrade: Where indicated on Construction Drawings or as required after continual failure, treat prepared subgrade with hydrated lime in accordance with state highway department specifications.

B. Cement Stabilized Subgrade: Where indicated on Construction Drawings or as required after continual failure, treat prepared subgrade with Portland cement in accordance with state highway department specifications.

C. Fly Ash Stabilized Subgrade: Where indicated on Construction Drawings or as required after continual failure, treat prepared subgrade with fly ash in accordance with state highway department specifications.

D. Bridge Lifts: Where indicated on Construction Drawings or as required after continual failure, treat prepared subgrade by application of a bridge lift. Bridging over existing soils shall be acceptable only when approved in writing by the Owner. Place geotextile fabric or geogrid over existing soils to be bridged. The geotextile fabric or geogrid selected shall be appropriate for the bridge lift material being placed. Place bridge lift over geotextile fabric or geogrid. Surge stone and shot rock will be approved by the Owner's representative on a submittal basis. The Owner and the Owner's representative shall have sole discretion as to the acceptability of all submittals.

E. Backfill and compaction of treated subsoil shall be in accordance with Sections 02300.

F. Maintain optimum moisture of mixed materials to attain required stabilization and compaction.

G. Finish subgrade surface in accordance with Section 02300.

H. Remove surplus mix materials from site.

1.13 CURING

A. Immediately following compaction of mix, seal top surface with curing seal.

B. Do not permit traffic for 72 hours after sealing top surface.

1.14 FIELD QUALITY CONTROL

A. Field quality control shall be the responsibility of the Contractor. Field quality control testing and inspection shall be at the discretion of the Contractor as necessary to assure compliance with Contract requirements

B. Unconfined compression tests on lime, fly ash, or Portland cement treated mixture shall be conducted by the CTL in accordance with ASTM D1633. Mold three specimens for each mix design submitted by the Contractor to verify mix design meets the specified requirements. Cure each specimen at a constant moisture content and temperature for 28 days. Test for unconfined compressive strength and compare to the specified design strength. Perform test minimum of three weeks prior to proposed stabilization activities.

C. Field Density: In-Place Field Density shall be determined as specified in Section 02300.

END OF SECTION

SECTION 313500 – EROSION CONTROL

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes

1. Installation of temporary and permanent erosion and sedimentation control systems.
2. Installation of temporary and permanent slope protection systems.
3. Stormwater Pollution Prevention Plan (SWPPP).

B. Related Sections and Documents

1. Louisiana Department of Transportation and Development (DOTD) Standards and Specifications (LSSRB), latest edition.
2. Section 02230 – Site Clearing
3. Section 02300 – Earthwork
4. Section 02375 – Rip-Rap (Stone Protection)
5. Section 02630 – Storm Drainage
6. Stormwater Pollution Prevention Plan (SWPPP)
7. Construction Drawings (“Site Maps”)
8. Construction Stormwater Details and Notes

1.2 ENVIRONMENTAL REQUIREMENTS

A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

1.3 ENVIRONMENTAL REQUIREMENTS

A. Protect adjacent properties, any identified endangered or threatened species and/or critical habitat, any identified cultural or historic resources, and receiving water resources from erosion and sediment damage until final stabilization is achieved. All stormwater controls and systems must be installed and functioning as designed and free of accumulated sediment and debris before final project approval.

B. Minimize dust emissions or provide equipment that suppresses dust.

C. Dispose of dry construction waste in accordance with the federal, state and local requirements.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Topsoil, seed, sod, and ground covers for the establishment of vegetation in accordance with the Landscaping Plan.

B. All erosion control products, sediment control devices and materials for non-stormwater BMPs as specified herein and on the Construction Drawings.

C. All Rolled Erosion Control Products shall have current QDOR™ status issued by the Erosion Control Technology Council (ECTC) (in addition to any state- or agency-specific requirements). Evidence of QDOR™ approval shall accompany the product shipped to the job site for ready identification by the General Contractor (GC) or an agency inspector.

D. Temporary mulches such as loose straw, or wood cellulose

E. Rip-Rap (stone protection) as specified in Section 02375.

F. Temporary and permanent outfall structures as specified on the drawings.

PART 3 – EXECUTION

3.1 PREPARATION

A. Review the drawings and Stormwater Pollution Prevention Plan (SWPPP).

D. Communicate SWPPP requirements, emphasizing construction sequence requirements, to Site Contractor, Erosion and Sediment Control Best Management Practice (BMP) installers, and all subcontractors working on-site.

E. Install initial BMP's according to SWPPP while disturbing only those areas required to construct said BMP's.

J. Proceed with site construction.

3.2 EROSION AND SEDIMENTATION CONTROL AND SLOPE PROTECTION IMPLEMENTATION

A. Place erosion and sediment control systems in accordance with the drawings and SWPPP or as may be dictated by site conditions in order to maintain the intent of the specifications and permits.

B. The SWPPP and Construction Drawings shall be corrected, modified or updated as site conditions change. Contractor must obtain approval from Owner's Engineer of Record prior to any modification or substitution of specified Best Management Practices. All BMP changes (and references to approvals) shall be noted in the SWPPP and posted on the drawings (Site Maps). Construction Drawings should be updated daily to track progress when any of the following activities occur: BMP installation or modification, major construction (paving, storm sewer installation, footing installation, etc…), clearing, grubbing or grading, or temporary or permanent stabilization.

D. Unless required within a shorter timeframe by the applicable General Permit for Stormwater Discharges Associated with Construction Activity, the GC shall, at a minimum, initiate soil stabilization measures immediately whenever any clearing, grading, excavating or other earth disturbing activities have temporarily or permanently ceased on any portion of the site, and will not likely resume for a period exceeding 14 calendar days.

SECTION 31 62 19 - TIMBER PILING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide a complete piling foundation as shown on the Drawings, including the furnishing and driving of pilings, proper cutoffs, etc.

B. Investigate and locate existing utilities and use all reasonable precautions necessary to prevent damage to existing buildings and utilities due to the execution of piling work. Items damaged because of Contractor's failure to exercise this care shall be completely restored or replaced at no cost to the Owner.

C. All references herein to standards of the American Society for Testing Materials (ASTM) and the American Wood Preservers Association (AWPA) apply to the latest revisions thereof.

1.2 PILING SPECIAL INSPECTIONS

A. In accordance with the 2021 International Building Code (IBC), Chapter 17, the Owner shall employ an approved agency (OAA) to verify that foundation piling comply with the contract documents and with the applicable provisions of the IBC.

B. The approved agency employed by the Owner (OAA) shall be the geotechnical engineer of record for the project.

C. The OAA shall perform inspections and verifications to comply with IBC Table 1705.7, and as necessary to determine that foundation piling conforms to the construction documents.

D. In addition to, or as supplement to, the verification and inspection tasks listed in IBC Table 1705.7 the OAA shall perform the following services:
   1. Provide copies of a numbered pile plan and distribute copies to the Architect, Structural Engineer, Contractor, and to other parties if so instructed by the Architect prior to the start of pile driving.
   2. Inspect all treated piling at point of treatment for size, for conformance to the specified timber standards and for conformance to the specified preservative treatment. Certify each piling by an appropriate mark near the butt.
   3. During driving, log the blows per foot for each foot of penetration. Number each piling for reference and record date and type of equipment on each log sheet. Record the length and size of each pile.

4. At the end of each driving day, provide neat, organized copies of the day's driving logs to the Architect, Structural Engineer, Contractor and to other parties if so instructed by the Architect.
5. Supervise and provide written report for the pile load test as herein specified.

E. The Contractor shall cooperate fully with the OAA, shall provide written certification(s) from suppliers and subcontractors if requested by the OAA and shall provide the OAA with convenient and safe access to construction activities as necessary for the OAA to conduct its duties. The Contractor shall inform the OAA of the source of supply and shall give adequate advance notice of preservative treatment and pile driving operations.

F. The Contractor has full responsibility to provide competent supervision and adequate quality control to assure that all foundation piling installed in the project meet the requirements of these specifications. The activities of the OAA do not, in any way, relieve the Contractor of this responsibility.

G. When inspection and tests performed by the OAA show that materials or installation fail to meet the specified requirements, the Contractor shall correct and/or remove and replace all defective work and shall coordinate retesting with the OAA. All costs associated with reinspection and retesting of defective work shall be the sole responsibility of the Contractor.

PART 2 - PRODUCTS

2.1 All treated timber piling shall be Southern Yellow Pine conforming to ASTM Specification D25.

2.2 All piling shall be treated in accordance with American Wood Protection Association Standard U1, Commodity Specification E, Category 4C to a final retention of 12 pounds per cubic foot of Creosote or to a final retention of 0.80 pounds per cubic foot of Chromated Cooper Arsenate Type C (CCA).

PART 3 - EXECUTION

3.1 HANDLING AND DRIVING

A. Use a driving rig of adequate size and design to efficiently position and drive all piling to their final tip elevation. Piling damaged by improper driving or driving equipment shall be replaced at the Contractor's expense. Driving rig shall develop at least 7,250 and not more than 10,000 foot pounds of energy per blow. Leads shall be fixed and plumb during driving.

B. Pile butts shall be cut square with the pile axis and shall be protected during driving by a properly fitted hood.

C. If unusual or unexpected conditions are encountered during driving, inform the Architect of these variations on the same day that they occur.

D. Drive piling plumb with a maximum variation of 1/4 inch per ten feet and locate cut-off within 1" of the cut-off elevation shown on the Drawings.

E. After cut-off, the location of any single pile shall not vary from its location shown on the Drawings by more than 3 inches.

F. Re-drive to the correct tip elevation, any piling that become unseated and heave due to driving of other piling.

G. Any piling that are damaged beyond serviceability shall be removed, if possible, and replaced with new piling which conform to these Specifications.

H. If modifications to the foundation and building structure become necessary due to piling being damaged by improper handling or driving, or because of piling locations exceeding specified tolerances, the cost of the design and construction of these modifications shall be the sole responsibility of the Contractor.

I. If driving characteristics, such as a sharp decrease in resistance, indicate pile breakage, such a pile shall be abandoned. A structurally sound pile shall be driven immediately adjacent to any broken piling or, if deemed necessary by the Architect, additional piling shall be driven to balance footing loads.

J. No piling shall be driven within 100 feet of freshly poured concrete less than seven days old, unless cylinder tests demonstrate such concrete to have attained 75% of the specified strength.

3.2 REFUSAL

A. Thirty (20) blows per foot with a 10,000 foot pound hammer shall be considered refusal. If pile resistance builds gradually to 20 blows per foot with at least 2 consecutive feet of penetration higher than 15 blows per foot and if the pile tip is more than 40 feet below grade, driving on that pile shall cease. Such a pile shall be incorporated into the foundation. If the tip of such a pile is less than 40 feet below grade when refusal occurs, or if driving resistance increases sharply to 20 blows per foot, the driving characteristics of the adjacent piling shall be supplied to the Architect who will render a decision on the questionable pile.

3.3 PROBE PILING AND PILE LOAD TEST

A. Before ordering production piles and commencing full scale pile driving operations, the pile-driving contractor shall drive probe piles at the locations shown on the plans to establish driving characteristics. Probe pile tip and butt diameter shall be no larger than the minimum specified diameters. One probe pile shall be selected for testing. The pile-driving contractor shall drive four (4) anchor piles, and shall furnish and install steel beam and anchorage devices as required to load test the test pile to failure or to 300% of the design load (pile design load is 6 tons). Contractor shall coordinate probe pile activities and schedule with the Geotechnical Engineer of Record.

B. Perform load test no sooner than 14 days after test pile is driven. Once load test has been successfully completed, production piles may be ordered. Production pile tip and butt diameters shall be no smaller than the probe piles.

C. Probe piles, test piles, and all production piles shall be driven with the same driving rig and driving arrangement.

3.4 VIBRATION MONITORING AND PRE-DRILLING

A. All piling shall be installed with extreme care to avoid damage to the existing buildings. Contractor shall monitor vibrations with a portable seismograph during pile driving and will take all necessary measures to assure that vibration levels do not exceed ¼ inch per second (0.25 inches per second) at any point on the ground around the edges of the existing buildings.

B. The Contractor shall provide any pre-drilling that is required to drive piling through or into high resistance strata. The pre-drilling bit shall be of the smallest diameter possible to reduce driving resistance to normally accepted levels and shall not exceed 2/3 of the average pile diameter. Pre-drilling shall extend no deeper than 10 feet above the pile tip elevation.

3.5 PILE CUT-OFF

A. Cut off all timber piling far enough below the driving butt to remove all crushed or broomed wood fibers. Piling with cut-off lengths exceeding 3'- 0" must be replaced if they are intended to carry the full design load. Inform the Architect before proceeding if cut-off exceeds this length.

B. Coat the butt of all cut-off piling with a liberal application of copper naphthenate until visible evidence of further penetration has ceased. Copper naphthenate solution shall have minimum 2.0% copper metal.

C. If damage necessitates cut off below specified elevation, the pile cap or footing will be modified as directed by the Architect. Cost of modification is the Contractor's responsibility.

D. Piling may be mandrel driven to final butt elevations below grade if each pile butt is inspected and found undamaged after butt is driven to approximately 1'- 0" above grade.

END OF SECTION 31 62 19

SECTION 321100 - BASE COURSE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Aggregate base for asphaltic concrete including sand/shell base and hot-mix sand asphalt base.

B. Related Requirements:
   1. Louisiana Department of Transportation and Development (DOTD) Standards and Specifications (LSSRB), latest edition. LSSRB shall be the governing specification.
   2. Section 02300 – Earthwork: Excavation, Backfill, and Compaction for Pavement subgrade.
   3. Appendix B – Testing and inspection by Owner.

1.2 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

B. ASTM International (ASTM):
   1. ASTM D698 – Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbs/ft³ (600 kN-m/m³)).
   2. ASTM D1557 – Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbs/ft³ (2,700 kN-m/m³)).

C. Asphalt Institute.

D. State Highway Department Standard Specifications.

1.3 SUBMITTALS

A. Submit materials certificate to the Owner's Engineer of Record and the appropriate Construction Testing Laboratory, signed by materials producer and Contractor, certifying that materials comply with, or exceed, requirements specified herein or on the Construction Drawings.

B. Submit certification of base course materials and placement as specified in Parts 2 and 3 hereinafter.

1.4 WEATHER LIMITATIONS

A. Do not place aggregate when base surface temperature is less than 40 degrees F, nor when air temperature is below 45 degrees F. Do not place aggregate when surface is wet or frozen. Do not place aggregate when weather conditions are unfavorable otherwise.

PART 2 - PRODUCTS

2.1 BASE COURSE MATERIAL

A. Aggregate Base Course: Aggregate base course shall consist of a well graded, durable aggregate uniformly moistened and mechanically stabilized by compaction. Base course may consist of a granular base (crushed slag, stone, or gravel, etc), sand/shell base material, or a hot-mix sand asphalt base.

B. Base course shall be as shown on the drawings, or when not shown, shall be as specified herein.

C. Aggregate base material requirements from State or other local highway agency specifications may be used for aggregate base course for roads, streets, or similar use pavements if the following conditions are met:
   1. Percentage of material by weight passing the No. 200 sieve will not exceed 10.

2. Portion of the material passing the No. 40 sieve must have a liquid limit not greater than 25 and a plasticity index not greater than 5.

D. Aggregate shall consist of clean, sound, durable particles of crushed stone, crushed slag, crushed gravel, angular sand, or other approved material. Aggregate shall be free of lumps of clay, organic matter, and other objectionable materials or coatings. The portion retained on the No. 4 sieve shall be known as coarse aggregate; that portion passing the No. 4 sieve shall be known as fine aggregate.
   1. Coarse aggregates shall be angular particles of uniform density.
   2. Fine aggregates shall be angular particles of uniform density. Fine aggregate shall consist of screenings, angular sand, crushed recycled concrete fines, or other finely divided mineral matter processed or naturally combined with the coarse aggregate.

E. Gradation: The specified gradation requirements shall apply to the completed base course. The aggregates shall have a maximum size of 2 inches and shall be continuously well graded within the following limits:

GRADATION OF AGGREGATES
Percentage by Weight Passing Square-Mesh Sieve

Sieve Designation	No. 1	No. 2	No. 3
2 inch	100	----	----
1-1/2 inch	70-100	100	----
1 inch	45-80	60-100	100
1/2 inch	30-60	30-65	40-70
No. 4	20-50	20-50	20-50
No. 10	15-40	15-40	15-40
No. 40	5-25	5-25	5-25
No. 200	0-10	0-10	0-10

NOTE: Particles having diameters less than 0.0008 inch shall not be in excess of 3 percent by weight of the total sample tested.

F. Hot-mix Sand Asphalt Bases: Asphalt Institute Type VI, VII, or VIII Mixes for Hot-mix Sand Asphalt Bases. Hot-Mix base shall be used only under asphaltic concrete surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Contractor shall verify to the Owner in writing that the subgrade has been inspected, tested, and gradients and elevations are correct, dry, and properly prepared in accordance with Section 02300.

3.2 CONSTRUCTION

A. Perform base course construction in accordance with the applicable State standard specifications or as shown or specified.

B. Perform base course construction in a manner that will drain the surface properly and prevent runoff from adjacent areas from draining onto base course construction.

C. Compact base material to not less than 98 percent of optimum density as determined by ASTM D698 or 95 percent of optimum density, as determined by ASTM D1557 unless otherwise indicated on the Drawings.

D. Construct to thickness indicated on Construction Drawings. The minimum base thickness as shown on drawings shall be achieved throughout all pavement areas.
   1. Granular Base: Apply in lifts or layers not exceeding 8-inches, measured loose.
   2. Sand/Shell Base: Apply in lifts or layers not exceeding 4-inches, measured loose.
   3. Hot-mix Sand Asphalt Bases: Apply in lifts or layers not exceeding 3-inches, measured loose.

3.3 FIELD QUALITY CONTROL

A. Field quality control shall be the responsibility of the Contractor in accordance with Contract Documents. Field quality control testing and inspection shall be at the discretion of the Contractor (except for specified mandatory testing listed below) as necessary to assure compliance with Contract requirements.

B. Mandatory Testing and Inspection:
   1. Measure base course tolerances no more than 25 ft. on center with a rod and level or stringline.
   2. Certify in writing to the Owner that base course placement is in accordance with Contract Document requirements prior to subsequent work thereon.

END OF SECTION

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Preparation and placement of Portland cement concrete parking areas.
2. Preparation and placement of Portland cement concrete roads and entrances.
3. Aggregate base below slab.
4. Exterior light pole bases.

B. Related Requirements:
1. Louisiana Department of Transportation and Development (DOTD) Standards and Specifications (LSSRB), latest edition.
2. Section 02300 - Earthwork: Excavation, backfill, compaction for subgrades.
3. Section 02765 - Pavement Markings.

1.2 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

B. American Concrete Institute (ACI):
1. ACI 117 - Tolerances for Concrete Construction and Materials and Commentary.
2. ACI 301 - Structural Concrete.
3. ACI 305.1- Hot Weather Concreting.
4. ACI 306.1- Cold Weather Concreting.
5. ACI 308.1 - Curing Concrete.
6. ACI 318 - Building Code Requirements for Reinforced Concrete and Commentary.

C. American Society for Testing and Materials (ASTM):
1. ASTM A 36 - Structural Steel.
2. ASTM A185 - Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
3. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.
4. ASTM C31 - Making and Curing Concrete Test Specimens in the Field.
5. ASTM C33 - Concrete Aggregates.
6. ASTM C 39 - Comprehensive Strength of Cylindrical Concrete Specimens.
7. ASTM C42 - Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
8. ASTM C94 - Ready-Mixed Concrete.
9. ASTM C138 - Unit Weight, Yield, and Air Content (Gravemetric) of Concrete.
10. ASTM C143 - Slump of Hydraulic Cement Concrete.
11. ASTM C150 - Portland Cement.
12. ASTM C172 - Sampling Freshly Mixed Concrete.
13. ASTM C231 - Air-Content of Freshly Mixed Concrete by the Pressure Method.
14. ASTM C260 - Air-Entraining Admixtures for Concrete.
15. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
16. ASTM C403 - Time of Setting of Concrete Mixtures by Penetration Resistance
17. ASTM C618 - Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete.
18. ASTM C920 - Elastomeric Joint Sealants.
19. ASTM C989 - Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
20. ASTM C1064 - Temperature of Freshly Mixed Portland Concrete Cement.
21. ASTM C1218 - Water-Soluble Chloride in Mortar and Concrete.
22. ASTM C1602 - Mixing Water used in the Production of Hydraulic Cement Concrete.
23. ASTM D98 - Calcium Chloride
24. ASTM D 698 - Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5 lb. (2.49 Kg) Hammerand 12-in (305 mm) Drop.

25. ASTM D994 - Preformed Expansion Joint Filler for Concrete (Bituminous).
26. ASTM D1241 - Materials for Soil-Aggregate Subbase, Base and Surface Courses
27. ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
28. ASTM D1752: Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
29. ASTM D2628 - Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements.
30. ASTM D3575: Standard Test Methods for Flexible Cellular Materials Made From Olefin Polymers.

D. Federal Specifications (FS):
1. FS HH-F-341 - Fillers, Expansion Joint: Bituminous (Asphalt & Tar)

E. International Code Council, Inc.:
1. International Building Code (IBC).

F. State Highway Department Standard Specifications.

G. National Ready-Mixed Concrete Association:
1. NRMCA Inspection Standards

1.3 SUBMITTALS

A. Submittal Procedures: Unless otherwise specified herein, submit in accordance with procedures specified in LSSRB.

B. Obtain Engineer of Record approval for Mix Design and Pavement Joint and Placement Plan prior to commencement of work.

C. Submit submittal items required within this section in a single submittal

D. Sieve Analysis for Aggregate Base: Submit current sieve analysis report, sampled and tested within the last 60 days of submittal date, for aggregate base and choker material.

E. Concrete Batch Plant Certifications: Submit name and address of the concrete supplier's batch plant and plant certification(s) by National Ready-Mix Concrete Association and/or State Department of Transportation.

F. Mix Design:
1. Fill out and submit attached Concrete Mix Design Submittal Form.
2. Submit three copies of each proposed mix.
3. Submit separate mix design for concrete to be placed by pumping in addition to the mix design for concrete to be placed directly from the truck chute.
4. Submit mix design to the Engineer of Record and the Construction Testing Laboratory.
5. Include applicable information shown on the Mix Design Submittal Form and the following:
    a. Proportions of cementitious materials, fine and coarse aggregate, and water.
    b. Water-cementitious material ratio, 28-day compressive design strength, slump, and air content.
    c. Type of cement, fly ash, slag and aggregate.
    d. Aggregate gradation.
    e. Type and dosage of admixtures.
    f. Special requirements for pumping.
    g. Range of ambient temperature and humidity for which design is valid.
    h. Special characteristics of mix which require precautions in mixing, placing, or finishing techniques to achieve finished product specified.
6. Materials and methods for curing concrete.

G. Attachments to Concrete Mix Design: Submit the following as attachments to be included with the Concrete Mix Design:
1. Cementitious materials mill test reports for the following:
    a. Portland cement
    b. Fly ash
    c. Slag

2. Designation, type, quality, and source (natural or manufactured) of coarse and fine aggregate materials.
3. Sieve Analysis Reports: Provide separate sieve analysis of percentages passing for coarse and fine aggregate. Show values for each sieve size shown on the mix design form. Do not leave any line blank. Sieve analysis sampling and testing for each aggregate source shall be conducted within 60 days of concrete submittal date.
4. Aggregate Supplier Statement:
    a. Stating if aggregate is possibly alkali-reactive based on tests or past service.
    b. Stating if aggregate can possibly cause pop-outs, "D" cracking, or other disruptions due to moisture gain, freezing, or other mechanisms, based on tests or past service.
5. Product data for the following concrete materials admixtures:
    a. Water reducing
    b. Set retarding
    c. Set accelerating
    d. Data indicating chloride ion content information for each admixture
6. Concrete compressive strength data as required by ACI 318.
7. Concrete supplier approval of mix design.
8. Chloride-Ion Content: Measured water-soluble chloride-ion content (percent by weight of cementitious materials) in accordance with ASTM C1218.
9. Time of Initial Setting: Initial setting time in accordance with ASTM C403.

H. Product Data: Submit certified laboratory test data or manufacturer's certificates and data for the items listed below certifying that materials are in conformance requirements specified herein. Engineer of Record and the Construction Testing Laboratory for review and approval and within 7 calendar days after receipt of Notice-to-Proceed.
1. Portland cement concrete mix design(s)
2. Type and source of Portland cement, fly ash, and slag
3. Aggregate gradations
4. Joint back-up material
5. Soft preformed joint filler
6. Pavement joint sealant
7. Dowel bars
8. Tie bars
9. Reinforcing steel bars
10. Welded wire fabric
11. Air entraining admixtures
12. Water-reducing, set-retarding, and set-accelerating admixtures (if used)

I. Pavement Joint and Placement Plan: For projects with all-concrete parking lots, provide a placement plan identifying the items listed below.
1. Concrete truck access location.
2. Extent of placements including width, length, slab placement area and volume.
3. Locations of construction joints.
4. Location of sawn contraction joints if different from those shown on the civil drawings.

J. Delivery Tickets:
1. Copies of delivery tickets for each load of concrete delivered to site.
2. Indicate information required by ASTM C 94 on each ticket including additional information required for slabs.
3. Information on ticket shall include quantities of material batched including the amount of free water in the aggregate and the quantity of water that can be added at the site without exceeding the maximum water cementitious ratio of the approved mix design. Aggregate moisture corrections shall be based on ASTM definitions of aggregate moisture content and absorption.
4. Mix identification number on ticket shall match number on submitted and approved mix design.

K. Statement of Approval of Concrete Supplier: Submit statement with information specified in Quality Assurance paragraph below.

1.4 QUALITY ASSURANCE

A. Concrete Truck Inspection:

1. Conform to ASTM C94, NRMCA, and Department of Transportation standards in state where project is located.
2. Perform inspections immediately before starting concreting operations.
3. Record acceptable truck numbers.
4. Record the identification numbers of those trucks found to be acceptable on the basis of inspections.
5. Do not bring on site for concreting operations, any truck whose identification numbers are not recorded as acceptable.

B. Tolerances:
1. Conform to most stringent requirements of ACI 117 and ACI 301 except as specified herein.
2. Conform to ACI 117 thickness tolerances for slabs-on-ground.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Concreting in Hot, Dry, or Windy Weather:
1. Employ precautions to avoid cracking when the concrete rate of evaporation exceeds 0.1 pounds per square foot per hour or when any combination of concrete materials and weather conditions are favorable for the formation of plastic shrinkage cracks.
2. Maintain an accurate reading thermometer at the job site to check temperature of concrete.
3. Reject concrete if more than one slump adjustment, as defined in ASTM C 94, is required.
4. Do not place concrete when forms, subgrade, aggregate base, or reinforcing bars are more than 120 F or the temperature differential between the forms, aggregate base, or reinforcing bars and concrete will create conditions favorable for settlement cracks or thermal cracking.

B. Concreting in Cold Weather:
1. Conform to ACI 306.1 when temperature and other environmental conditions are as noted therein.
2. Subgrade shall be thawed to depth of 12 inches immediately before placing concrete.
3. Measure and record concrete temperature during protection period in each placement at regular time intervals, but not less than 3 times per 24 hour period.
4. Do not place slabs on subgrade or base that is more than 20°F cooler than concrete. Warm subgrade or base to decrease temperature differential to 20 F or less

PART 2 - PRODUCTS

2.1 MATERIALS

A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends as required. Coat forms with nonstaining type of coating that will not discolor or deface surface of concrete.

B. Aggregate Base and Choker Materials:
1. Aggregate Base Material:
a. Gradation: Conform to gradation shown on the Civil Drawings.
b. Equivalent Gradation: Equivalent gradations may be used upon approval of the Civil Engineer of Record. Submit proposed equivalent gradation to the Architect for approval within 30 days after the award of contract. Equivalent gradation shall be one of the following.
1) Any state DOT approved road base material meeting the following gradation:

Std. Sieve Size	% Passing
No. 1-1/2	100
No. 4	15-55
No. 200	5-12

2) Material conforming to the General Requirements and of the Gradation “A”, ”C”, or “D” requirements (with the modified allowance of 5% to 12% passing the No. 200 sieve) as defined by ASTM D1241
2. Aggregate Choker Material: Clean granular fill with less than 3% clay and/or friable particles. Use one of the following gradations:

a. ASTM 448 No. 10 with 6% to 12% passing No. 200 sieve.
b. Material meeting the following gradation:

Std. Sieve Size	% Passing
No. 4	85-100
No. 8	75-95
No. 16	55-75
No. 50	22-45
No. 100	10-30
No. 200	6-12

C. Reinforcement:
1. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A185. Furnish in flat sheets.
2. Reinforcing Bars: Deformed steel bars, ASTM A615, Grade 60.
3. Joint Dowel Bars: ASTM A615, grade 40 minimum, smooth round plain steel bars, or ASTM A36, smooth round or square plain steel bars, cut bars true to length with ends square and free of burrs. Epoxy coat per State Highway Department Standard Specifications.

D. Cementitious Materials:
1. Portland Cement: ASTM C150, Type I, Use only one brand throughout project.
2. Fly Ash: ASTM C 618, Class C or F. Use only one type and source throughout project.
3. Slag: ASTM C989, Grade 100 or 120. Use only one type and source throughout project.

E. Pavement Joint Materials:
1. Joint Back-up Material: Polyethylene foam, 100% closed cell
2. Soft Preformed Joint Filler: Flexible closed-cell non-extruding synthetic foam expansion joint strips.
   a. Ceramar Flexibe Foam Expansion Joint, by W.R. Meadows.
   b. Deck-O-Foam Expansion Joint Filler, by W.R. Meadows
3. Sealant:
   a. Dow 888, by Dow Corning.
   b. 301 NS by Pecora.
   c. Spectrum 800 by Tremco.

F. Concrete Aggregate:
1. Conform to ASTM C33.
2. Aggregate shall contain no coal or lignite in concrete that will not be covered by soil.
3. Fine Aggregate:
   a. Conform to fine aggregate grading requirements as defined in section 6.1 of ASTM C 33 unless approved by the Civil Engineer.
   b. If manufactured sand is used, blend with minimum 25% natural sand unless otherwise approved by Civil Engineer.
4. Coarse Aggregate:
   a. Nominal maximum coarse aggregate size shall be 1 inch for slabs ≤ 5-1/2 inch thick.
   b. The nominal maximum size of an aggregate is the smallest sieve size through which the major portion of the aggregate must pass, with a minimal amount retained on the maximum sieve size. Maximum 4% shall be retained on the nominal maximum size sieve.
5. Adjust proportions of combined coarse, intermediate, and fine aggregates to provide the following particle size distribution characteristics, unless otherwise approved:
   a. Coarseness Factor of 60 to 75%.
      1) The Coarseness Factor (CF) is the percent of combined aggregate retained on the #8 sieve that is also retained on the 3/8” sieve.
      2) The Coarseness Factor is calculated as follows:
         a) CF = Aggregate retained on 3/8” sieve / Aggregate retained on #8 sieve.
   b. Adjusted Workability Factor
      1) The Workability Factor (WF) is the percent of combined aggregate that passes the #8 sieve.
      2) The Adjusted Workability Factor (Adj-WF) is calculated as follows:
         a) Adj-WF = WF+[(Cementitious Material -564 lbs.)/37.6]
      3) The range of accepted Adj-WF for a given CF is as follows:
         a) Adj-WF = [(11.25 - .15 CF) + 33] ± 2.5

4) Combined percent retained on any given sieve size shall not exceed 24%.

c. Gradation requirement of ASTM C33 may be waived in order to meet ranges specified.

G. Water: ASTM C 1602.

H. Air Entrainment: ASTM C260.
1. Air-Mix or AEA-92, by Euclid.
2. MasterAir VR 10, MasterAir AE 90, or MasterAir E 200 by BASF Admixtures.
3. Daravair or Darex Series, by W.R. Grace.
4. Equivalent approved products.

I. Evaporation Retardant: Water-based polymer, sprayable.
1. Euco-Bar, by Euclid
2. MasterKure ER 50 by BASF Admixtures
3. Aquafilm, by Dayton Superior.

J. Liquid Membrane Curing and Sealing Compound: ASTM C 1315, Type I, Class A or B, 25% minimum solids content, clear non-yellowing with no styrene-butadiene.
1. Water Based, VOC less than 350 g/l:
   a. Super Aqua Cure, by Euclid Chemical Corp.
   b. MasterKure CC 1315WB by BASF Admixtures.
2. Solvent Based (For use below 40F)
   a. Super Rez-Seal, by Euclid Chemical Corp.
   b. MasterKure CC 300 SB by BASF Admixtures.

K. Dissipating Curing Compound (For use below 40F): ASTM C 309 Type 1, Class A or B.
1. Solvent base, VOC less than 350 g/l: Cetri Vex EnvioCure 100 by Vexcon.

2.2 CONCRETE MIX

A. Design mix shall produce normal weight concrete consisting of Portland cement, supplementary cementitious materials, aggregates, admixtures, and water to produce specified requirements.

B. Concrete Site Pavement and Light Pole Bases
1. ACI Exposure Category and classification:
   a. Negligible exposure: F0
   b. Moderate exposure: F2
   c. Severe exposure: F3
2. Compressive Strength: Strength at 28 days, unless otherwise indicated on the Drawings:
   a. Negligible exposure classification: 3,500 psi.
   b. Moderate exposure classification: 4,500 psi.
3. Maximum Water-Cementitious Material Ratio (Cement Quantity Includes Fly Ash or slag):
   a. Negligible exposure: 0.55 by wt.
   b. Moderate and severe exposure classification: 0.45 by wt.
4. Slump Range: Slump at the point of placement shall be 2 to 4 inches for hand placed concrete, 1-1/14 to 3 inches for machine placed (slip form) concrete. Maximum slump variance shall be 2 inches.
5. Air Content: As shown in the table below.

C. Air Entrainment as shown below:

Nominal Maximum Size Aggregate (Inch)	Average Air Content (%) +/- 1.5% By Exposure Category	
	Negligible - F0	Moderate or Severe – F2 & F3
3/8	4.5	7.5
1/2	4.0	7.0

3/4	3.5	6.0
1	3.0	6.0
1-1/2	2.5	5.5

D. Supplementary Cementitious Materials (SCM):
1. Concrete mix shall contain SCM at the amounts specified unless other amounts are approved by the Civil Engineer. Either fly ash or ground granulated blast furnace slag (GGBFS) may be used for the SCM but shall not be used together to form a ternary mix. Use of fly ash or GGBFS in the concrete mix is mandatory.
2. Fly Ash: Substitute fly ash for Portland cement at 20% of the total cementitious content.
   a. If used to mitigate potential aggregate reactivity, up to 30% fly ash substitution of Portland cement is allowed. Only Type F fly ash may be used and shall have the following maximum properties: 1.5% available alkali and 8.0% CaO. When a maximum of 30% replacement is used, up to 10.0% CaO is permitted.
3. Ground Granulated Blast Furnace Slag (GGBFS): Substitute GGBFS for Portland cement at 25% of the total cementitious content.
   a. If required to mitigate potential sulfate exposure or aggregate reactivity, up to 50% GGBFS substitution of Portland cement is allowed.
4. Maintain air-entrainment at specified levels.

E. Calcium Chloride:
1. Calcium chloride (Type L) may be used in solution form as part of the mixing water to accelerate concrete setting and early-strength development.
2. Amount of calcium chloride added shall not be more than necessary to produce the desired results and shall not exceed 2% by weight of cement.
3. The dosage range for the calcium chloride for the entire project shall not vary by more than 1%. Range is defined as the difference between the maximum and minimum dosages of calcium chloride for the entire project.
4. Calcium chloride shall not be used in the following applications unless approved by the Civil Engineer:
   a. concrete containing embedded dissimilar metals or aluminum
   b. slabs supported on permanent galvanized steel forms
   c. concrete exposed to deicing chemicals
   d. prestressed or post-tension concrete
   e. concrete containing aggregates with potentially deleterious reactivity and concrete exposed to soil
   f. concrete exposed to soil or water containing sulfates.
5. Use calcium chloride in accordance with manufacturer's recommendation.
6. Chloride-ion Concentration: Maximum water-soluble chloride-ion concentrations in hardened concrete at ages from 28 to 42 days contributed from the ingredients including water, aggregates, cementitious materials, and admixtures shall not exceed the following limits unless approved by the Civil Engineer:

Type of Member	Maximum water-soluble chloride ion (Cl-) content in concrete (percent by weight of cement)
Prestressed concrete	0.06
Reinforced concrete exposed to chloride in service	0.15
Reinforced concrete that will be dry or protected from moisture in service	1.00
Other reinforced concrete construction	0.30

7. When using calcium chloride or other admixtures containing chlorides, measure water-soluble chloride-ion content (percent by weight of cement) per ASTM C 1218. Sample shall be from concrete representing the submitted mix design and maximum chloride dosage anticipated for the project.

2.3 MIXING

A. Mix concrete and deliver in accordance with ASTM C 94.

PART 3 - EXECUTION

3.1 PREPARATION

A. Proofroll prepared base material surface to check for unstable areas in accordance with Section 02300 including documentation and re-proof rolling as required. Paving work shall begin only after unsuitable areas have been corrected and are ready to receive paving.

B. Remove loose material from compacted base material surface to produce firm, smooth surface immediately before placing concrete.

3.2 AGGREGATE BASE PLACEMENT

A. Unless otherwise specified on the Drawings, place aggregate base as specified herein.

B. Aggregate Base:
1. Install aggregate base where shown on Drawings.
2. Compact to final thickness shown in layers not exceeding 6 inches with minimum of 2 passes per layer with vibratory compactor.
3. Compact fill to 98% of aggregate's Standard Proctor as determined by Method D of ASTM D698.
4. Leave base up to 2 inches low until just prior to concrete placement.

C. Aggregate Base Fine Grading:
1. Compact to final thickness shown with 2 passes minimum vibratory compactor to produce smooth, flat, dense surface.
2. Do not allow excess moisture in or on base at time of placing concrete.
3. Level off aggregate base top surface with a maximum 3/4" thick aggregate choker material to achieve the following:
   a. To reduce surface friction and to meet specified fine grade tolerances specified below.
   b. To level areas exposed to rain, traffic, or excavations for buried utilities.
   c. At areas where aggregate base material does not have sufficient fine particles to produce a surface that is free of exposed aggregate or surface voids greater than 3/8" in size at time of slab installation.
4. Provide dry, smooth, flat, dense surface
5. Proof-roll 48 hrs. maximum prior to concrete placement. Depression under a fully loaded ready mix truck shall not exceed 1/2 inch.

D. Pavement Aggregate Base Fine Grade Tolerance: +0 inch, -3/4 inch with transition no greater than 3/4 inch vertically to 8 inches horizontally.

3.3 INSTALLATION

A. Form Construction
1. Set forms to required grades and lines, rigidly braced and secured.
2. Install sufficient quantity of forms to allow continuance of work and so that forms remain in place minimum of 24 hours after concrete placement.
3. Check completed formwork for grade and alignment to following tolerances:
   a. Top of forms not more than 1/8-inch in 10'-0".
   b. Vertical face on longitudinal axis, not more than 1/4-inch in 10'-0".
4. Clean forms after each use and coat with form release agent as often as required to ensure separation from concrete without damage.

B. Reinforcement: Fasten reinforcing bars or welded wire fabric (if required) accurately and securely in place with suitable supports and ties. Remove from reinforcement all dirt, oil, loose mill scale, rust, and other substances that will prevent proper bonding of the concrete to the reinforcement.

C. Concrete Placement
1. Mix and place concrete when the air temperature in the shade and away from artificial heat is a minimum of 35 degrees F and rising. Hot and cold weather concreting shall be in accordance with ACI 305.1 (hot weather) and 306.1 (cold weather).
2. Do not place concrete until base material and forms have been checked for alignment and grade. Concrete shall not be placed around manholes or other structures until they are at required finish elevation and alignment.

3. Place concrete using methods that prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.
4. Deposit and spread concrete in continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2 hour, place construction joint.

D. Contraction and Construction Joints: Construct contraction and construction joints straight with face perpendicular to concrete surface. Construct transverse joints perpendicular to centerline, unless otherwise detailed.
1. Contraction Joints: Provide joints at spacing of 12'-0" on centers, maximum each way. Construct control joints for depth equal to at least 1/4 of the concrete thickness, as follows:
a. Form tooled joints in fresh concrete by grooving top with recommended tool and finishing edge with jointer.
b. Sawed Contraction Joints:
1) Use saws, blades, skid plates, and accessories by Soff-Cut International, Inc. or approved equal.
2) Start cutting sawed joints as soon as concrete has hardened sufficiently to prevent raveling or dislodging of aggregates. This will typically be from 1 hour in hot weather to 4 hours in cold weather after completing finishing of slab in that joint location.
3) Provide at least two “Soff-Cut” saws on site with blades capable of achieving the required depth of saw cut.
4) Extend sawed joint to the slab boundaries and abutments, including columns, drains, and other penetrations in the path of a defined joint. Implement methods and timing of the saw cut beyond the limits of the Soff-Cut saw reach to provide a consistent depth of cut with minimal raveling of joint edges.
2. Construction Joints: Place construction joints at end of placements and at locations where placement operations are stopped for period of more than 1/2 hour. Construct joints in accordance with details shown.

E. Isolation and Fixed Object Joints: Construct joint at locations and in accordance with details shown.

F. Pavement Joint Materials: Place joint fillers, back-up material, and sealants at locations shown and in accordance with manufacturer’s instructions.
1. Soft Preformed Joint Fillers: Extend preformed joint fillers full-width and depth of joint, and not less than 1/2-inch or more than 1-inch below finished surface. Furnish preformed joint fillers in 1-piece lengths for full width being placed, wherever possible. Where more than 1 length is required, lace or clip preformed joint filler sections together in a single plane.

3.4 CONCRETE FINISHING

A. After initial striking off and consolidating of concrete paving, smooth surface using either magnesium straight edge, wood, or magnesium channel float.

B. Round edges of slabs and formed joints to 1/2-inch radius with edging tool. Eliminate tool marks on concrete surface.

C. After completion of straightedge / floating and when excess moisture or surface sheen has disappeared, uniformly finish surface to provide a coarse, nonslip finish by scoring surface with stiff-bristled broom perpendicular to flow of traffic so as to produce regular corrugations not over 1/16 of an inch deep. Initial nonslip finishing shall be approved by the Owner’s Representative.

D. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point up minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Owner.

3.5 CURING AND PROTECTION

A. Protect and cure finished concrete paving using curing compound. Cure for a period not less than 7 days.

B. Use solvent based curing compound when compound is applied below 40 F.

3.6 CLEANING AND ADJUSTING

A. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just prior to final inspection.

B. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials.

3.7 FIELD QUALITY CONTROL

A. Field quality control shall be the responsibility of the Contractor in accordance with the appropriate Contract Documents. Field quality control testing and inspection shall be at the discretion of the Contractor as necessary to assure compliance with Contract requirements.

B. Responsibilities and Duties Relative to Testing and Inspection:
   1. Notify CTL in advance of concrete placements to allow sufficient time to prepare for a site visit.
   2. Assist testing agency in securing field specimens.
   3. Provide and maintain for sole use of CTL, facilities for safe storage and proper curing of concrete test cylinders at project site as required by ASTM C31 and acceptable to Construction Testing Laboratory.

C. Correction of Deficient Work:
   1. When directed by the Owner, remove and replace or repair concrete and related Work which does not conform to specified requirements including strength, tolerances, and finishes.
   2. Bare cost of corrections or delays to other work affected by, or resulting from, corrections to concrete Work.
   3. If results of compressive strength tests reveal deficiencies in concrete, meet requirements of ACI 318 and ACI 301.

END OF SECTION

SECTION 321600 - CURBS AND SIDEWALKS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Portland cement concrete curbs, gutters, and sidewalks except sidewalks adjacent to building.

B. Related Requirements:
   1. Louisiana Department of Transportation and Development (DOTD) Standards and Specifications (LSSRB), latest edition.
   2. Section 02300 - Earthwork: Preparation of subgrades.
   3. Section 03310 - Structural Concrete and Exterior Concrete Slabs: Exterior sidewalks adjacent to building.

1.2 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

B. American Concrete Institute (ACI):
   1. ACI 305R - Hot Weather Concreting
   2. ACI 306R - Cold Weather Concreting
   3. ACI 306.1 - Cold Weather Concreting.
   4. ACI 308 - Curing Concrete

C. ASTM International (ASTM):
   1. ASTM A185 - Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
   2. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.
   3. ASTM C31 - Making and Curing Concrete Test Specimens in the Field.
   4. ASTM C39 - Comprehensive Strength of Cylindrical Concrete Specimens.
   5. ASTM C42 - Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
   6. ASTM C94 - Ready-Mixed Concrete.
   7. ASTM C138 - Test Method for Unit Weight, Yield, and Air Content (Gravemetric) of Concrete.
   8. ASTM C143 - Slump of Hydraulic Cement Concrete.
   9. ASTM C231 - Air-Content of Freshly Mixed Concrete by the Pressure Method.
   10. ASTM C172 - Sampling Freshly Mixed Concrete.
   11. ASTM C173 - Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
   12. ASTM C260 - Air-Entraining Admixtures for Concrete.
   13. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
   14. ASTM C618 - Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete.
   15. ASTM C989 - Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
   16. ASTM C1064 - Temperature of Freshly Mixed Portland Concrete Cement.
   17. ASTM C1218 - Water-Soluble Chloride in Mortar and Concrete.
   18. ASTM D98 - Calcium Chloride.
   19. ASTM D994 - Preformed Expansion Joint Filler for Concrete (Bituminous).
   20. ASTM D1190 - Concrete Joint Sealer, Hot Poured, Elastic Type.
   21. ASTM D1751 - Performed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
   22. ASTM D2628 - Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements.

D. Federal Specifications (FS):
   1. FS HH-F-341 - Fillers, Expansion Joint: Bituminous (Asphalt & Tar)

E. State Highway Louisiana Department of Transportation and Development (DOTD) Standards and Specifications (LSSRB), latest edition.

1.3 SUBMITTALS

A. Mix Design:
   1. Fill out and submit attached Concrete Mix Design Submittal Form.
   2. Submit three copies of each proposed mix.
   3. Submit separate mix design for concrete to be placed by pumping in addition to the mix design for concrete to be placed directly from the truck chute.
   4. Submit mix design to the Engineer of Record and the Construction Testing Laboratory.
   5. Include applicable information shown on the Mix Design Submittal Form and the following:
      a. Proportions of cementitious materials, fine and coarse aggregate, and water.
      b. Water-cementitious material ratio, 28-day compressive design strength, slump, and air content.
      c. Type of cement, fly ash, slag and aggregate.
      d. Aggregate gradation.
      e. Type and dosage of admixtures.
      f. Special requirements for pumping.
      g. Range of ambient temperature and humidity for which design is valid.
      h. Special characteristics of mix which require precautions in mixing, placing, or finishing techniques to achieve finished product specified.
      i. Materials and methods for curing concrete.

B. Submit certified laboratory test data or manufacturer's certificates and data for the items listed below certifying that materials are in conformance requirements specified herein. Submit to the Engineer of Record and the Construction Testing Laboratory for review and approval and within 7 calendar days after receipt of Notice-to-Proceed.
   1. Concrete mix design(s)
   2. Type and source of Portland cement, fly ash, and slag
   3. Aggregate gradations
   4. Preformed expansion joint filler
   5. Field molded/poured sealant
   6. Dowel bars
   7. Expansion sleeves
   8. Tie bars
   9. Reinforcing steel bars
   10. Welded wire fabric
   11. Air entraining admixtures
   12. Water-reducing, set-retarding and set-accelerating admixtures (if used)

C. Test Reports: Submit field quality control test reports.

1.4 PROJECT CONDITIONS

A. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize temporary striping, flagmen, barricades, warning signs, and warning lights as required.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends as required. Forms shall be of depth equal to depth of curbing or sidewalk, and so designed as to permit secure fastening together at tops. Coat forms with nonstaining type of coating that will not discolor or deface surface of concrete.

B. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A185. Furnish in flat sheets.

C. Reinforcing Steel: Deformed steel bars, ASTM A615, Grade 60.

D. Portland Cement: Shall conform to ASTM C150, Type I.

E. Fly Ash: ASTM C618, Class C or F. Use only one type and source throughout project.

F. Slag: ASTM C989, Grade 100 or 120. Use only one type and source throughout project.

G. Exterior Pavement Joint Materials
   1. Joint Back-up Material: Polyethylene foam, 100% closed cell.
   2. Sealant:
      a. Dow 888, by Dow Corning.
      b. 301 NS by Pecora.
      c. Spectrum 800 or 900 by Tremco.

H. Aggregate: ASTM C33.

I. Water: Clean and potable

J. Dowel Bars: ASTM A615, grade 60, and plain steel bars.

K. Air Entrainment: ASTM C260. .
   1. Air-Mix or AEA-92, by Euclid Chemical Corp.
   2. MasterAir VR 10, MasterAir AE 90, or MasterAir E 200 by BASF Admixtures.
   3. Daravair or Darex Series, by W.R. Grace.
   4. Equivalent approved products.

L. Liquid Membrane Curing and Sealing Compound: ASTM C1315, Type I, Class A or B, 25% minimum solids content, clear non-yellowing with no styrene-butadiene.
   1. Water Based, VOC less than 350 g/l:
      a. Super Aqua Cure, by Euclid Chemical Corp.
      b. MasterKure CC 1315WB by BASF Admixtures.
   2. Solvent Based
      a. Super Rez-Seal, by Euclid Chemical Corp.
      b. MasterKure CC 300 SB by BASF Admixtures.

M. Dissipating Curing Compound: ASTM C309 Type 1, Class A or B.
   1. Solvent base, VOC less than 350 g/l: Cetri Vex EnvioCure 100 by Vexcon.

2.2 CONCRETE MIXING

A. Mix concrete and deliver in accordance with ASTM C94. Design mix shall produce normal weight concrete consisting of Portland cement, supplementary cementitious materials, aggregates, admixtures and water to produce the following:
   1. Compressive Strength: 3,500 psi minimum at 28 days unless otherwise indicated on the Drawings.
   2. Slump Range: 2”-4” for hand placed concrete, 1-1/4” to 3” for machine placed (slipform) concrete.
   3. Air Entrainment: 5 to 8 percent.

B. Supplementary Cementitous Materials (SCM):
   1. Concrete mix shall contain SCM at the amounts specified unless other amounts are approved by the Civil Engineer. Either fly ash or ground granulated blast furnace slag (GGBFS) may be used for the SCM but shall not be used together to form a ternary mix. Use of fly ash or GGBFS in the concrete mix is mandatory.
   2. Fly Ash: Substitute fly ash for Portland cement at 15% of the total cementitious content.
      a. If used to mitigate potential aggregate reactivity, only Type F fly ash may be used and shall have the following maximum properties: 1.5% available alkali and 8.0% CaO. When a maximum of 25% replacement is used, up to 10.0% CaO is permitted.
   3. Ground Granulated Blast Furnace Slag (GGBFS): Substitute GGBFS for Portland cement at 20% of the total cementitious content.
      a. If required to mitigate potential sulfate exposure or aggregate reactivity, up to 50% substitution of Portland cement is allowed.
   4. Maintain air-entrainment at specified levels.

C. Calcium chloride:

1. Calcium chloride (Type L) may be used in solution form as part of the mixing water to accelerate concrete setting and early-strength development.
    a. Amount of calcium chloride added shall not be more than necessary to produce the desired results and shall not exceed 2% by weight of cement.
    b. The dosage range for the calcium chloride for the entire project shall not vary by more than 1%. Range is defined as the difference between the maximum and minimum dosages of calcium chloride for the entire project.
    c. Calcium chloride shall not be used in the following applications unless approved by the Civil Engineer:
        1) concrete containing embedded dissimilar metals or aluminum
        2) slabs supported on permanent galvanized steel forms
        3) concrete exposed to deicing chemicals
        4) prestressed or post-tension concrete
        5) concrete containing aggregates with potentially deleterious reactivity and concrete exposed to soil
        6) concrete exposed to soil or water containing sulfates.
2. Use calcium chloride in accordance with manufacturer's recommendation.
3. Chloride-ion Concentration:
    a. Maximum water-soluble chloride-ion concentrations in hardened concrete at ages from 28 to 42 days contributed from the ingredients including water, aggregates, cementitious material, and admixtures shall not exceed the following limits unless approved by the Civil Engineer:

Type of Member	Maximum water-soluble chloride ion (Cl-) content in concrete (percent by weight of cement)
Prestressed concrete	0.06
Reinforced concrete exposed to chloride in service	0.15
Reinforced concrete that will be dry or protected from moisture in service	1.00
Other reinforced concrete construction	0.30

4. When using calcium chloride or other admixtures containing chlorides, measure water-soluble chloride-ion content (percent by weight of cementitious materials) per ASTM C1218. Sample shall be from concrete representing the submitted mix design and maximum chloride dosage anticipated for the project.

PART 3 - EXECUTION

3.1 PREPARATION

A. Begin paving work only after unsuitable areas have been corrected and are ready to receive paving.

B. Remove loose material from compacted base material surface to produce firm, smooth surface immediately before placing concrete.

3.2 INSTALLATION

A. Form Construction
1. Set forms to required grades and lines, rigidly braced and secured.
2. Install sufficient quantity of forms to allow continuance of work and so that forms remain in place minimum of 24 hours after concrete placement.
3. Check completed formwork for grade and alignment to following tolerances:
    a. Top of forms not more than 1/8-inch in 10'-0".
    b. Vertical face on longitudinal axis, not more than 1/4-inch in 10'-0".
4. Clean forms after each use and coat with form release agent as often as required to ensure separation from concrete without damage.

B. Reinforcement: Fasten reinforcing bars or welded wire fabric (if required) accurately and securely in place with suitable supports and ties. Remove from reinforcement all dirt, oil, loose mill scale, rust, and other substances that will prevent proper bonding of the concrete to the reinforcement.

C. Concrete Placement

1. Concrete shall be mixed and placed when the air temperature in the shade and away from artificial heat is a minimum of 35 degrees F and rising. Hot and cold weather concreting shall be in accordance with ACI 305R (hot weather) and 306.1 and 306R (cold weather).Do not place concrete until base material and forms have been checked for line and grade. Moisten base material if required to provide uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until set at required finish elevation and alignment.
2. Place concrete using methods that prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.
3. Deposit and spread concrete in continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2 hour, place construction joint. Automatic machine may be used for curb and gutter placement. Machine placement shall be at required cross section, line, grade, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified herein.

D. Joint Construction

1. Contraction Joints: Construct concrete curb or combination concrete curb and gutter, where specified on Construction Drawings, in uniform sections of length specified on Construction Drawings. Form joints between sections either by steel templates, 1/8-inch in thickness, of length equal to width of curb and gutter, and with depth which will penetrate at least 2-inches below surface of curb and gutter; or with 3/4-inch thick performed expansion joint filler cut to exact cross section of curb and gutter; or by sawing to depth of at least 2-inches while concrete is between 4 and 24 hours old. If steel templates are used, they shall be left in place until concrete has set enough to hold its shape, but shall be removed while forms are still in place.
2. Longitudinal Construction Joints: Tie concrete curb or combination concrete curb and gutter, where specified on Construction Drawings, to concrete pavement with 1/2-inch round deformed reinforcement bars of length and spacing shown on Construction Drawings.
3. Transverse Expansion Joints: Concrete curb, combination concrete curb and gutter, or concrete sidewalk shall have filler cut to exact cross section of curb, gutter, or sidewalk. Joints shall be similar to type of expansion joint used in adjacent pavement.

E. Joint Fillers: Extend joint fillers full-width and depth of joint, and not less than 1/2-inch or more than 1-inch below finished surface where joint sealer is indicated. Furnish joint fillers in 1-piece lengths for full width being placed, wherever possible. Where more than 1 length is required, lace or clip joint filler sections together.

F. Joint Sealants: Install in accordance with manufacturer's recommendations.

3.3 CONCRETE FINISHING

A. After striking off and consolidating concrete, smooth surface by screeding and floating. Adjust floating to compact surface and produce uniform texture. After floating, test surface for trueness with 10'-0" straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide continuous smooth finish.

B. Work edges of sidewalks, gutters, back top edge of curb, and formed joints with edging tool, rounding edge to 1/2-inch radius. Eliminate tool marks on concrete surface. After completion of floating and trowelling, when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:

1. Curbs, gutters, and sidewalks: Broom finish by drawing fine-hair broom across surface perpendicular to flow of traffic. Repeat operation as necessary to produce fine line texture.

C. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point up minor honeycombed areas. Remove and replace areas or sections with major defects as directed Owner.

D. Check surface areas at intervals necessary to eliminate ponding areas. Remove and replace unacceptable work as directed by Owner.

3.4 CURING AND PROTECTION

A. Protect and cure finished concrete paving using with curing compound or with acceptable moist-curing methods in accordance with "water-curing" section of ACI 308. Cure for a period not less than 7 days.

B. Use solvent based curing compound when compound is applied below 40 F.

3.5 BACKFILL

A. After concrete has set sufficiently, spaces on either side of concrete curb, combination concrete curb and gutter, or concrete sidewalk shall be refilled to required elevation with suitable material compacted in accordance with Section 02300.

3.6 CLEANING AND PROTECTION

A. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just prior to final inspection.

B. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials.

3.7 FIELD QUALITY CONTROL

A. Field quality control shall be the responsibility of the Contractor in accordance with Section 01452. Field quality control testing and inspection shall be at the discretion of the Contractor as necessary to assure compliance with Contract requirements.

END OF SECTION

SECTION 32 16 25 - ARCHITECTURAL SIDEWALKS

PART 1 - GENERAL

1.1 The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete of concrete walks as shown on drawings and specified in accordance with provisions of the contract documents and completely coordinated with that of all other trades.

1.2 Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.

1.3 Refer to Sections:
03 11 00 - Concrete Formwork,
03 30 00 - Cast-in-Place Concrete
32 13 13 - Concrete Paving

1.4 Shop Drawings shall be required and shall include a floor plan indicating the following:

A. Location of all control joints
B. Location of all expansion joints
C. Spacing of all control joints
D. Spacing of all expansion joints
E. Indication of control joint and expansion joint material to be used along with sealant

1.5 The Louisiana Standard Specifications for Roads and Bridges Current Edition, published by the State of Louisiana, Department of Transportation and Development is hereby made a part of these specifications by reference. Any reference to the “Project Engineer” or “Department” made in these specifications should be revised to “Project Architect”. All work on concrete walks will be in accordance with Section 706 of the Standard Specifications or any section referenced with Section 706.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Construct all concrete walks and paving as detailed on the plans. If not specifically shown control joints at concrete walks shall be 6'-0" o.c. If not specifically shown, control joints at areas other than concrete walks shall be no more than 10'-0" o.c. each way for large areas. Control joints shall be 3-1/8” galvanized steel screed key joint with Greenstreak Inc. Model #627 screed cap or as indicated on Contract Documents. (Manufacturer: Greenstreak, P.O. Box 7139, St. Louis, Missouri 63177, (314) 225-9400 and (800) 325-9504, or approved equal.)

B. Expansion joints shall be 3/4" wide with a 3/4" wide polypropylene expansion board, with G-Seal #605 paving cap seal. Also use this material and system where concrete walks butt up against building, grade beams, etc. Expansion joints shall be spaced no more than 24' o.c. and as indicated on drawings. Verify exact location with Architect before installation.

1. **Optional Expansion Joint Assembly**: shall be 3/4” wide asphalt impregnated expansion filler (Conform to ASTM D – 1751) with top 3/4” filled with Sonneborn Sonolastic SL-1 Self-Leveling Sealant. Also use this material and system where concrete walks butt up against building, grade beams, etc. Expansion joints shall be spaced no more than 24' o.c. and as indicated on drawings. Verify exact location with Architect before installation.

C. Unless otherwise indicated on the drawings, all concrete used for Architectural Concrete Walks shall be minimum 3000 psi and shall be fiber reinforced. (Re: 03 30 00 - Cast-In-Place Concrete, for additional information)

1. Concrete mix design shall include 2-1/4" long Forta Macro/Structural Synthetic Twisted Bundle Reinforcement fibers at a rate of 3.0 lbs. per cubic yard of concrete (min.).

PART 3 - EXECUTION

3.1 All walks shall be level, straight and true (slope if any shall be as shown on plans, as follows the adjacent ground level, but in no case more than 1:20).

3.2 Slope of sidewalks directly adjoining an exit shall not exceed 1:50 for a min. of 4'-0" measured perpendicularly to the width of the entire opening.

3.3 All walks shall have a moderately non-slip finish (light broom finish).

3.4 All curved or radius walks shall have special care taken to build true to form and shape with all walks greater than 1" out of true or not tangent to straight runs shall be rejected by the Architect, demolished and replaced at the contractor’s expense.

END OF SECTION 32 16 25

SECTION 321723 - PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Painting and marking of pavements, curbs, guard posts, and light pole bases.

B. Related Requirements:
   1. Louisiana Department of Transportation and Development (DOTD) Standards and Specifications (LSSRB), latest edition.

1.2 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

B. American Association of State Highway and Transportation (AASHTO):
   1. AASHTO M247 - Glass Beads Used in Traffic Paints
   2. AASHTO M248 - Ready-Mixed White and Yellow Traffic Paints

C. Master Painter's Institute (MPI):
   1. MPI 32 – Traffic Marking Paint, Solvent Based.
   2. MPI 97 – Traffic Marking Paint, Latex.

D. ASTM International (ASTM):
   1. ASTM D4259 – Standard Practice for Abrading Concrete.
   2. ASTM D4414 - Standard Practice for Measurement of Wet Film Thickness by Notched Gauges.

E. Federal Specifications (FS):
   1. FS A-A-2886 - Paint, Traffic, Solvent Based (supersedes FS TT-P-85 and FS TT-P-115, Type I)
   2. FS TT-B-1325 - Beads (Glass Spheres) Retro-Reflective
   3. FS TT-P-1952 - Paint, Traffic And Airfield Marking, Waterborne

F. The Society for Protective Coatings (SSPC):
   1. SSPC-SP13 – Surface Preparation of Concrete.

1.3 ENVIRONMENTAL REQUIREMENTS

A. Minimize dust emissions and provide equipment that suppresses dust.

1.4 PROJECT CONDITIONS

A. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize flagmen, barricades, warning signs, and warning lights as required.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Paint shall be waterborne or solvent borne, colors as shown or specified herein. Pavement marking paints shall comply with applicable state and local laws enacted to ensure compliance with Federal Clean Air Standards. Paint materials shall conform to the restrictions of the local Air Pollution Control District.

B. Waterborne Paint: Paints shall conform to FS TT-P-1952 and have MPI 97 approval.

C. Solvent Borne Paint: Paint shall conform to FS A-A-2886 or AASHTO M248 and have MPI 32 approval. Paint shall be non-bleeding, quick-drying, and alkyd petroleum base paint suitable for traffic-bearing surface and be mixed in accordance with manufacturer's instructions before application for colors White, Yellow, Blue, and Red.

D. Glass Beads: AASHTO M 247, Type 1 or FS TT-B-1325, Type 1, Gradation A.

E. Pickup Area Pavement Marking Paint: Paint shall conform to the requirements specified herein for solvent borne or waterborne paints, with exception of the relevant difference due to the material being supplied in a color other than white or yellow.

1. Color: Orange, according to the following mix rate:

Gallon	Color
5	Yellow
1	Red
6	Orange

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the work area and correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Sweep and clean surface to eliminate loose material and dust.

B. Where existing pavement markings are indicated on Construction Drawings to be removed or would interfere with adhesion of new paint, sodium bicarbonate (soda) blasting shall be used to remove the markings. Equipment employed shall not damage existing paving or create surfaces hazardous to vehicle or pedestrian traffic and shall be equipped with a manufacturer's recommended mist system for dust suppression. Within public rights-of-way, appropriate governing authority shall approve method of marking removal.

C. New pavement surfaces shall be allowed to cure for not less than 30 days before application of marking materials.

3.3 CLEANING EXISTING PAVEMENT MARKINGS

A. Remove existing pavement markings which are in good condition but interfere or conflict with the newly applied marking patterns. Deteriorated or obscured markings that are not misleading or confusing or do not interfere with the adhesion of the new marking material do not require removal. Conduct sodium bicarbonate (soda) blasting in such a manner that the finished pavement surface is not damaged or left in a pattern that is misleading or confusing. Use a water mist spray system recommended by the manufacturer for dust suppression when pavement preparation includes soda blasting of existing pavement markings.

3.4 APPLICATION

A. Apply two coats of same color of paint as specified below, at manufacturer's recommended rate, without addition of thinner, with maximum of 100 square feet per gallon or as required to provide a minimum wet film thickness of 15 mils and dry film thickness of 7 ½ mils per coat. Paint shall be applied for a total dry film thickness of 15 mils. Apply with mechanical equipment to produce uniform straight edges. At sidewalk curbs and crosswalks, use straightedge to ensure uniform, clean, and straight stripe.

B. Install pavement markings according to manufacturer's recommended procedures for the specified material.

C. Following items shall be painted with colors noted below:
1. Pedestrian Crosswalks: White
2. Exterior Sidewalk Curbs and Guard posts: Yellow
3. Exterior Light Pole Bases: Yellow (unless otherwise noted on Construction Detail).

4. Fire Lanes: Red or per local code.
5. Lane Striping where separating traffic moving in opposite directions: Yellow.
6. Lane Striping where separating traffic moving in the same direction: White.
7. ADA Symbols: Blue or per local code.
8. ADA parking space markings as shown on the drawings.
9. Parking Stall Striping: Yellow, unless otherwise noted on Construction Drawings.

D. Apply glass beads at pedestrian crosswalk striping and at lane striping and arrows at driveways connecting to public streets. Broadcast glass beads uniformly into wet markings at a rate of 6 lb/gal.

3.5 FIELD QUALITY CONTROL

A. Field quality control shall be the responsibility of the Contractor in accordance with Contract Documents. Field quality control testing and inspection shall be at the discretion of the Contractor as necessary to assure compliance with Contract requirements.

3.6 CLEANING

A. Waste materials shall be removed at the end of each workday. Upon completion of the work, all containers and debris shall be removed from the site. Paint spots upon adjacent surfaces shall be carefully removed by approved procedures that will not damage the surfaces and the entire job left clean and acceptable.

END OF SECTION

SECTION 321725 – Traffic Signs and Signals

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Traffic control signs.

B. Related Requirements:
   1. Louisiana Department of Transportation and Development (DOTD) Standards and Specifications (LSSRB), latest edition, and standard details.
   2. Section 09900 - Painting. Painting for painted posts where shown on the Drawings.

1.2 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

B. ASTM International (ASTM):
   1. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
   2. ASTM C94 - Ready Mix Concrete
   3. ASTM D4956 - Retroreflective Sheeting for Traffic Control.

C. US Department of Transportation, Federal Highway Administration:
   1. Manual on Uniform Traffic Control Devices (MUTCD).

PART 2 - PRODUCTS

2.1 SIGNS

A. Conform to US Department of Transportation MUTCD. Sign classification, type, size, and color shall be as shown on the drawings

B. Retroreflectivity: Microprismatic type, diamond grade reflective sheeting conforming to ASTM D 4956

2.2 POSTS

A. Square Post: Square tubular steel sign post, galvanized, 12 ga, perforated full-length with 7/16 inch holes on four sides, unless noted otherwise on the Construction Drawings. Post size shall be as shown on the Drawings.

B. Steel Pipe: ASTM A 53, Type E (electric-resistance welded) or Type S (seamless), Grade B, Schedule 40, size as shown on the Drawings.

2.3 CONCRETE

A. Mix concrete and deliver in accordance with ASTM C 94.

B. Design mix to produce normal weight concrete consisting of Portland cement, aggregate, water-reducing admixture, air-entraining admixture, and water to produce following:
   1. Compressive Strength: 3,500 psi, minimum at 28 days, unless otherwise indicated on the Drawings.
   2. Slump Range: 1 to 3-inches at time of placement
   3. Air Entrainment: 5 to 8 percent

PART 3 - EXECUTION

3.1 PREPARATION

A. Field verify underground utilities prior to sign installation. Primary utilities of concern of shallow depths are lawn sprinkler systems, electric, telephone, fiber optic, cable and gas.

3.2 INSTALLATION

A. Install signs as shown on the Drawings and in accordance with MUTCD and manufacturer's instructions.

B. Install signs of the type and at locations shown on the Drawings.

C. Install posts of the type as shown on the drawing.

END OF SECTION

SECTION 32 31 13 - COLOR CHAIN LINK FRAMEWORK FENCING (COMMERCIAL WEIGHT)

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete of color chain link framework fencing (commercial weight) as shown on drawings and specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.

B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.

C. Refer to Section 31 00 00 - Excavation, Filling, and Grading, Section 03 11 00 - Concrete Formwork, and Section 03 30 00 - Cast-in-Place Concrete for additional information.

D. Shop Drawings shall be required and shall include a floor plan indicating the following:
1. Color chain link framework fencing system fabric.
2. Color chain link framework fencing posts supports.
3. Foundation excavations at new fencing
4. Concrete and concrete reinforcing for fence supports
5. Color chain link framework fencing gates and associated braces and rails
6. Steel ornamental cantilever gates and associated braces, pickets, and rails

E. The Contractor shall provide an earth surface that is level beneath the color chain link framework fencing.

F. Provide color chain link framework fence and gates as a complete unit produced by a single manufacturer, including necessary erection accessories, fittings and fastenings.

G. The installer must examine the conditions under which the fence and gates are to be installed. Notify the Architect in writing of conditions which would interfere with proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.

H. The installer shall follow the standards of the City, Parish and State along with the International Building Code.

I. Height of the color chain link framework fence shall be as indicated specifically in the Drawings.

1.2 QUALITY ASSURANCE

A. The Contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and materials and techniques specified.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM) Standards: A90/A90M - Test Method for Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.

B. A653/A653M - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

C. A924/A924M - Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

D. B6 - Specification for Zinc. B117 - Practice for Operating Salt Spray (Fog) Apparatus.

E. D1499 - Practice for Operating Light- and Water-Exposure Apparatus (Carbon-Arc Type) for Exposure of Plastics.

F. D3359 - Test Methods for Measuring Adhesion by Tape Test. E8/E8M - Test Methods for Tension Testing of Metallic Materials.

G. F567 - Practice for Installation of Chain-Link Fence. F626 - Specification for Fence Fittings.

H. F668 - Specification for Poly (Vinyl Chloride) (PVC)-Coated Steel Chain-Link Fence Fabric.

I. F900 - Specification for Industrial and Commercial Swing Gates.

J. F934 - Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials.

K. F969 - Practice for Construction of Chain-Link Tennis Court Fence.

L. F1043 - Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.

M. F1184 - Specification for Industrial and Commercial Horizontal Slide Gates.

N. American Association of State Highway and Transportation Officials (AASHTO) Standards: M181 - Standard Specification for Chain-Link Fence.

O. United States Federal Supply Service General Services Administration Specifications: RR-F-191/3 - Federal Specification Sheet for Fencing, Wire and Post, Metal (Chain-Link Fence Posts, Top Rails and Braces) - Detail Specification.

1.4 SUBMITTALS

A. Shop Drawings:

1. Details of special fabrication and installation necessary for this project, including special conditions, which require special configurations.

2. The shop drawings shall show a layout of the color chain link framework fence and gates along with locations of gates with the indication of width and height.

3. **Any and all shop drawings not reviewed, stamped, dated and signed by the Contractor prior to submittal to the Architect will be returned as rejected.**

4. The Contractor shall be responsible for all dimensions, quantities, assortments and accuracies of the shop drawings.

5. Generally, notes and markings on the shop drawings by the Contractor placed after the review by the Architect shall be null and void unless again reviewed by the Architect.

6. **Note! Any changes from the Contract Documents shall be highlighted in yellow on the shop drawings (dimension, size, color, etc.).**

7. Furnish the Architect with four (4) blueline prints of every sheet required. (Prints are to be reviewed and stamped approved by the Contractor before submitting to the Architect.)

8. Manufacturer's literature:
   a. Recommended installation methods and procedures.
   b. Standard drawings for fence and gate installation.

9. Certificates:
   a. Manufacturer's certification that materials meet specification requirements, for record purposes.

1.5 PRODUCT HANDLING AND STORAGE

A. Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism and theft.

1.6 PRODUCT WARRANTY

A. All fencing components (i.e. posts, rails, and braces) shall be warranted within specified limitations, by the manufacturer for a period of **15 years from date of Substantial Completion**. Warranty shall cover any defects in material finish, including cracking, peeling, chipping, blistering or corroding. A sample copy of the PermaCoat Colored Chain Link Framework 15 Year Limited Warranty is attached to the end of this section.

PART 2 - PRODUCTS

2.1 MATERIALS

A. The color chain link framework fence systems shall conform to Ameristar PermaCoat PC-20 (Commercial Weight) as manufactured by:

1. Ameristar Fence Products, Inc., in Tulsa, Oklahoma, Contact Person: Chris Koehler (Phone 800-321-8724) or

2. Merchant Metals (www.merchantmetals.com) Phone: (888)260-1600

prior approved equal.

B. Material - Steel Framework:

1. The steel material used to manufacture Ameristar PermaCoat PC-20 shall be zinc-coated steel strip, galvanized by the hot-dip process conforming to the criteria of ASTM A653/A653M and the general requirements of ASTM A924/A924M.

2. The zinc used in the galvanizing process shall conform to ASTM B6. Weight of zinc shall be determined using the test method described in ASTM A90 and shall conform to the weight range allowance for ASTM A653, Designation G-90.

3. The framework shall be manufactured in accordance with commercial standards to meet the strength (50,000 psi minimum yield strength) and coating requirements of ASTM F1043, Group IC, Electrical Resistance Welded Round Steel Pipe, light industrial weight.

4. The exterior surface of the electrical resistance weld shall be recoated with the same type of material and thickness as the basic zinc coating.

5. The manufactured framework shall be subjected to the PermaCoat process, a complete thermal stratification coating process (multi-stage, high-temperature, multi-layer) including, as a minimum, a six-stage pretreatment/wash (with zinc

phosphate), an electrostatic spray application of an epoxy base, and a separate electrostatic spray application of a polyester finish.

6. The material used for the base coat shall be a (gray color) thermosetting epoxy; the minimum thickness of the base coat shall be two (2) mils. The material used for the finish coat shall be a thermosetting “no-mar” TGIC polyester powder; the minimum thickness of the finish coat shall be two (2) mils. The stratification coated pipe shall demonstrate the ability to endure a salt-spray resistance test in accordance with ASTM B117 without loss of adhesion for a minimum exposure time of 3,500 hours. Additionally, the coated pipe shall demonstrate the ability to withstand exposure in a weather-ometer apparatus for 1,000 hours without failure in accordance with ASTM D1499 and to show satisfactory adhesion when subjected to the cross-hatch test, Method B, in ASTM D3359. The polyester finish coat shall not crack, blister or split under normal use.

7. The color of all framework shall be Black in accordance with ASTM F934.

8. The strength of Ameristar PermaCoat PC-20 shall conform to the requirements of ASTM F1043; the minimum weight shall not be less than 90% of the nominal weight (see Table 1). The strength of line, end, corner and pull posts shall be determined by the use of 4’ or 6’ cantilevered beam test. The top rail shall be determined by a 10’ free-supported beam test (see Table 1). An alternative method of determining pipe strength is by the calculation of bending moment (see Table 1). Conformance with this specification can be demonstrated by measuring the yield strength of a randomly selected piece of pipe from each lot and calculating the section modulus. The yield strength shall be determined according to the methods described in ASTM E8. For materials under this specification, the 0.2 offset method shall be used in determining yield strength. Terminal posts, line posts and top/bottom rails shall be precut to specified lengths.

C. Material - Fence Fabric

1. The material for chain link fence fabric shall be manufactured from galvanized steel wire. The weight of zinc shall meet the requirements of ASTM F668, Table 4. Galvanized wire shall be PVC-coated to meet the requirements of ASTM F668. The class of the fence fabric shall be Class 2B - Fused and Bonded.

2. Selvage: Top edge knuckled and bottom edge knuckled.

3. Color: The coating color for the fence fabric shall be Black. Reference ASTM F668 and ASTM F934.

4. Wire Size: The size of the steel wire core shall be 9 gauge and shall have a 2 to 4 mils coating.

5. Height and Mesh Size: The fabric height shall be 6' (see Drawings) feet high with a mesh size of 2 inches. (See Table 2).

D. Material - Fence Fittings

1. The material for fence fittings shall be manufactured to meet the requirements of ASTM F626. The coating for all fittings shall be the same PermaCoat color coating system required for the framework (see G.2.); the color of all fittings and fasteners shall be Black in accordance with ASTM F934. All fasteners shall be stainless steel.

E. Material - Gates

1. Swing gates shall be manufactured and coated to meet the requirements of ASTM F900. Slide gates shall be manufactured to meet the requirements of ASTM F1184. The color of all gates shall be Black in accordance with ASTM F934.

2. Provide locking drop bars and hold backs with all gates.

3. Match gate fabric to that of the fence system. Gatepost per ASTM F1083 schedule 40 galvanized steel pipe. Gate frames shall be fully welded prior to galvanizing and finish coat is applied. Gates shall be light mill coated prior to installation of final PVC or Polyester Coating (fused and adhered).

4. Polymer coated gate frames and gateposts; match the coating type and color to that specified for the fence framework.

5. Moveable parts such as hinges, latches and drop rods may be field coated using a liquid polymer touch up.

PART 3 - EXECUTION

3.1 PREPARATION

A. All new installation shall be laid out by the contractor in accordance with the construction plan.

3.2 INSTALLATION

A. Install chain link fence in accordance with ASTM F567. For chain link tennis court fences, install in accordance with ASTM F969. Fence posts shall be set at spacings of a maximum of 8' o.c. Gate posts shall be spaced according to the gate openings specified in the Contract Documents. The “Paving and Surfacing” and “Cast-In-Place Concrete” sections of this specification shall govern post base placement and material requirements. Install fabric using tension bands and carriage bolts on security side and attach with wire ties or clip to line posts at 15 inches o.c. and to rails, braces and tension wire at 24 inches o.c.

B. Posts: Posts shall be set plumb in concrete footings in accordance with ASTM F567. Size Footings as per Contract Documents. Top of concrete footing to be at grade crowned to shed water away from the post.

C. Terminal Posts: End, Corner Pull and Gate Posts shall be braced and trussed for fences 6 ft. and higher. The horizontal brace rail and diagonal truss rod shall be installed in accordance with ASTM F567.

D. Tension Wire: Fences without bottom rail shall have a tension wire installed 3 in. up from the bottom of the fabric. Tension wire to be stretched taut, independently and prior to the fabric, between the terminal posts and secured to the terminal post using a brace band. Secure the tension wire to each line post with a tie wire.

E. Gate Installation: Swing Gates and gateposts in compliance with ASTM F567. Direction of swing shall be outward. Gates shall be plumb in the closed position having a bottom clearance of 3 in. Gate drop bars and gate leaf hold backs shall be installed for all gates.

3.3 CLEANING

A. The Contractor shall clean the jobsite of excess materials. Post hole excavations shall be scattered uniformly away from posts.

TABLE 1

Fence Industry	Decimal O.D. Equivalent		Pipe Wall Thickness		Weight		Section Modulus Inches	x	Min. Yield Strength psi	=	Max. Bending Moment lb. in.	Calculated Load (lbs.)		
												10' Free Supported	Cantilever	
O.D.	Inches	(mm)	Inches	(mm)	lb./ft.	(kg/m)							4'	6'
1-3/8"	1.315	33.40	.080	2.03	1.06	1.57	.0900	x	50,000	=	4,500	150	N/A	N/A
1-5/8"	1.660	42.16	.085	2.16	1.43	2.13	.1574	x	50,000	=	7,870	262	164	109
2"	1.900	48.26	.090	2.29	1.74	2.59	.2208	x	50,000	=	11,040	N/A	230	154
2-1/2"	2.375	60.33	.095	2.41	2.32	3.45	.3734	x	50,000	=	18,670	N/A	389	259
3"	2.875	73.03	.111	2.82	3.26	4.85	.6365	x	50,000	=	31,825	N/A	663	442

TABLE 2

Finished Gauge	Finished OD (NOM)	Core Diameter (NOM)	PVC Coating Thickness	Mesh Sizes Available	Fabric Extrusion Type	Minimum Breaking Strength
8	.162 (4.11 mm)	.120 (3.05 mm)	.015 - .025 (0.38 - 0.64 mm)	2 (50 mm); 1-3/4 (44 mm); 1 (25 mm)	CLASS 1, 2A	850#
9	.148 (3.76 mm)	.097 (2.46 mm)	.015 - .025 (0.38 - 0.64 mm)	2 (50 mm); 1-3/4 (44 mm); 1-1/4 (32 mm); 1 (25 mm)	CLASS 1, 2A	650#

PERMACOAT® COLOR CHAIN LINK FRAMEWORK
15 YEAR LIMITED WARRANTY

PermaCoat® Color Chain Link Framework by AMERISTAR® is manufactured from the highest quality materials by skilled craftsmen to meet the highest standards of workmanship in the industry. Galvanized steel framework shall be subject to a six stage pretreatment/wash (with zinc phosphate) followed by an electrostatic spray application of PermaCoat® Color System, a two coat powder system. The base coat is a thermosetting epoxy powder coating (gray in color). The top coat is a "no-mar" TGIC polyester powder coat finish, which provides the protection necessary to withstand adverse environmental conditions.

The powder coated surface on all framework by AMERISTAR® is guaranteed under normal and proper usage, against cracking, peeling, chipping, blistering or corroding for a period of fifteen (15) years from the original purchase date. Normal and proper usage does not include physical damage, abrasion or exposure to salty environments to the protective coating.

PermaCoat® Color Chain Link Framework is also guaranteed for the same period of time against defects in workmanship or materials.

Should any ornamental fence framework manufactured by Ameristar® Fence Products fail in accordance with any of the above conditions, Ameristar® Fence Products warrants to the original purchaser their redemption through replacement, renewal or issuance of a pro-rated credit. The decision as to which method of redemption is allowed is solely at the discretion of Ameristar®. If pro-rated allowance is the chosen alternative, the amount will be based on the total number of years under warranty from date of purchase to date of claim, based on the original cost of framing materials found to be defective. Notice of failure under the conditions of this warranty shall be sent to Ameristar® Fence Products or its authorized representative, in writing, together with proof of purchase and shall specify the nature of the defect and when it was first observed. When cutting PermaCoat Color Chain Link Framework tubing or pipe immediately seal the exposed surfaces by **1)** Removing all metal shavings from cut area **2)** Apply zinc-rich primer to thoroughly cover cut edge and drilled hole; let dry **3)** Apply 2 coats of custom finish spray paint matching fence color. Failure to seal exposed surfaces per steps 1-3 above will negate warranty. Should the fence be improperly installed, Ameristar® Fence Products shall not be responsible for guaranteed performance or appearance of the material. Neither does this guarantee apply when failure or damage is due to improper use or application, abuse or misuse, salty environments, vandalism or acts of God. Ameristar® Fence Products reserves the right to inspect the material to determine validity of the claim.

Upon validation of the claim by Ameristar® Fence Products or its authorized representative, redemption by replacement, renewal or issuance of a pro-rated credit shall be made by Ameristar® Fence Products. Reimbursement for the costs of removal and installation of materials are **not** included in the guarantee, nor will Ameristar® Fence Products provide those services.

The above constitutes the complete warranty by the manufacturer. No other agreement, written or implied, is valid. Ameristar® Fence Products does not authorize any other person or agent to make any other express warranties. Ameristar® Fence Products neither assumes nor authorizes any other person or agent to assume any other liability in connection with PermaCoat® Color Chain Link Framework. Some jurisdictions do not allow limitations on how long an implied warranty lasts, nor do they allow an exclusion or limitation of incidental or consequential damages; therefore, the limitations and exclusions noted herein may not apply.

PURCHASE DATE _____

DEALER SIGNATURE _____

AMERISTAR®

P. O. BOX 581000 TULSA, OKLAHOMA 74158-1000

END OF SECTION 32 31 13

SECTION 32 31 19 - ALUMINUM ORNAMENTAL FENCE SYSTEM

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete of aluminum ornamental fence system as shown on drawings and specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.

B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.

C. Refer to Section 31 00 00 - Earthwork, Section 03 11 00 - Concrete Forming, Section 03 30 00 - Cast-in-Place Concrete and Section 08 71 00 - Door Hardware for additional information.

D. Shop Drawings shall be required and shall include a floor plan indicating the following:
1. Aluminum ornamental fence system columns, rails and pickets
2. Foundation excavations at new fencing
3. Concrete and concrete reinforcing for fence supports
4. Aluminum ornamental cantilever gates and associated braces, pickets, and rails
5. Aluminum ornamental cantilever gates and associated braces, pickets, and rails

E. The Contractor shall provide an earth surface that is level beneath the Aluminum ornamental fence system.

F. Provide aluminum ornamental fence, gates and aluminum cantilever gate as a complete unit produced by a single manufacturer, including necessary erection accessories, fittings and fastenings.

G. The installer must examine the conditions under which the fence and gates are to be installed. Notify the Architect in writing of conditions which would interfere with proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.

H. The installer shall follow the standards of the City, Parish and State along with the International Building Code.

I. Height of the ornamental fence shall be as indicated specifically in the Drawings.

1.2 QUALITY ASSURANCE

A. The Contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and materials and techniques specified.

1.3 REFERENCES

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

B. ASTM B117 - Practice for Operating Salt-Spray (Fog) Apparatus.

C. ASTM D523 - Test Method for Specular Gloss

D. ASTM D714 - Test Method for Evaluating Degree of Blistering in Paint.

E. ASTM D822 - Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.

F. ASTM D1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.

G. ASTM D2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.

H. ASTM D2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).

I. ASTM D3359 - Test Method for Measuring Adhesion by Tape Test.

J. ASTM F2408 – Ornamental Fences Employing Galvanized Steel Tubular Pickets.

1.4 SUBMITTALS

A. Shop Drawings:

1. Details of special fabrication and installation necessary for this project, including special conditions, which require special configurations.

2. The shop drawings shall show a layout of the aluminum ornamental fence system, gates and the ornamental aluminum cantilever gates along with locations of gates with the indication of width and height.

3. **Any and all shop drawings not reviewed, stamped, dated and signed by the Contractor prior to submittal to the Architect will be returned as rejected.**

4. The Contractor shall be responsible for all dimensions, quantities, assortments and accuracies of the shop drawings.

5. Generally, notes and markings on the shop drawings by the Contractor placed after the review by the Architect shall be null and void unless again reviewed by the Architect.

6. **Note! Any changes from the Contract Documents shall be highlighted in yellow on the shop drawings (dimension, size, color, etc.).**

7. Furnish the Architect with four (4) prints of every sheet required. (Prints are to be reviewed and stamped approved by the Contractor before submitting to the Architect.)

8. Manufacturer’s literature:

a. Recommended installation methods and procedures.

b. Standard drawings for fence and gate installation.

9. Certificates:

a. Manufacturer’s certification that materials meet specification requirements, for record purposes.

1.5 PRODUCT HANDLING AND STORAGE

A. Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism and theft.

1.6 PRODUCT WARRANTY

A. All structural fence components (i.e. rails, pickets, and posts) shall be warranted within specified limitations, by the manufacturer for a period of 20 years from date of Substantial Completion. Warranty shall cover any defects in material finish, including cracking, peeling, chipping, blistering or corroding.

B. Reimbursement for labor necessary to restore or replace components that have been found to be defective under the terms of manufactures warranty shall be guaranteed for five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All 4' high aluminum ornamental fence systems shall conform to Echelon II standard picket spaced Majestic design, extended picket bottom rail treatment, 3-Rail style as manufactured by Ameristar Fence Products, Inc., in Tulsa, Oklahoma, Contact Person: Chris Koehler (Phone 800-321-8724) or prior approved equal.

B. All 6' high aluminum ornamental fence system shall conform to Echelon II standard picket space Classic design, extended picket bottom rail treatment, 3-Rail style manufactured by Ameristar Fence Products, Inc., in Tulsa, Oklahoma, Contact Person: Chris Koehler (Phone 800-321-8724) or prior approved equal.

C. Material:

1. Aluminum material for fence panels and posts shall conform to the requirements of ASTM B221.The aluminum extrusions for posts and rails shall be Alloy and Temper Designation 6005-T52. The aluminum extrusions for pickets shall be Alloy and Temper Designation 6063 -T52.

2. Material for pickets shall be 1" square x 0.062" thick extruded tubing. The rails shall be steel channel, 1.75 square. The top wall and internal web of the rail shall be 0.070" thick. Picket holes in the rail shall be spaced 4.175” o.c. Fence posts and gate posts shall meet the minimum size requirements of Table 1.

3. Bracket to rail attachments shall be made using specially designed one-way tamper proof security nuts with carriage bolt. Bracket to post connections shall be made using self-drilling hex head screws.

4. Aluminum castings shall be used for all post caps, finials and miscellaneous adornments.

2.2 FABRICATION

A. Pickets, rails and posts shall be pre-cut to specified lengths. Rails shall be pre-punched to accept pickets.

B. The rail inner slide shall be fully inserted into the rail outer channel to form the raceway of the internal retaining rod. Grommets shall be inserted int the pre-punched holes in the rails and pickets shall be inserted through the grommets so that pre-drilled picket holes align with the internal raceway of the two -part rails. (Note: this can best be accomplished by using an alignment template). Retaining rods shall be inserted into each rail so that they pass through the pre-drilled holes in each picket, thus completing the panel assembly.

C. The manufactured framework and posts shall be subjected to the Ameristar thermal stratification coating process. (high-temperature, in-line multi stage and multi-layer) including, minimum 6 stage pretreatment/ wash and an electrostatic spray application of

a polyester finish. The topcoat shall be a TGIC polyester powder coat finish with a minimum thickness of 2 mils. The color shall be Black. The coated panels and posts shall be capable of meeting the performance requirements for each quality characteristic shown in Table 2.

D. Completed panels shall be capable of supporting a 300lb. load (applied at midspan) without permanent deformation. Panels shall be biasable to a 25% change in grade.

E. Gates shall be fabricated using 1.75” sq. runner rail material, 2" sq. x .250" gate ends and 1" sq. x .125" pickets. All rail and upright intersections shall be joined by welding. All picket and rail intersections shall also be joined by welding. Gates and surrounding panels to have LWD 9 gauge ¾” diamond pregalvanized mesh installed using pin headed pan head torx fasteners and 1” washers. Panic plates and bars installed where specified.

PART 3 - EXECUTION

3.1 PREPARATION

A. All new installation shall be laid out by the contractor in accordance with the Contract Documents (Drawings and Specifications).

3.2 INSTALLATION

A. Fence post shall be spaced according to Table 3, plus or minus 1/2”. For installations that must be raked to follow sloping grades, the post spacing dimension must be measured along the grade. Fence panels shall be attached to posts with brackets supplied by the manufacturer. Posts shall be set in concrete footers having a minimum depth of 36” (Note: In some cases, local restrictions of freezing weather conditions may require a greater depth). The “Earthwork” and “Concrete” sections of this specification and drawings shall govern material requirements for the concrete footer. Posts setting by other methods such as plated posts or grouted core-drilled footers are permissible only if shown by engineering analysis to be sufficient in strength for the intended application, which is to withstand 129 mph winds.

3.3 FENCE INSTALLATION MAINTENANCE

A. When cutting/drilling rails or posts adhere to the following steps to seal the exposed surfaces; 1) Remove all metal shavings from cut area. 2) Apply custom finish paint matching fence color. Failure to seal exposed surfaces per steps 1-2 above will negate warranty. Ameristar spray cans or paint pens shall be used to prime and finish exposed surfaces; it is recommended that paint pens be used to prevent overspray. Use of non-Ameristar parts or components will negate the manufactures’ warranty. A manufacturer’s warranty shall be provided to Owner.

3.4 GATE INSTALLATION

A. Gate posts shall be spaced according to the manufacturers’ gate drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected. Type and quantity of gate hinges shall be based on the application; weight, height, and number of gate cycles. All gate hinges shall have the capability of opening 180 degrees. The manufacturers’ gate drawings shall identify the necessary gate hardware required for the application. Gate hardware shall be provided by the manufacture of the gate and shall be installed per manufacturer’s recommendations and in locations shown on Contract Documents. **Gate shall be capable of being locked with a padlock. See Section 08 71 00 - Door Hardware.**

B. Each swinging ornamental gate shall receive a lockable Cane Bolt. A 3/4" hole shall be drilled into the existing concrete at the 90 degree open position of all gates.

3.5 CLEANING

A. The Contractor shall clean the jobsite of excess materials; post-hole excavations shall be scattered uniformly in areas as directed by Architect and Owner.

Table 1 - Minimum Sizes for Montage Plus Posts		
Fence Posts	Panel Height	
2-1/2" x 2-1/2" x 0.080" Alum. w/ reinforced web	Up to & Including 6' Height	
Gate Leaf	Gate Height	
	Up to & Including 4'	Over 4' Up to & Including 6'
Up to 4'	3" x 3" x 0.120" Alum.	4" x 4" x 0.250" Alum.
4'1" to 6'	4" x 4" x 0.250" Alum.	3" x 12 Ga.
6'1" to 8'	4" x 11 Ga.	4" x 11 Ga.

Table 2 - Coating Performance Requirements		
Quality Characteristics	ASTM Test Method	Performance Requirements
Adhesion	D3359 - Method B	Adhesion (Retention of Coating) over 90% of test area (Tape and knife test).
Corrosion Resistance	B117 & D1654	Corrosion Resistance over 1,000 hours (Scribed per D1654; failure mode is accumulation of 1/8" coating loss from scribe or medium #8 blisters).
Impact Resistance	D2794	Impact Resistance over 60" lb. (Forward impact using 0.625" ball).
Weathering Resistance	D822 D224, D523 (60°Method)	Weathering Resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of more than 3 delta-E color units).

Table 3 - Echelon II - Post Spacing By Bracket Type						
Span	For CLASSIC, GENESIS, MAJESTIC, & WARRIOR 8' Nominal (92.625" Rail)					
Post Size	2-1/2" to 3"	2-1/2"	2-1/2"	3"	2-1/2"	3"
Bracket Type	Industrial Flat Mount (BB301)	Industrial Universal (BB302)	Industrial Flat Mount (BB303)		Industrial Swivel (BB304)*	
Post Settings ± 1/2" O.C.	94.5" to 95"	96"	96"	96.5"	*97.5"	*98"
*Note: When using BB304 swivel brackets on either or both ends of a panel installation, care must be taken to ensure the spacing between post and adjoining pickets meets applicable codes. This will require trimming one or both ends of the panel.						

END OF SECTION 32 31 19

SECTION 32 92 23 - PLANTING, SEEDING AND SOD

PART 1 - GENERAL

1.1 SCOPE

A. The contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of planting as shown on drawings and as specified in accordance with provisions of the contract documents and completely coordinated with that of all other trades.

B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.

C. Submittals required in addition to product certificates are as follows:

1. Certification of grass seed from seed vendor for each seed mixture.

2. Planting schedule indicating anticipated dates and locations for sodding.

a. Provide sodding of quality and species complying with applicable requirements of ANSI Z60.1 (American Standard for Nursery Stock).

3. Maintain and establish lawns by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations to produce a uniformly smooth lawn for not less than the following:
   a. Seeded lawns: 60 days after date of Substantial Completion
   b. Sodded lawns: 30 days after date of Substantial Completion

PART 2 - PRODUCTS

2.1 Sod Grass: Provide solid Bermuda grass sod of strain or variety (Celebration, Tiffway, etc.) adapted to the climate of this area and suitable for high incidence of foot traffic.

A. Provide strongly rooted sod, not less than 2 years old and free of weeds and undesirable native grasses and machine cut to pad thickness of 3/4" excluding top growth and thatch.

B. Provide only sod capable of vigorous growth and development when planted.

C. Provide sod of uniform sizes with maximum 5% deviation in either length or width.

D. Broken pads or pads with uneven ends will not be acceptable.

E. Sod pads incapable of supporting their own weight when suspended vertically with a firm grasp on the upper 10% of pad will be rejected.

2.2 New-Crop Seed Grass: Provide fresh, clean, new-crop seed complying with tolerance for purity and germination established by Official Seed Analyst of North America “Rules for Testing Seeds”.

A. Provide seed of grass species and varieties, proportion by weight, and minimum percentages of purity, germination and maximum percent of weed seed as recommended for the time of year.

B. **On all other areas cleared in the immediate vicinity or having the ground broken during construction of this phase provide and place rye grass seed mixed with unhulled Common Bermuda, and broadcast at a rate of 5 lbs. per 1000 s.f.**

2.3 **Areas to receive seeding or sod shall be prepared by placing 2" thick fine graded top soil over the rough fill for growing grass.**

PART 3 - EXECUTION

3.1 Areas to Receive Sod: (Refer to “Site Plan/Contract Documents)

A. Sodding shall be installed within the perimeter of the new drives and parking areas and within all of the open areas associated with the new drives and parking to fill areas as indicated on the Contract Documents.

B. **New sod shall be installed within 10' of all paved sidewalks and at the entire perimeter of the new construction. In areas to receive sodding, solid Bermuda grass sod of strain or variety adapted to the climate of this area and suitable for high incidence of foot traffic shall be provided and installed.**

3.2 Before mixing, clean topsoil of roots, plants, sod, stones, slates, lumps, and other extraneous material harmful to plant growth. Any object larger than 5/8" shall be removed as debris.

3.3 Loosen subgrade with tiller to a minimum depth of 4". Remove concrete, bricks, sticks, roots, rubbish, and other extraneous materials then place 2" of topsoil graded at required slopes for drainage of water.

3.4 Lay sod to form a solid mass with tightly fitted joints within 24 hours of stripping. Butt ends and sides of sod and do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. During delivery and storage, sod must be protected from excessive during especially the root systems. Sod shall be healthy, disease and insect free, and completely devoid of weeds. Work sifted soil or fine sand into minor cracks between pieces of sod, removing excess to avoid smothering sod and adjacent grass. Plant and sow as per recommendations of supply nursery. All sod and seed shall be placed on minimum 2" of fine grade, lime-enriched topsoil. Grass shall not be placed until the final phase of construction except in high erosion areas where rye grass seed mixed with Bermuda shall be broadcast. All lawns shall have all-purpose, ferti-lome 11-3-6 or equal at the rate of 40 lbs. per 3,000 sq. ft. Saturate sod with fine water spray within 2 hours of planting. During first week, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2" below the sod. Lime should be spread evenly and thoroughly mixed with soil approximately 2,000 lbs. per acre. The General Contractor shall mow established lawns until Substantial Completion of the project. Note: anchor sod on slopes exceeding 1:6 with wood pegs spaced as recommended by sod manufacturer.

3.5 All planting shall be watered and fertilized as recommended by the nursery supplier to guarantee the establishment and growth of a complete, dense and healthy lawn. All planting not surviving one year shall be replaced and replanted at the contractor's expense. (Exceptions: Planting destroyed by severe and unusual weather or destroyed through physical abuse beyond the control of the contractor.) After acceptance of the work, the Owner shall assume responsibility for watering and mowing as per schedule established in ITEM 1.1 C.3. (Above).

3.6 Timing of Planting: The contractor should not attempt planting under unfavorable weather conditions, although to do so is a full option of the general contractor who shall assume full responsibility.

3.7 SITE PREPARATION

A. Excavate planting pits a minimum of twice the root ball width and no deeper than the root ball height.

B. Remove debris, construction waste, and unsuitable soils from planting areas.

C. Provide approved topsoil where required to achieve proper planting depth and drainage.

END OF SECTION 32 92 23

SECTION 331000 - WATER DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Site water piping and fittings including domestic potable waterline and fire protection system supply waterline, valves, and fire hydrants.

B. Related Requirements:

1. Section 02300 – Earthwork: Trenching, backfill, and compaction for utilities.

C. NOTE: All water system items considered part of the proposed Public Water system, noted by call out on the plans or by virtue of being located in an existing or proposed public servitude, shall conform to the requirements and specifications found in Appendix A to this Section 331000.

1.2 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

B. American Society of Mechanical Engineers (ASME):

1. ASME B 16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

C. ASTM International (ASTM):

1. ASTM B88 - Seamless Copper Water Tube.
2. ASTM D1784 - Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
3. ASTM D2241 - Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR-Series).
4. ASTM D2564 - Poly (Vinyl Chloride) (PVC) Solvent Cement.
5. ASTM D2672 - Poly (Vinyl Chloride) (PVC) Integrally Molded Bell Ends For Solvent - Cemented Pipe Joints.
6. ASTM D3139 - Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals.
7. ASTM F477 - Elastomeric Gaskets And Lubricant.
8. ASTM F656 - Poly (Vinyl Chloride) (PVC) Cement Primer.

D. American Water Works Association (AWWA):

1. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
2. AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and other Liquids.
3. AWWA C116 - Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings for Watersupply Service.
4. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids.
5. AWWA C153 - Ductile-Iron Compact Fittings for Water Service.
6. AWWA C504 - Rubber-Seated Butterfly Valves.
7. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service.
8. AWWA C550 - Protective Interior Coatings for Valves And Hydrants.
9. AWWA C600 - Installation of Ductile-Iron Water Mains and Appurtenances.
10. AWWA C605 - Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.
11. AWWA C651 - Disinfecting Water Mains.
12. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inches Through 12 Inches, for Water Distribution.

E. National Fire Protection Association (NFPA):

1. NFPA 24 – Installation of Private Fire Service Mains and Their Appurtenances

1.3 SUBMITTALS

A. Submit manufacturer information on all pipe, fittings, seals, etc. that will be used for the installation of the system.

B. Furnish 1 copy of results of meter test and hydrostatic pressure test to Owner, Civil Engineer of Record, and utility company upon completion of water distribution backfilling operations.

C. Project Record Documents:

1. Disinfection report: Record the following:
   a. Type and form of disinfectant used.
   b. Date and time disinfectant injection start and time of completion.
   c. Test locations.
   d. Initial and 24 hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
   e. Date and time of flushing start and completion.
   f. Disinfectant residual after flushing in ppm for each outlet tested.
2. Bacteriological report: Record the following:
   a. Date issued, project name, testing laboratory name, address, and telephone number.
   b. Time and date of water sample collection.
   c. Name of person collecting samples.
   d. Test locations.
   e. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
   f. Coliform bacteria test results for each outlet tested.
   g. Certification that water conforms, or fails to conform, to bacterial standards.
   h. Bacteriologist's signature and authority.
3. Accurately record actual locations of piping mains, valves, connections, and top of pipe elevations.
4. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.

PART 2 - PRODUCTS

2.1 PIPE

A. Pipe sizes 3-inches and smaller for installation below grade and outside building shall comply with one or combination of following:

1. Seamless Copper Tubing: Type "K" soft copper, ASTM B88.
   a. Fittings: Wrought copper (95-5 Tin Antimony solder joint), ASME B 16.22.
2. Polyvinyl Chloride (PVC) Water Pipe: Pipe, ASTM D 2241, with SDR 21 rating, continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM D1784 material classification.
   a. Pipe joints: Integrally molded bell ends, ASTM D2672.
   b. Cement primer: ASTM F656.
   c. Solvent cement: ASTM D2564.

B. Pipe sizes 4 to 16 inches for installation below grade and outside building shall comply with one or combination of following:

1. Ductile Iron Water Pipe: AWWA C151, Pressure class 350 (4-12") Pressure Class 250 (14-16").
   a. Fittings: Either mechanical joint or push-on joint, AWWA C153, and shall be coated with a 6-8 mil nominal thickness fusion bonded epoxy conforming to the requirements of AWWA C550 and C116, or cement mortar lined in accordance with AWWA C104.
   b. Elastomeric gaskets and lubricant: ASTM F477.
2. Polyvinyl Chloride (PVC) Water Pipe: Pipe, AWWA C900, rated DR 18 (Class 150), continually marked as required.
   a. Elastomeric gaskets and lubricant: ASTM F477 for smaller pipes.

b. Pipe joints: Integrally molded bell ends, ASTM D3139.

2.2 VALVES

A. Gate Valves, 2-Inches and Larger:

1. Manufacturer and Model: Mueller Resilient Wedge Gate Valves or approved equal.
2. AWWA C509, iron body, non-rising stem with square nut, single wedge, resilient seat, flanged or mechanical joint ends, control rod, post indicator where indicated on Construction Drawings, extension box and valve key.

B. Ball Valves, 2-Inches and Smaller:

1. Manufacturer and Model: Mueller Oriseal or approved equal.
2. Brass body, teflon coated brass ball, rubber seats and stem seals, Tee stem pre-drilled for control rod, AWWA compression inlet end, compression outlet with electrical ground connector, with control rod, extension box and valve key.

C. Butterfly Valves, From 2-Inch to 24-Inch: AWWA C504, Iron body, bronze disc, resilient replaceable seat, water or lug ends, infinite position lever handle.

D. Check Valves, Post Indicator Valves, And Backflow Preventers: Refer to Section 13900 - Fire Suppression.

E. Mark manufacturer's name and pressure rating on valve body.

2.3 FIRE HYDRANTS

A. Fire Hydrants: Type as required by utility company/Local Fire Department and as shown on Construction Drawings.

B. Hydrant Extensions: Fabricate in multiples of 6-inches with rod and coupling to increase barrel length.

C. Hose and Steamer Connections: Match sizes with utility company, with two hose nozzles, one pumper nozzle.

D. Finish: Apply primer and 2 coats of enamel or special coating to color as required by utility company.

2.4 ACCESSORIES

A. Thrust Blocking: Place 2500 psi concrete to provide sufficient bearing area to transmit unbalanced thrust from bends, tees, caps, or plugs to undisturbed soil without loading undisturbed soil in excess of 2,500 pounds per square foot when water main pressure is 100 psi.

MINIMUM THRUST BLOCKING BEARING AREAS

Pipe Diameter	Tees Sq. Ft	90° Bend Sq. Ft	45° Bend Sq. Ft	22½° Bend Sq. Ft.	11¼° Bend Sq. Ft.	5 5/8 Bend Sq. Ft.	Cap/Plug Sq. Ft.
3"	1.0	1.0	1.0	1.0	1.0	1.0	1.5
4"	1.0	1.0	1.0	1.0	1.0	1.0	2.0
6"	1.5	2.0	1.0	1.0	1.0	1.0	3.0
8"	2.5	3.5	1.8	1.0	1.0	1.0	4.0
10"	4.0	5.5	2.8	1.5	1.0	1.0	6.0
12"	6.0	8.0	4.0	2.0	1.5	1.0	8.5
14"	8.0	11.0	5.5	3.0	2.0	1.5	12.0
16"	10.0	14.2	7.0	4.0	3.0	2.5	15.0
18"	21.0	21.0	12.0	6.0	4.0	3.5	24.0

B. Locked mechanical joint fittings shall be installed where vertical changes in direction are required and, if approved by Owner and governing authority, can be installed in lieu of above thrust blocking requirements.

C. Polyethylene Encasement: Single layer of two ply cross-laminated high density polyethylene encasement per AWWA C105, Section 4.1.2, Type III, Class C (Black), Grade 33, tensile strength 5,000 psi minimum, elongation 100 percent, thickness nominal 0.004 inch (4 mil).

D. Trace Wire: Magnetic detectable conductor, (#12 Copper) brightly colored plastic covering imprinted with "Water Service" in large letters.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that building service connection and municipal utility water main size, location, and depth are as indicated on Construction Drawings.

3.2 PREPARATION

A. Ream pipe and tube ends and remove burrs.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare pipe for connections to equipment with flanges or unions.

D. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by licensed land surveyor and replaced, as necessary, by same.

3.3 TRENCHING AND BEDDING

A. Excavate pipe trench and place bedding material in accordance with Section 02300.

3.4 INSTALLATION – GENERAL

A. Perform installation in accordance with utility company or municipality requirements which shall take precedence over requirements stated herein when difference exists.

3.5 INSTALLATION - PIPE AND FITTINGS

A. Maintain separation of water main from sanitary and storm sewer piping in accordance with state or local codes.

B. Install ductile iron pipe and fittings in accordance with AWWA C600.

C. Install PVC pipe and fittings in accordance with AWWA C605.

D. Ductile iron pipe and fittings shall be installed with polyethylene encasement around the pipe for the entire length of the project except where water main is within steel casing or is concrete encased. Install polyethylene encasement in accordance with AWWA C105, Method A.

E. Install pipe to allow for expansion and contraction without stressing pipe or joints or as specified by pipe manufacturer.

F. Install access fittings in accordance with local codes to permit disinfection of water system performed under this Section.

G. Connections with Existing Pipelines: Where connections are made between new work and existing piping, make connection using suitable fittings for conditions encountered. Make each connection with existing pipe at time and under conditions with least interference with operation of existing pipeline and in compliance with local utility company.

H. Form and place concrete for thrust blocks or other specified methods of retainage at each change of direction or end of pipe main.

I. Place pipe to depth in accordance with Section 02300.

J. Backfill trench in accordance with Section 02300.

K. Install trace wire continuous over top of non-metal pipe. Bury a minimum of 6 inches below finish grade, and above pipeline.

3.6 INSTALLATION - VALVES AND HYDRANTS

A. Install gate valves as indicated on Construction Drawings. Support valve on concrete pads with valve stem vertical and plumb. Install valve boxes in manner that will not transmit loads, stress, or shock to valve body. Center valve box over operating nut of valve vertical and plumb. Securely fit valve box together leaving cover flush with finished surface.

B. Install fire hydrant assemblies as indicated on Construction Drawings in vertical and plumb position with steamer/pumper nozzle pointed perpendicular to traffic where hydrant is adjacent to street, roadway, or parking lot drive or toward protected building unless otherwise directed by local authorities. Support hydrant assembly on concrete pad and firmly brace on side opposite inlet pipe against undisturbed soil and concrete blocking. Place minimum of 6-cubic feet of crushed stone or gravel around hydrant base and barrel after thrust blocking has cured at least 24 hours. Maintain vertical position of hydrant backfilling and compacting.

3.7 FLUSHING OF PIPING

A. Thoroughly flush underground piping from the water supply to the system riser, and lead-in connections to the system riser, before the connection is made to downstream fire protection system piping. Continue flushing for sufficient time to ensure through cleaning.

B. The minimum rate of flow shall be not less than one of the following:

1. 1,560 GPM for 8 in. piping; 2,440 GPM for 10 in. piping; and 3,520 GPM for 12 in. piping.
2. Maximum flow rate available to the system under fire conditions.
3. When supply cannot produce stipulated flow rates, obtain maximum available.

3.8 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Perform disinfection of potable lines in accordance with AWWA C651.

B. Disinfect distribution system with chlorine before acceptance for domestic operation. Chlorine dosage shall be not less than 50 parts per million. Flush lines before introduction of chlorinating materials and after contact period of not less than 24 hours. Flush with clean water after contact period until residual chlorine content is not greater than 1.0 part per million. Flush water discharged from water supply lines or hydrants shall not be allowed to discharge directly onto exposed soil or turf which could result in erosion of soil. If potential for erosion exists at discharge point, measures shall be taken to prevent erosion. Open and close valves in lines being disinfected several times during contact period. After disinfection, take water sample and bacteriological test in accordance with AWWA C651. Do not place distribution system in service until approval is obtained from local governing authorities.

C. Provide a means of neutralizing the super-chlorinated water before releasing into the environment. This may be accomplished by either a method of dechlorinization, direct release into a detention area approved by Wal-Mart, or any method acceptable to federal, state, and local codes. Direct release to open ground shall not be allowed, unless contained within an onsite detention facility with 6" permanent storage. In this case, the Contractor shall time the release to assure that no rainstorms are imminent. The intent of this condition is to allow the majority of the chlorine to evaporate into the atmosphere before a rainstorm has the opportunity to wash the residual downstream. Contractor shall not release super-chlorinated water directly into the sanitary sewer system, private or public, nor any storm drain system not directly discharging into the detention facility.

3.9 SERVICE CONNECTIONS

A. Provide water service connection in compliance with utility company requirements including reduced pressure backflow preventer (if required) and water meter with by-pass valves and sand strainer.

3.10 FIELD QUALITY CONTROL

A. Test water distribution system pipe installed below grade and outside building in accordance with the following procedures:

1. Perform testing of pipe materials, joints, and other materials incorporated into construction of water mains and force mains to determine leakage and water tightness. In the event state or local code requires more stringent test, more stringent test shall take precedence.
2. Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water. Hydrostatically test at 200 psi, or 50 psi in excess of the system working pressure, whichever is greater, and shall maintain that pressure at +/- 5 psi for 2 hours. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage shall be 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

B. Prepare reports of testing activities.

END SECTION

Standard Specifications

for

Subdivision Waterline Construction

Consolidated Waterworks District No. 1
Terrebonne Parish, Louisiana

October 1, 2004

DIVISION I

GENERAL CONDITIONS

1.1.0 GENERAL:

1.1.1 It is the intention of these specifications to provide standards for the construction of a water distribution system within Development/Subdivision within Terrebonne Parish, Louisiana.

1.1.2 Where ever a standard specification is referred to, it is intended that the latest revision effective as of the date of plan approval shall apply.

1.1.3 The PROJECT ENGINEER shall consult with the DISTRICT for standards or materials not covered by these specifications.

1.1.4 For purposes of these specifications the following definitions shall apply:

1.1.4.1 Consolidated Waterworks District No. 1 (District): The political subdivision created by a resolution of the Terrebonne Parish Consolidated Government adopted on March 23, 1994 and governed by its Board of Commissioners, and commencing operations on July 1, 1994.

1.1.4.2 Contractor: Any person, group or corporation acting as a unit or an agent thereof, licensed as required by the State of Louisiana, engaging in the construction of a water transmission system to be connected to the public water supply of the District.

1.1.4.3 Owner: The subdivider or developer.

1.1.4.4 Project Engineer: An Engineer, registered in the State of Louisiana, retained by the sub-divider/developer to design and administer the construction of improvements in a subdivision/commercial development.

1.1.4.5 Project Representative: The PROJECT ENGINEER'S representative at the construction site.

1.2.0 PRODUCTS INFORMATION:

1.2.1 Manufacturer's warranty for all material and products to be furnished by the CONTRACTOR and to be incorporated into the completed work shall be furnished to the DISTRICT through the PROJECT ENGINEER.

1.2.2 The manufacturer of all material and products shall furnish complete information as to any special conditions or restrictions to be applied in the use of these items. Should

the manner or method of installation, specified performance or test results as set forth in these specifications be contrary to the manufacturer's recommendations for use of the project, the manufacturer shall at once notify the PROJECT ENGINEER who shall forward same to the DISTRICT for appropriate action. Lack of such notification shall be certification by the CONTRACTOR that specification requirements will be met by the material and products under project conditions.

1.2.3 Data submitted on all material shall include complete maintenance instructions and parts list in sufficient detail to facilitate ordering replacements.

1.2.4 Manufacturer's installation guide shall be followed during construction of pipelines. Before construction begins, three (3) copies of the installation guide shall be submitted to the DISTRICT. One copy bearing the DISTRICT'S approval shall be at the job site of installation and the instructions carried out by the foreman in charge of the crew.

1.3.0 SPECIAL CONSTRUCTION:

1.3.1 Special construction projects, such as submarine crossings, pile crossings, bulkheads, roadway crossings, etc. shall be submitted to the DISTRICT for approval prior to construction.

1.4.0 CHANGES IN PLANS:

1.4.1 Should it be necessary to change the location or elevation of the waterline or any other detail as shown in the drawings after receiving DISTRICT approval, then such change shall be brought to the DISTRICT for approval prior to making the change in the construction.

1.4.2 All change in construction from that shown in the approved drawings shall be shown on the record drawings submitted for the final approval.

1.5.0 RECORD DRAWINGS:

1.5.1 One (1) copy of the test reports, manufacturer's submittals, record drawings and one (1) computer disk of the record drawings, shall be submitted with the PROJECT ENGINEER'S letter requesting final approval and acceptance of the waterline project. Record drawings shall indicate the location and GPS coordinates on the waterline at reasonable intervals and on all valves, hydrants and fittings greater than 45 degrees. The depth at all conflicting utility or ditch crossings shall also be shown.

1.6.0 STORAGE OF MATERIALS:

1.6.1 Materials shall be stored so as to insure the preservation of their quality and fitness for the work, and in such a manner that leaves the material accessible for inspection by the DISTRICT.

DIVISION II

WATER PIPELINE MATERIAL

2.1.0 GENERAL:

2.1.1 Waterline material, as indicated on the plans, shall be Polyvinyl Chloride, bell and spigot type with single rubber gasket seals of the push-on type, or butt fused polyethylene pipe.

2.1.2 All pipe shall be in first class condition at the time it is installed in the work.

2.1.3 All pipe shall be designed for a minimum working pressure of 150 psi, plus a surge pressure of 100 psi and an overall minimum safety factor of 2.5. Design laying conditions shall be Class B, WPCF Manual of Practice No. 9 (Page 212) for a maximum cover as indicated on the plans. Design factors for pipe shall be furnished to the PROJECT ENGINEER.

2.2.0 POLYVINYL CHLORIDE PRESSURE PIPE:

2.2.1 All pipe 12-inches and smaller for the distribution system shall meet or exceed the requirements of ASTM D-1784, "Standard Specifications for Rigid Poly (Vinyl Chloride) compounds; and AWWA Specifications C-900, pressure rating class 150, SDR 18 with design factors as given in paragraph 1(c) herein. Pipe shall be Type I, Grade 1 (12454B) with a hydrostatic design stress of 2000 psi, designated as PVC 1120 or equivalent.

2.2.2 All plastic pipe shall have outside diameters equivalent to the OD of cast iron pipe.

2.2.3 Wall thickness and outside diameter subject to tolerance allowed in AWWA C-900 shall be as shown on the following table:

Nominal Size	Average	OD Tolerance	Wall Thickness Minimum	Tolerance
4"	4.80"	+0.009	0.267	+0.032
6"	6.90"	+0.011	0.383	+0.046
8"	9.05"	+0.015	0.503	+0.060
12"	13.20"	+0.015	0.733	+0.088

2.2.4 Polyvinyl chloride pipe shall be furnished in 20 foot lengths.

2.2.5 Rubber ring gaskets shall conform to ASTM D-1869. Couplings and gaskets shall provide automatic end separation without auxiliary spacing devices.

2.3.0 POLYETHYLENE (PE) PIPE:

2.3.1 All PE pipe and fittings shall be made from virgin resins exhibiting a cell classification of PE 345464C as defined in ASTM D3350 with an established hydrostatic-design-basis (HDB) rating of 1,600 psi at 73°F for water. All PE pipe and fittings shall be manufactured in accordance with AWWA C-906. The pipe shall be Series 4000, pressure Class 160, SDR11, unless specifically stated otherwise. The material shall be listed and approved for potable water in accordance with NSF Standard 61. All PE pipe shall have outside diameters (OD) equivalent to the OD of cast iron pipe.

2.3.2 Pipe joints shall be joined by means of zero leak-rate heat fusion or electrofusion method and shall be installed in strict accordance within the pipe manufacturer's recommendations.

2.4.0 DUCTILE IRON PIPE:

2.4.1 Pipe shall be designed in accordance with ANSI Specifications ANSI/AWWA C150/A21.50, "American National Standard for the Thickness Design of Ductile Iron Pipe". Pipe shall be designed for a working pressure of 150 psi and a minimum surge allowance of 100 psi, trench conditions Type 2, with width of d+2 feet and depth of cover 3 to 8 feet with overall minimum safety factor of 2.5.

2.4.2 Pipe shall be manufactured in accordance with AWWA Specifications ANSI/AWWA C151/A21.51 with minimum wall thickness subject to tolerance allowance allowed in said specification under Class 51 for pipe size indicated.

2.5.0 CAST IRON AND DUCTILE IRON FITTINGS:

2.5.1 Fittings shall be furnished in accordance with ANSI/AWWA C-110-A21.10 or C153-A21.53. Joints shall be of the type called for on the plans and shall be push-on or mechanical joints conforming to ANSI/AWWA C-111-A21.11. Consideration will be given to alternate joint configuration; however, such alternate shall receive approval of the DISTRICT prior to installation.

2.5.2 Fittings 12 inches and smaller shall be rated for 250 psi water working pressure.

2.6.0 LINING AND COATING OF FITTINGS:

2.6.1 All cast iron and ductile iron fittings shall have an inside cement mortar lining conforming with Specification for Cement Lining for Cast Iron Pipe and Fittings ANSI/AWWA C104-A21.4 or manufacturer's standard specifications for seal coated "enameline" type cement lining or equal. Outside coating shall conform with ASA Specifications for Coal-Tar Dip Coating for Cast Iron Pipe and Fittings (A21.5; A21.10), latest revision. Thickness shall be standard thickness.

2.7.0 DUCTILE IRON FITTINGS - SPECIAL COATINGS:

2.7.1 Ductile iron fittings may be lined and coated, in and out, with an approved aminecured epoxy resin. This epoxy resin is molecularly bonded to the metal assuring permanents without flaking and shall be of 12 mil thickness. This lining and coating shall be done by the manufacturer in order to insure uniformity.

2.8.0 P.E. FITTINGS:

2.8.1 Molded fittings shall be manufactured and tested in accordance with ASTM D 3261 and shall be so marked. Molded fittings shall be tested in accordance with AWWA C906.

2.8.2 Fabricated fittings shall be made by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock or molded fittings. Fittings shall be molded or fabricated of the same material and manufacturer as the pipe; and in no case shall have thinner walls than those of the pipe furnished. All custom fabricated fittings shall be pressure rated for the same internal pressure rating as the mating pipe. Fittings shall be of butt fusing design and shall be produced by the same manufacturer as the pipe being bid. Fabricated fittings shall be tested in accordance with AWWA C906.

2.8.3 If required, a sample of each type fitting shall be submitted for the PROJECT ENGINEER'S approval, and his approval must be obtained before purchase of the fittings.

2.9.0 ACCESSORIES:

2.9.1 The supplier of cast iron or ductile iron fittings shall furnish all glands and gaskets as recommended by the manufacturer and approved by the DISTRICT. All bolts and nuts shall be Corten, Teflon coated Corten or stainless steel. No direct payment will be made on these items; the cost of same to be included in weight paid for the fitting.

2.9.2 All tie rods shall be 316 stainless steel. When required, tie rods shall be used to secure all bends, ends of pipe, caps, plugs, etc. and all places where thrusting may produce “blow outs”. These tie rods will be used in conjunction with properly sized bands which will attach circumferentially to the pipe. Hot-dipped galvanized bands shall be coated with an approved bitumastic coating before and after installation.

2.9.3 Adapters between PE pipe and flange fittings shall be made with a Harvey adapter or approved equal.

2.10.0 JOINTS:

2.10.1 Joints of the push-on type shall conform to ASTM Specifications C-111-ASA A21.11.

2.10.2 Mechanical joints shall be in accordance with ASA Specifications A21.11 with Corten, Teflon coated Corten or stainless steel bolts.

2.10.3 Joints of the restrained type shall be U.S. Pipe's TR FLEX restrained joint pipe, American's LOK-RING restrained joint, or CLOW'S Super-Lock joint pipe, or an approved equal.

2.10.4 Retainer glands, when allowed, for ductile iron pipe and PVC pipe 12-inches and smaller shall be EBAA, or NAAPCO glands with stainless steel set screws or approved equal.

2.11.0 FLANGED FITTINGS AND SPECIALS:

2.11.1 Flanged fittings shall conform in dimensions, methods of manufacture and tests to the "Standard Specifications for Cast Iron Pipe and Fittings", as adopted by ANSI Class 125.

2.11.2 All flanges and fittings shall conform in weight, thickness and drilling to the "Standard Specifications for Class 125 Cast Iron Flanges and Flanged Fittings", as adopted by ANSI. All flanges shall be faced and drilled, unless special drilling is required as detailed or specified on the plans. All drilling shall conform to the ANSI standards. Where cap screws or stud bolts are required by the plans or specifications, flanges shall be provided with tapped holes for such cap screws or stud bolts.

2.12.0 TAPPING SLEEVES:

2.12.1 Tapping sleeves shall be the stainless steel sleeve type. The body shall be a full circle band that meet or exceeds the Waterworks Specifications for repair clamps, stainless steel 18-8 type 304 with gridded overlapping virgin neoprene rubber gasket. The flange shall be 304 (18-8) stainless steel or ductile iron AWWA C207 Class D ANSI 150 lb. drilling recessed to accept a standard tapping valve. Taping sleeves shall be Rockwell 662 or approved equal.

2.12.2 Tapping sleeve valves shall be similar to the valves specified in Division IV.

2.12.3 All bolts and nuts shall be Corten, Teflon coated Corten or stainless steel.

2.13.0 TESTS AND INSPECTIONS:

2.13.1 All pipe and fittings shall be inspected and tested at manufacturer's plant during manufacture in accordance with manufacturer's standard test procedures at the manufacturer's expense.

2.13.2 For ductile iron fittings, chemical analysis shall be furnished indicating the use of 80-06-03 metal in accordance with ASTM Specifications A339.

2.13.3 For polyvinyl chloride (PVC) pipe, all pipe and couplings shipped must be accompanied by the manufacturer's certificates of test and conformity to applicable ASTM and AWWA Specifications.

2.13.4 Testing of PE pipe and fittings supplied under this specification shall be in accordance with ASTM D-3350.

2.13.5 A letter shall be submitted to the PROJECT ENGINEER by the PE material manufacturer certifying that materials to be furnished meets or exceeds the requirements of AWWA C-906.

2.13.6 The test reports shall be submitted by the PROJECT ENGINEER to the DISTRICT with the request for final acceptance. These test reports shall certify that material furnished under this contract is in compliance with these specifications.

2.13.7 For polyvinyl chloride pipe, quality control shall randomly select pipe to check SDR requirements. This shall be done by cutting the pipe and measuring the actual wall thickness by the use of a micrometer. Result of check shall be submitted to the Project Representative.

DIVISION III

WATER MAIN CONSTRUCTION AND INSTALLATION

3.1.0 GENERAL:

3.1.1 The construction of water lines includes the furnishing of all material in accordance with these specifications and all labor and equipment required for the installation of pipe, fittings, valves, road crossings, canal crossings, stream crossings, ditch crossings, and all incidental work required for completion of the water line system.

3.1.2 The installation of waterlines shall be in accordance with the manufacturer's pipe handbook and instructions.

3.2.0 DELIVERY OF MATERIAL:

3.2.1 Pipe shall be strung along the line of work in a manner that will not cause it to be a hazard to the public, block traffic or access to property, nor shall it be placed in a drainage ditch.

3.2.2 Protective coated fittings shall be received, stored and transported to a point of installation in a manner that will adequately protect the coating. Damaged coating will be cause for rejection of the fittings.

3.2.3 All pipe shall be removed from the transporting vehicle in a manner recommended by the manufacturer. Pipe removed from the vehicle in a manner not acceptable by the DISTRICT and/or manufacturer will be rejected.

3.3.0 CARE OF WORK AND MATERIAL:

3.3.1 The CONTRACTOR shall at all times handle, transport and install all material with the degree of care required to assure that these materials are in first class condition when installed.

3.4.0 INSPECTION OF MATERIALS:

3.4.1 The CONTRACTOR'S quality control representative shall inspect all materials before they are installed in the work, and shall ascertain that satisfactory test reports have been submitted to the PROJECT ENGINEER covering materials inspected. All material found to be defective shall be immediately removed from the work.

3.4.2 Should hidden or unobserved defects be discovered by the PROJECT ENGINEER after the material is in place or show up during testing, the

CONTRACTOR shall be required to remove the defective material and replace it with satisfactory material. The CONTRACTOR shall be solely responsible for the quality of the material he supplies for installation in the work and shall have the full responsibility of obtaining material meeting the requirements of these specifications.

3.5.0 DEPTH OF LINES:

3.5.1 All water mains shall be laid to line and grade as shown on the plans. In general, a minimum cover of thirty (30") inches and a maximum cover of forty-two (42") inches shall be required from the finished ground surface.

3.5.2 The alignment and/or grade may be altered by the PROJECT ENGINEER or his representative as required because of interference with other pipes or structures and to get below ditch bottoms. In general, a minimum of two (2') foot cover is required in a ditch, or canal crossings and a one (1') foot clearance is required below pipeline crossings. These alterations are within the scope of the contract and shall be provided at no extra cost to the OWNER. In the event of a major alteration resulting in a change in contract price, a change order will be issued prior to the execution of the construction work.

3.6.0 EXCAVATION:

3.6.1 Excavation shall be open cut with vertical sides unless in special cases the PROJECT ENGINEER shall permit sloping sides. The CONTRACTOR shall leave a berm on each side of trench to allow free passage and full working space for the PROJECT ENGINEER or his PROJECT REPRESENTATIVE.

3.6.2 The PROJECT ENGINEER shall have authority at any time to require the CONTRACTOR to discontinue use of any excavating machine or other appliance which in his judgement is not adapted to the situation in which it is being used. He may require last 4 inches in depth of excavation to be done by hand or by such machine as is acceptable to him and may forbid the use of such methods of excavation as seem likely to disturb the subgrade.

3.6.3 The CONTRACTOR shall confine his excavation to the least width that will allow the easy installation of the water main and its appurtenances; this width is here declared to be the distance between parallel vertical planes twelve (12") inches from each side of the outside of the barrel of the pipe unless the PROJECT ENGINEER shall specifically allow a greater or lessor width.

3.6.4 In case excavation is carried below grade as established by the PROJECT ENGINEER, the CONTRACTOR shall fill the bottom of excavation up to grade with suitable material and in a manner acceptable to the PROJECT ENGINEER without compensation for either the excavation or the refilling.

3.6.5 No greater length of trench shall be opened in advance of an installed, but not backfilled water main, than shall seem proper to the PROJECT ENGINEER, who will be guided by the circumstances in each case. The PROJECT ENGINEER, will at the request of the CONTRACTOR lay down a general rule to be followed but the right is reserved to the PROJECT ENGINEER to change this rule at his discretion.

3.6.6 If any stumps, roots, logs or other obstructions are encountered within the bounds of the trench, the obstruction shall be cut out to 6 inches below level of established bottom of the trench. The excess depth shall then be backfilled with good earth or aggregate, well tamped, in two layers.

3.6.7 Where there are large trees along the line of the work, large roots of these trees shall not be cut without authorization from the PROJECT ENGINEER. Wherever practicable trench shall be tunneled under such roots, which may require hand digging.

3.6.8 Excavation and piling of excavated material on lawns shall be done so as to cause the minimum of damage to shrubs and flower beds on lawns. Any damage that may result to shrubs and flower beds shall be the responsibility of the CONTRACTOR at no extra cost to OWNER.

3.6.9 Whenever pipe laying is stopped for the night, or for any other reason, the end of the pipe and openings on specials shall be closely secured with a cap or plug or otherwise to prevent the entrance of water, mud, insects, small animals or other obstructions. Unused openings shall be permanently plugged.

3.7.0 SHEATHING AND BRACING:

3.7.1 The CONTRACTOR must protect the sides of his trench by such shoring or bracing as may be necessary. He will be held fully responsible for all damage to property, pavement or underground structures, that may be caused by settlement or caving of the banks of the trench. No payment will be made for any shoring or bracing as such; its cost must be included in the price bid for laying water mains of such size. Sheathing Left-In-Place shall be done only after consulting with the PROJECT ENGINEER or his PROJECT REPRESENTATIVE.

3.8.0 FOUNDATION AND BEDDING:

3.8.1 Under average conditions, the soil at the bottom of the trench will be found to make a satisfactory foundation for the pipe. The bottom of the trench shall be leveled and pipe laid thereon. Bell holes shall be dug of sufficient size to let the whole length of the pipe barrel to be bedded as required and to allow proper assembling of joints.

3.8.2 When bottom of trench is not satisfactory for foundation, excavation shall be carried below level of established bottom of trench to a solid strata and backfilled to pipe grade with granular backfill material. Such extra excavation and backfill will be paid for at the unit price bid per cubic yard of granular backfill material.

3.9.0 LAYING POLYVINYL-CHLORIDE (PVC) PIPE OR POLYETHYLENE PIPE:

3.9.1 Trench width shall not exceed three (3') feet. The bottom of the trench shall be level to provide a uniform bedding for the pipe. Excavate underneath pipe ends to allow pipe to rest firmly on trench foundation. Provide pumps as necessary to dewater the trench and keep the pipe essentially dry until initial backfilling has been accomplished.

3.9.2 Suitable tools and appliances for the safe and convenient handling and laying of the pipe shall be used.

3.9.3 All pipe shall be carefully examined for defects and may be subjected to extra tests as the PROJECT ENGINEER may deem necessary. If any defective pipe or specials should be discovered after having been laid, it shall be removed and replaced with a sound pipe or special without extra charge for the work or removing and replacing.

3.9.4 Caps, plugs and bends for C900 pipe shall be anchored by means of retainer glands, timber thrust block or tie rods and clamps in accordance with the details shown on the plans or other methods recommended by the manufacturer of the pipe.

3.9.5 Whenever pipe laying is stopped for the night, or for any other reason, the end of the pipe and openings on specials shall be closely secured with a cap or plug or otherwise to prevent the entrance of water, mud, insects, small animals or other obstructions. Unused openings shall be permanently plugged.

3.9.6 A blue, 4 mil, low density polyethylene tape as manufactured by New Source, Inc., Waterloo, Wisconsin, or approved equal shall be installed directly over the top center of the pipe approximately 12-inches above the pipe surface. Careful backfilling shall be required to retain tape in place during backfilling operations.

3.9.7 Tracer wire shall be a single No. 10 AWG, blue coated stranded conductor wire with UL approval direct burial insulation and shall be placed directly on top and center of the water main and service pipe. The tracer wire shall be taped to water pipe at 10-foot intervals.

3.9.8 Each mechanical joint, flanged joint, fitting, valves, restraining rods and bands shall be wrapped with a 6 mil thick polyethylene plastic wrap.

3.10.0 LAYING DUCTILE IRON WATERLINE:

3.10.1 All cast iron and ductile iron waterlines shall be protected by means of an 8 mil thickness polyethylene tube. Tubing shall be furnished and installed with the recommendation of the Cast Iron Pipe Research Association.

3.11.0 CONNECTIONS TO EXISTING WATER MAINS:

3.11.1 Work includes connections to existing water mains. Cutting-in operations shall be planned to cause a minimum of inconvenience to customers on existing mains and shall be done under the rules and regulations of the DISTRICT.

3.11.2 The CONTRACTOR shall not open or close any valve in an existing distribution system nor shall he open or close any valve set under this contract after a line has been placed in service, unless the DISTRICT has authorized him to do so.

3.11.3 Procedure for disinfecting at cut-in points shall be reviewed and approved by the DISTRICT.

3.12.0 THRUST RESISTORS:

3.12.1 All water mains, valves and fittings shall be blocked and/or restrained to resist thrust in conjunction with retainer glands in accordance with the manufacturer's recommendations for the individual pipe used. The cost of all labor and material required for thrust resistors shall be included in the unit price bid per foot for the water mains and fittings complete in place. Any timber used in connection with thrust blocks shall have wood preservative (pressure treatment) per AWDA Treatment C1 using water-borne ACA or CCA preservative with 0.25 percent retention.

3.12.2 Prior to backfilling, the PROJECT ENGINEER shall inspect all blocking techniques to ensure conformance with manufacturer’s recommendations.

3.13.0 PLUGS:

3.13.1 All fittings and discontinuous pipes shall be capped with a suitable MJ plug or cap and properly blocked. PE pipe shall have a fused cap.

3.13.2 All plugs shall be paid for by the pound as fittings unless otherwise shown on the plans. All plugs shall include thrust resistors.

3.14.0 BACKFILLING:

3.14.1 Backfill shall be thoroughly but carefully compacted, under and around the pipe to the spring line. Selected backfilled free of rocks or jagged material shall be carefully compacted over the top of the pipe for a depth of one (1) foot.

3.14.2 Remainder of backfilling shall be completed by filling the trench with earth firmly packed by tamping, rolling or other method approved by the PROJECT ENGINEER, so as to secure as compact a trench as possible.

3.14.3 Backfilling of trench across driveways and streets shall not be delayed pending line tests, but shall be completed immediately after line is placed. If necessary to locate leaks, joints located under this backfill shall be exposed for testing.

3.14.4 All excess excavation shall either remain the property of the OWNER and be placed and rough spread on the adjacent property, or shall become the property of the CONTRACTOR and be hauled away from the site, as directed by the PROJECT ENGINEER.

3.15.0 SAMPLING TAPS:

3.15.1 Sampling taps shall be installed at locations along the water main not to exceed 1,000 feet on centers, or at locations approved on the drawings.

3.15.2 The requirements for a sampling tap are as follows:

3.15.2.1 New brass faucet with no internal or external threads (vendor where these can be purchased is the USA Bluebook at (800) 548-1234 item number 45325 and 45326. No cut off faucets without adequate neck.

3.15.2.2 Faucet is facing downward.

3.15.2.3 Faucet has shut-off handle to enable collector to close valve and flame tap.

3.15.2.4 Faucet must be secured to a stake, 32 - 40 inches above the ground.

3.15.2.5 Faucet must be clean.

3.15.2.6 Sample location must be free of grass, weeds and debris.

3.15.2.7 No sample points in ditches.

3.15.3 After a satisfactory sample test report has been received, the sampling taps shall be removed and plugged at the main.

3.16.0 PRESSURE TESTING:

3.16.1 As the work progresses, all sections of pipe shall be tested to a minimum hydrostatic pressure of 125 pounds per square inch for a minimum period of 4 hours. If after 4 hours, the pressure drop is less than 10 psi, the test is acceptable. If after 4 hours, pressure drops to 10 psi or more, but less than 25 psi, let the test on over night to determine what pressure the line will hold. If the pressure does not drop more than 25 psi, after 24 hours, the test is acceptable. If the pressure does drop more than 25 psi, within 24 hours, the test is not acceptable, and the line will be inspected for leaks and retested. (Any defective work revealed by the test must be repaired by the CONTRACTOR at his expense.) Test pressure shall not be exerted against a valve operated by the District. All test sections shall be sealed with plugs or caps.

3.16.2 There shall be a minimum of leakage in the lines under the stated pressure. Volume of leakage shall be determined from the quantity of water required to bring up the pressure and from direct meter readings on completed lines.

3.16.3 The entire cost of the test, including pumps, gauges, connection pipe, etc., will be made at the CONTRACTOR'S expense.

3.16.4 Potable water shall be used for testing and shall be obtained and paid for by the CONTRACTOR.

3.16.5 All hydrostatic pressure tests shall commence prior to 1:00 P.M. If the CONTRACTOR fails to reach the pressure of 125 psi by 1:00 P.M., the pressure test shall be postponed until the next regular working day.

3.16.6 CONTRACTOR shall submit to the PROJECT ENGINEER and the DISTRICT, a schedule of pressure tests which shall be revised as conditions require. The PROJECT ENGINEER and the DISTRICT shall be notified at least 24 hours in advance of the beginning of any test. It is imperative that testing be done immediately upon completion of each portion of the line. Failure to properly schedule and conduct tests will be sufficient cause for the PROJECT ENGINEER to prohibit the opening up of additional trench until all previously installed pipe and specials have been tested and all backfilling completed and work cleaned up. Work shall proceed in an orderly and expeditiously manner with all parts of the operation completion and cleaned up as the CONTRACTOR proceeds along the line.

3.17.0 STERILIZATION:

3.17.1 Procedure for disinfecting line shall be in accordance with paragraph 12:020-1 through paragraph 12:020-4, Chapter XII (Water Supplies) of the Louisiana State Sanitary Code dated March 20, 1984, or latest revision.

3.17.2 In general, after pressure tests have been made and any repairs found needed have been completed, the main shall be flushed as thoroughly as possible. When the initial flushing has been completed, pipes and all other parts of the system shall be thoroughly disinfected by the use of chlorine or chlorine compounds. The rate of application of chlorine shall be in such proportion to the rate of water entering the pipe or other appurtenances, such that the chlorine applied to the water shall be at least 50 ppm. Chlorinated water shall be retained in the pipe long enough to destroy all non-spore-forming bacteria, normally not less than 24 hours. After the chlorine treated water has been retained for the required time, the chlorine residual at pipe extremities and at other representative points shall be at least 5 ppm. If the residual is less than 5 ppm the disinfection procedure shall be repeated until a 5 ppm residual is obtained as required above.

3.17.3 At the end of 24 hours, the main shall again be thoroughly flushed. When flushing has been completed, the main shall be refilled with system water and allowed to stand for one (1) week. Samples shall then be taken by either a private laboratory or by the DISTRICT'S laboratory. Satisfactory test results are valid for forth-five (45) days from the date of sample collection.

3.17.4 The final inspection shall occur after receipt of satisfactory sample test reports, but within 15 days of sample collection. After an acceptable final inspection, the Development/Subdivision shall be opened to the public system and local service provided.

3.17.5 After the final inspection, the Development/Subdivision shall be submitted to the DISTRICT for acceptance within forty-five (45) days of sample collection.

3.17.6 If the system has not been accepted by the DISTRICT during this forty-five (45) day period, additional flushing, sterilization and sanitary testing may be required at the expense of the OWNER.

3.17.7 Mains containing water that does not meet standards of the DISTRICT shall be again disinfected and retested.

3.17.8 No special payment will be made for disinfecting. The entire cost of water, chemicals, equipment and testing shall be included in the unit price bid for laying pipe.

DIVISION IV

VALVES

4.1.0 GENERAL:

4.1.1 Watermains 12-inch and smaller shall have gate valves.

4.1.2 All valves shall open left (counter clock-wise).

4.1.3 Upon completion of construction, all valves shall be left in the open position.

4.2.0 GATE VALVES:

4.2.1 Gate valves 12-inch or smaller shall be cast iron, resilient wedge, non-rising stem with standard mechanical joint or flanged ends.

4.2.2 Gate valves shall be manufactured to AWWA C-509, Standard Specifications for Gate Valves for ordinary Waterworks Service.

4.2.3 Mueller, A2360 Series or approved equal.

4.2.4 Gate valves for hydrant supply lines shall have flanged by mechanical joint ends.

4.2.5 All interior and exterior cast iron valve bodies shall receive 10 mil fusion epoxy coating in accordance with AWWA C550.

4.3.0 VALVE BOXES:

4.3.1 Valve boxes for all valves shall be B & T Company, Tyler Company, or approved equal two-piece valve box.

4.3.2 Covers for valve boxes shall be round drop covers indicating "water".

4.3.3 All valve boxes shall be supplied with a centering seal.

4.3.4 The top of the installed valve box shall be flush with the surface of the finished property elevation.

4.3.5 All valve boxes shall have a 18-inch by 18-inch by 4-inch square, or 18-inch round plain concrete pad poured around the valve box flush with the level of the ground. Pads may be precast and sealed in place.

DIVISION V

FIRE HYDRANT INSTALLATION

5.1.0 FIRE HYDRANTS:

5.1.1 Fire hydrants shall meet all provisions of the current AWWA Specifications governing fire hydrants. Hydrants shall be of the "Traffic Model or Break Flange Type" so designed when the hydrant is subjected to severe impact, the special break flange ring will shear off at the ground line. Hydrant shall be constructed that it can be extended without the necessity of digging. "O" ring seals shall be used to prevent leakage.

5.1.2 All residential hydrants shall be three-way hydrants with two 2½ inch hose nozzles and one 4½ inch pump nozzle. Commercial hydrants shall have two 4½" pump nozzles. Valve opening shall be 5¼ inch.

5.1.3 Threading shall be National Standard, opening left with a 1-1/2" pentagon operating nut.

5.1.4 End inlet shall be mechanical joint with Corten, Teflon coated Corten or stainless steel bolts and nuts.

5.1.5 The term "bury" is defined as meaning the distance from the ground line to the bottom of the pipe. Average bury is approximately three feet, six inches (3'-6"). Before ordering hydrants, the amount of bury for each hydrant location shall be determined by the CONTRACTOR. The CONTRACTOR shall furnish labor and equipment needed for locating water line and establishing amount of bury.

5.1.6 All fire hydrants shall be water-tight when subjected to a hydraulic pressure test of 300 pounds per square inch. This test shall be applied to each hydrant by the manufacturer of the hydrant and certification that each hydrant has been tested shall be stamped on each hydrant by an approved testing lab.

5.1.7 Hydrants shall be Mueller "Centurian" or approved equal.

5.1.8 One spanner wrench shall be provided for each six (6) hydrants.

5.2.0 INSTALLATION OF FIRE HYDRANTS:

5.2.1 All hydrants shall be constructed in accordance with the drawing entitled "Typical Hydrant Setting".

5.2.2 All fire hydrants shall be connected to the distribution system through a 6-inch feeder valve. In those locations where the fire hydrants are being installed on an existing four-inch (4") main, a 4-inch by 6-inch increaser shall be installed on the tee.

5.2.3 Fire hydrants shall be set on and blocked by pressure treated (See 3.12.1) timber blocks placed on a bed of 6-inches of gravel or limestone. Hydrant shall be held in place by means of galvanized pipe straps, as shown on details or installed using a mechanical joint anchoring coupling. After straps or couplings are in place the hydrant joint and water line joint shall be wrapped with 6 or 8 mil polyethylene film, lapped so as to have two layers of film in each wrapping. Film shall be taped to pipe barrel on each of side of joint. Several holes shall be punched in film to allow drainage.

5.2.4 After wrapping is in place, limestone or gravel shall be used to fill around the inlet of the hydrant to a height of three inches (3") above the drain hole.

5.3.0 TAPPING SLEEVE AND VALVES:

5.3.1 When used, these shall be Mueller mechanical joint ends, or stainless steel tapping sleeve with test plug and stainless steel flange, Ford "SST" or approved equal.

5.3.2 All bolts and nuts used on mechanical joints shall be Corten, Teflon coated Corten or stainless steel.

5.3.3 Each mechanical and each flanged joint shall be wrapped with polyethylene film as specified for hydrant joint.

5.4.0 FIRE HYDRANT EXTENSIONS:

5.4.1 It is anticipated that in some locations the bury of the fire hydrant will be in excess of the standard depth specified. At these locations a fire hydrant extension shall be installed to bring the break-off of the fire hydrant above the ground level. The use of fire hydrant extensions shall be approved by PROJECT ENGINEER prior to ordering.

5.5.0 CUTTING INTO EXISTING LINES:

5.5.1 When it is necessary to install a fire hydrant on an existing water main, when tapping sleeves and valves are not used, the tie-in shall be made by cutting the existing water main and inserting a mechanical joint on other approved tees. The CONTRACTOR shall plan this operation in a manner that will cause a minimum interruption of water service. Cards will be prepared and delivered to residents of the area where water is to be cut off advising them when service will be cut off and the approximate duration of the interruption of service.

5.5.2 Cutting of waterlines shall be done with a hydraulic pipe cutter.

5.5.3 Fittings shall be standardized mechanical joint type and shall conform with AWWA Specifications C-110 for 250 psi working pressure (ASA A-21.10). Inside lining shall be "enamaline" type cement lining or approved equal. Outside coating shall be coal-tar dip (ASA A21.5). Bolts and nuts shall be Corten or stainless steel.

5.5.4 When a cut is made into a water line, excavation shall be kept dry to prevent water from entering pipe and to assist in keeping pipe and fittings clean. HTH or similar chemical for disinfection shall be dusted into each fitting, each piece of pipe and each hydrant as they are installed in the system.

5.6.0 STERILIZATION:

5.6.1 After hydrant installation is completed, water supply valve shall be opened just enough to fill the line and bleed air from line through the hydrant. As soon as water reaches hydrant, supply valve shall be closed and chlorinated water allowed to set in the hydrant supply line for 30 minutes, after which supply valve shall be opened and line flushed through the hydrant.

5.7.0 BACKFILLING AND CLEANING UP:

5.7.1 Excavation for hydrant installation shall be backfilled with best available material obtained from the excavation. Backfilling shall be done in layers not over nine inches (9"), each layer being thoroughly compacted. Before final inspection all hydrant location areas shall be redressed and cleaned-up.

5.8.0 COLOR CODING:

5.8.1 All fire hydrants shall be painted red and bonnet and nozzle caps of the hydrant and nozzle caps shall be color coded according to the measured flow from the hydrant. Color coding shall be as follows:

FLOW RANGE	COLOR CODE
Less than 500 GPM	Red (1210 Rust-O-Leum)
501 - 1,000 GPM	Yellow (659 Rust-O-Leum)
More than 1,000 GPM	Green (1282 Rust-O-Leum)

5.8.2 CONTRACTOR shall coordinate flow testing with fire company representative of DISTRICT where hydrant is being installed.

DIVISION XX

MEASUREMENTS AND PAYMENTS

20.1.0 GENERAL:

20.1.1 General contracts for waterlines are unit price contracts and all quantities are approximate quantities. The CONTRACTOR'S attention is directed to the items of work for which no payment item has been established. All work shown on the drawings and outlined in the specifications is to be completed in all respects, and the cost of all miscellaneous and associated work is to be included in the unit prices bid for the various items that payment items have been established for.

20.1.2 All quantities shall be measured and tabulated by both the PROJECT ENGINEER and CONTRACTOR. Requests for payment and supporting data shall be prepared by the CONTRACTOR and given to the PROJECT ENGINEER sufficiently in advance of payment date to permit thorough checking of all quantities.

20.1.3 CONTRACTOR shall submit a daily report and daily sketch sheet showing lines, fittings, valves, taps, etc., installed with sufficient data to accurately locate these items after trench has been backfilled.

20.1.4 The CONTRACTOR shall furnish the PROJECT ENGINEER whatever assistance is required, laborers, clerks and records that will enable the PROJECT ENGINEER to expeditiously check all estimates and especially the final "Record Drawing" quantities of the project.

PAYMENT ITEMS 1 - 4 WATERLINE PIPE AND FITTINGS

20.2.0 WATER PIPE:

20.2.1 Water pipe will be paid for by the linear foot according to size and type.

20.2.2 Method of Measurement: Water pipe will be measured by the linear foot of pipe placed, tested, sterilized and accepted without deductions for the space occupied by valves, fittings or specials.

20.2.3 Basis of Payment: Water pipe placed and accepted measured as provided above will be paid for at the contract unit price per linear foot for water pipe of the

various sizes, types and classifications, which price and payment shall be complete with thrust resistors, warning tape, tracer wire, plastic wrapping, testing and sterilizing the pipe and adapters; for excavation, backfilling and preparation of bed, compaction and removing surplus earth; and reshaping and dressing the surface; and for the furnishing of all equipment, tools, labor, and incidentals necessary to complete the item in accordance with the plans and specifications.

20.2.4 Payment Item:

Item No. 1 - Various Size Water Pipe

20.3.0 CAST IRON OR DUCTILE IRON FITTINGS:

20.3.1 Cast iron fittings or ductile iron fittings used in waterlines will be paid for by the pound. Adapters and retainers will not be paid for separately but will be included in the unit price bid per linear foot of pipe.

20.3.2 Method of Measurement: Fittings shall be measured in units of pounds of cast iron fittings, installed, tested, sterilized and accepted, and payment for mechanical joint, flange and push-on joint fittings, whether cast iron or ductile iron shall be made on the basis of ASA A21.10 published body weights for mechanical joint fittings exclusive of weight of gaskets and linings, glands and bolts.

20.3.3 Basis of Payment: Cast iron or ductile iron fittings used in waterline construction will be paid for by the pound. Adapters, retainers and plastic wrapping will not be paid for separately but will be included in the unit price bid per linear foot of pipe.

20.3.4 Payment Item:

Item No. 2 - Cast Iron and Ductile Iron Fittings

20.4.0 TIE-IN TO EXISTING MAIN OR VALVE:

20.4.1 Tie-ins to existing mains or valve will be paid for per each. Valves and fittings are measured and paid for under other item. This item will provide payment for removal, if necessary, of any existing fittings and existing timber and/or concrete blocking, for installation of new fittings and the reconnection of all lines as necessary. This price shall also include verification by CONTRACTOR of the existing waterline size. Tie-ins to cast iron or ductile iron pipe shall include cutting-in-sleeves.

20.4.2 Method of Measurement: Connections to existing mains or valves will be measured by an actual count of each connection according to type, size, installed, tested, sterilized and accepted.

20.4.3 Basis of Payment: Connections to existing mains or valves installed and accepted, measured as provided above, will be paid for at the contract unit price per each, which price and payment shall constitute full compensation for furnishing all equipment, tools, labor and incidentals necessary for the completion of the item in accordance with plans and specifications.

20.4.4 Payment Item:

Item No. 3 - Various Types of Tie-ins

20.5.0 CUT AND PLUG EXISTING LINES:

20.5.1 As detailed on the plans, existing lines shall be cut and a plug or cap used to seal open line.

20.5.2 Method of Measurement: Payment for each unit under this item will be for furnishing all labor and materials to disconnect and plug existing lines where shown on the plans or called for in the specifications. The cost of the plug shall be included in unit price bid of cast iron fittings unless otherwise noted on plans.

20.5.3 Basis of Payment: The cutting and plugging of existing lines, measured as provided above will be paid for at the contract unit price bid per each, which price and payment shall constitute full compensation for all the material, equipment, tools, labor and incidental items necessary to complete the item in accordance with the plans and specifications.

20.5.4 Payment Item:

Item No. 4 - Cut and Plug Various Size and Type Lines

PAYMENT ITEM 21 VALVES

20.21.0 VALVES AND VALVE BOXES:

20.21.1 Valves and valve boxes together as a unit will be paid for per each.

20.21.2 Method of Measurement: Valves together with valve boxes, spool or smooth pieces and special foundation when shown on plans and concrete pads, all together as a unit will be measured by an actual count of each size, installed, tested, sterilized and accepted. The unit bid price shall include any necessary joint adaptors for connecting valves into the system.

20.21.3 Basis of Payment: The number of valves with valve boxes and accessories together as a unit, accepted, measured as provided above, will be paid for at the contract unit price per each, which price and payment shall constitute full compensation for furnishing, hauling, installing complete and testing and sterilizing, for excavation and backfilling, and for the furnishing of all equipment, tools, labor and incidentals necessary to complete the item in accordance with plans and specifications.

20.21.4 Payment Item:

Item No. 21 - Various Size Valves and Valve Boxes

PAYMENT ITEM 22 TRACER WIRE HOUSING UNITS

20.22.0 TRACER WIRE HOUSING UNITS:

20.22.1 Tracer Wire Housing Units shall be paid for per each.

20.22.2 Method of Measurement: Tracer Wire Housing Units complete will be measured by an actual count installed and accepted.

20.22.3 Basis of Payment: Payment for each will be for the furnishing of all labor, material and equipment to install the unit complete in accordance with the specifications.

20.22.4 Payment Item:

Item No.22 - Tracer Wire Housing Units

PAYMENT ITEMS 30 - 32 FIRE HYDRANTS, TEES AND EXTENSIONS

20.30.0 FIRE HYDRANT INSTALLATION:

20.30.1 Fire hydrant installation complete will be paid for per each according to the type and size connection provided for in the proposal. Standard burial shall be 3 feet, 6 inches.

20.30.2 Method of Measurement: Fire hydrant installation complete will be measured by the actual count of each fire hydrant, type and size connection installed and accepted. The unit price bid for each shall include the hydrant with boot as called for on the proposal.

20.30.3 Basis of Payment: Fire hydrant installation complete placed and accepted measured as provided above will be paid for at the contract unit price per each, which price and payment shall constitute full compensation for furnishing, hauling, installing completed, testing and sterilizing each hydrant, and for the furnishing of all equipment, tools, labor and incidentals necessary to complete the item in accordance with the plans and specifications.

20.30.4 Payment Item:

Item No. 30 - Various Size and Type Fire Hydrant Installations

20.31.0 FIRE HYDRANT TEE AND VALVE INSTALLATION:

20.31.1 Fire hydrant tee and valve installation will be paid for per each as detailed on the plans including supply pipe up to 4 feet in length. Supply pipe over 4 feet in length will be paid for under Payment Item No. 1 - Water Pipe.

20.31.2 Method of Measurement: Fire hydrant tee and valve installation will be measured by the actual count of each unit installed and accepted. The unit price bid for each shall include the necessary tee, valve and box, up to four (4') feet of supply pipe, the tie-in or connection, all as called for on the proposal, as well as the thrust block anchoring device, gravel pack and/or concrete base where required and polyethylene film.

20.31.3 Basis of Payment: Fire hydrant tee and valve installation placed and accepted measured as provided above will be paid for at the contract unit price bid per each, which price and payment shall constitute full compensation for furnishing, hauling, installing completed, testing and sterilizing each tee, with its associated valve, supply pipe and connection fittings; for excavation, backfilling and dressing and for the furnishing of all equipment, tools, labor and incidentals necessary to complete the item in accordance with the plans and specifications.

20.31.4 Payment Item:

Item No. 31 - Various Size Fire Hydrant Tees and Valves

20.32.0 FIRE HYDRANT EXTENSION:

20.32.1 Extra depth for fire hydrants will be paid for per vertical foot.

20.32.2 Method of Measurement: Extra depth for fire hydrant in excess of standard depth will be measured in increments of six inches (6").

20.32.3 Basis of Payment: Extra depth for fire hydrants in excess of standard depth, measured as provided above, will be paid for at the contract unit price per foot, which price and payment shall constitute full compensation for the furnishing of all equipment, tools, labor and incidentals necessary to complete the item in accordance with the plans and specifications.

20.32.4 Payment Item:

Item No. 32 - Fire Hydrant Extension

PAYMENT ITEMS 36 - 38 PIPE EMBEDMENT

20.36.0 LIMESTONE FOUNDATION:

20.36.1 When required by plans or specifications, standard limestone foundation shall be paid for by the linear foot in place. Unless otherwise shown or specified, limestone foundation for 4-inch through 12-inch waterline normally shall be 4 inches below the pipe and shall extend to the spring line of the pipe. The width of limestone base shall be the width of the trench.

20.36.2 Method of Measurement: Limestone foundation placed in accordance with the plans and accepted will be measured by the linear foot in place. No special payment will be made for additional material necessary to correct unauthorized over-width or over-depth excavation.

20.36.3 Basis of Payment: Limestone foundation in place and accepted, measured as provided above, will be paid for at the contract unit price bid per linear foot of limestone, which price and payment shall constitute full compensation for furnishing, hauling and installing all material and for furnishing all equipment, tools, labor and incidentals necessary to complete the item in accordance with the drawing and specifications.

20.36.4 Payment Item:

Item No. 36 - Limestone Foundation for Various Size Waterlines

20.37.0 FOUNDATION LUMBER:

20.37.1 When required by plans or specifications, foundation lumber shall be paid for by the thousand board feet or fraction thereof.

20.37.2 Method of Measurement: Foundation lumber will be measured by unit of one thousand board feet and fraction thereof as determined by using nominal sizes of lumber furnished.

20.37.3 Basis of Payment: Foundation lumber installed and accepted, measured as provided above, will be paid for at the unit price bid by the CONTRACTOR, which combined price and payment shall constitute full compensation for furnishing, hauling and installing all sheeting and bracing required to be left in place, and for furnishing all equipment, tools, labor, and incidental items necessary to complete the item in accordance with the plans and specifications.

20.37.4 Payment Item:

Item No. 37 - Foundation Lumber

20.38.0 GRANULAR BACKFILL MATERIAL:

20.38.1 This work shall consist of furnishing and placing granular material in accordance with the specifications when called for.

20.38.2 Method of Measurement: Granular material used to backfill trenches for the installation of pipe will be measured by the cubic yard of granular material placed, compacted and accepted. Granular material will be placed only at the direction of the PROJECT ENGINEER. Measurement for granular material will be made by the cubic yard in vehicles at the point of delivery. Yardages in vehicles will be measured at the point of delivery. The CONTRACTOR shall strike off and level the load and the checker or project representative shall inspect each load and check its yardage. Approved vehicle for this purpose may be of any size or type acceptable to the PROJECT ENGINEER provided the body is of such shape that the actual delivered contents may be readily and accurately determined and will remain constant. Unless all approved vehicle on the work are of uniform capacity, each vehicle must bear a plainly legible identification mark, indicating its specified approved vehicle. The Project Representative may reject all loads not hauled in approved vehicles. Two haul tickets shall be given the Project Representative for each load of granular fill used. The ticket shall be signed, the location where used noted on the tickets, and one ticket returned to the CONTRACTOR. Tickets for granular fill hauled to a storage site shall not be signed or honored.

20.38.3 Basis of Payment: Granular material in place, compacted, bladed and accepted; measured as provided above, will be paid for at the contract unit price per cubic yard, truck measurement, of granular material hauled and spread; which price shall constitute full compensation for furnishing, hauling, spreading and compacting of granular fill and or the furnishing of all equipment, tools, labor and incidental items necessary to complete the item in accordance with the drawings and specifications.

20.38.4 Payment Item:

Item No. 38 - Granular Backfill

20.66.0 SHEETING LEFT-IN-PLACE:

20.66.1 Sheeting Left-In-Place along with the bracing and shoring utilized in conjunction therewith will be paid for by the linear foot of trench according to category of depth.

20.66.2 Method of Measurement: Sheeting Left-In-Place at the direction of the PROJECT ENGINEER will be measured by the linear foot of trench as measured along the centerline of the trench.

20.66.3 Basis of Payment: Sheeting Left-In-Place, as directed by the PROJECT ENGINEER, installed and accepted, measured as provided above, will be paid for at the contract unit price bid per linear foot of trench, which price and payment shall constitute full compensation for furnishing, hauling and installing all sheeting required to be left-in-place; furnishing, hauling and installing all bracing and shoring required to meet OSHA requirements; removal of hydraulic or temporary bracing and shoring as backfill progresses; and for furnishing all equipment, tools, labor and incidentals necessary to complete the item in accordance with the drawings and specifications.

20.66.4 Payment Items:

Item No. 66 - Sheeting Left-In-Place

SECTION 333000 - SANITARY SEWAGE SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Sanitary sewer drainage piping, fittings, accessories, cleanouts, and bedding.
2. Connection of site sanitary sewer system to municipal sanitary sewer systems.

B. Related Requirements:
1. Section 02300 – Earthwork: Trenching, backfill, and compaction for utilities
2. Section 02536 - Sewer Manholes, Frames, and Covers
3. Section 03310 – Cast-in-place Structural Concrete

1.2 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

B. ASTM International (ASTM):
1. ASTM A74 - Cast Iron Soil Pipe and Fittings
2. ASTM A746 - Ductile Iron Gravity Sewer Pipe
3. ASTM C425 - Compression Joints for Vitrified Clay Pipe and Fittings
4. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings
5. ASTM C700 - Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated
6. ASTM D2241 - Poly (vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
7. ASTM D2657 - Heat-Joining Polyolefin pipe and Fittings
8. ASTM D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
9. ASTM D3035 - Polyethylene (PE) Plastic Pipe Using Flexible Elastomeric Seals
10. ASTM D3139 - Joints for Plastic Pressure Pipe Using Flexible Elastomeric Seals
11. ASTM D3261 - Butt Heat Fussion Polyethylene (PE) Plastic Fittings For Polyethylene Plastic Pipe And Tubing
12. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe
13. ASTM F1417 - Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air.

C. American Water Works Association (AWWA):
1. AWWA C111 - Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings
2. AWWA C600 - Ductile-Iron Water Mains And Their Appurtenances
3. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In, For Water Distribution
4. AWWA C901 - Polyethylene (PE) Pressure Pipe, Tubing And Fittings 1/2 Inch Through 3 Inches, For Water Distribution
5. AWWA C906 - Polyethylene (PE) Pressure Pipe And Fittings, 4 Inch Through 63 Inch, For Water Distribution

1.3 SUBMITTALS

A. Project Record Documents:
1. Submit manufacturer information on all pipe, fittings, seals, etc. that will be used for the installation of the system.
2. Accurately record actual locations of pipe runs, connections, cleanouts, and invert elevations.
3. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.

1.4 PROJECT CONDITIONS

A. Coordinate work with termination of sanitary sewer connection outside building and connection to municipal sewer utility service.

PART 2 - PRODUCTS

2.1 SEWER PIPE, FITTINGS, AND JOINTS

A. Polyvinyl Chloride Pipe (PVC): ASTM D 3034, rated SDR 35 unless otherwise specified by the utility company. Pipe shall be continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM D 3034 classification.
   1. Pipe joints: Integrally molded bell ends, ASTM D 3034, Table 2, with factory supplied elastomeric gaskets and lubricant.

B. Vitrified Clay Pipe (VCP): ASTM C700: Use only if required by local jurisdiction.
   1. Fittings: ASTM C700
   2. Joints: ASTM C425
   3. Gaskets: ASTM C425. Gaskets shall be manufactured from high grade, properly vulcanized elastomeric compound consisting of either basic natural or synthetic rubber. Gasket manufacturing tolerances shall comply with Rubber Manufacturer's Association tolerances for gaskets.
   4. Lubricant: Suitable for lubricating joint components; no deteriorating effects on gasket or pipe material, will not support growth of fungi or bacteria, and shall be of type recommended by gasket manufacturer.

C. Force Main:
   1. High-Density Polyethylene Pipe (HDPE): AWWA C901 and C906, ASTM D3035, SDR 11 for 150 psi pressure rating.
      a. Fittings: Molded, AWWA C901 or C906.
      b. Joints: Butt fusion, ASTM D2657, flanged gasket joints at interface
   2. Polyvinyl Chloride Pipe (PVC): For less than 4 inches in diameter, ASTM D2241 for push-on or solvent weld joints, and for pipe 4 inches in diameter and larger, AWWA C900, Class 150 with push-on joints.
      a. Joints/Fittings: Push-on, ASTM D3139 with ASTM F477 gaskets.
      b. Solvent Cement: ASTM D2564.
   3. Ductile Iron Pipe (DIP): ASTM A746, Class 50, inside nominal diameter as shown on the drawings, bell and spigot end.
      a. Ductile Iron Pipe Joint Device: AWWA C111, rubber gasket joint devices.

2.2 PIPE ACCESSORIES

A. Pipe Joints: Mechanical clamp ring type, stainless steel expanding and contracting sleeve, neoprene-ribbed gasket for positive seal.

B. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps, etc.

2.3 CLEANOUTS AND MANHOLES

A. Manholes shall conform to Section 02536.

B. Lid and Frame: Provide in accordance with Section 02536. Provide traffic grade and rated covers and frames where cleanouts and manholes are within pavement, with the letters “SSCO” or “SANITARY SEWER” respectively cast into the cover.

C. Shaft Construction: Cast iron shaft of internal diameter as specified on Construction Drawings with 2500 psi concrete collar for cleanouts.

2.4 APPURTENANCES

A. Trace Wire: Magnetic detectable conductor (#12 copper), brightly colored plastic covering, imprinted with "Sanitary Sewer Service" in large letters.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that trench cut and excavation is ready to receive work and excavations, dimensions, and elevations are as indicated on Construction Drawings.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with bedding material.

B. Remove large stones or other hard matter that could damage pipe or impede consistent backfilling or compaction.

3.3 BEDDING

A. Excavate trench and place bedding material in accordance with Section 02300.

3.4 INSTALLATION - PIPE

A. Install type and class of pipe as shown on the drawings. Pipes shall be laid and maintained to the required line and grade with necessary fittings, bends, manhole risers, cleanouts and other appurtenances placed at the required locations. The pipe shall be installed with uniform bearing under the full length of the barrel of the pipe. The pipe shall be inspected for defects and cracks before being lowered into the trench. Defective, damaged or unsound pipe, or pipe that has had its grade disturbed after laying shall be taken up and replaced. Commence installation at lowest point with the bell end upgrade.

B. No pipe shall be laid in water or when trench conditions are unsuitable for work.

C. Pipe connecting to manholes or other structures shall terminate flush inside of the structure wall.

D. Joints for PVC and CISP shall be thoroughly lubricated with an approved lubricant before pipe sections are slipped together. Open ends shall be fully protected with a stopper to prevent earth or other material from entering the pipe during construction. Carefully free interior of the pipe from dirt, cement and other deleterious material as the work progresses.

E. Maintain separation of potable water main from sewer piping at crossings a minimum of 10 feet horizontal and 18 inches vertical.

F. Install HDPE piping and fittings to AWWA C901 and C906. Butt fusion welded per ASTM D3261.

G. Route pipe in straight line parallel to roads, buildings and adjacent utilities and as shown on the drawings.

H. Establish elevations of buried piping with sufficient cover as recommended by pipe manufacturer to ensure not less than 3 feet of cover, except as noted on drawings.

I. Form and place concrete for thrust blocks at each elbow of pipe force main. See construction drawing for details of construction.

J. Backfill trench in accordance with Section 02300.

K. Install trace wire continuous over top of non-metal pipe. Bury 6 inches minimum below finish grade, above pipeline.

3.5 INSTALLATION – CLEANOUTS AND MANHOLES

A. Form bottom of excavation clean and smooth to correct elevation.

B. For cleanouts, form and place cast-in-place concrete base pad with provision for sanitary sewer pipe to be installed to proper elevations.

C. For manholes, construct inverts according to the following guidelines:
   1. Invert channel shall be smooth and accurately shaped to a semicircular bottom to match with the inside of the adjacent sewer section.
   2. Invert channels and structure bottoms shall be shaped with mortar and lean concrete.
   3. Changes in size and grade of invert shall be made gradually and evenly.
   4. Changes in the direction of the sewer entering branch or branches shall have a true curve of as large a radius as the manhole will permit.

D. For manholes, provide manhole rings, frame, and cover as shown on the construction drawings.

3.6 FIELD QUALITY CONTROL

A. Field quality control shall be conducted by the Contractor in accordance with Contract Documents.

B. Pipes and joints shall not be completely backfilled until after inspection, testing, and approval by the Owner and local jurisdiction.

C. Prior to testing for leakage, the pipe trench shall be backfilled to at least the spring line of the pipe. If required to prevent pipe movement during testing, additional backfill shall be added leaving the pipe joints uncovered to permit inspection.

D. Exfiltration Test
   1. Each section of sewer line between successive manholes shall be tested by closing the lower end of the sewer to be tested and the inlet sewer of the upper manhole, using stoppers.
   2. Fill the manhole and pipe with water to a point which produces a maximum of 3 feet of head above the invert of the sewer at the center of the upper manhole; or if groundwater is present, 3 feet of head above the average adjacent groundwater level.
   3. The allowable leakage shall be 200 gal/inch of pipe diameter/mile/day

E. Infiltration Test
   1. If excessive ground water is encountered in the construction of a section of the sewer, the exfiltration test shall not be used.
   2. The upper and lower ends of the sewer to be tested shall be closed sufficiently to prevent the entrance of water.
   3. Pumping of ground water shall be discontinued for at least 3 days; then infiltration shall be tested.
   4. Infiltration into each section of sewer between adjoining manholes shall not exceed that allowed for the exfiltration test, except that head conditions shall be a maximum of 6 feet.

F. The Exfiltration Test may be limited to the manholes only when the authority having jurisdiction does not require the test and the construction manager waives the test. The Infiltration Test will always be required when excessive ground water is encountered in addition to the air test.

G. Air Test: Gravity systems shall be air tested between manholes at 3.5 psi for 5 minutes per ASTM F1417 for plastic pipes.

H. Deflection Test:
   1. Deflection tests shall be conducted on all plastic pipe using a mandrel with a diameter equal to 95 percent of the inside diameter of the pipe. The test shall be performed without mechanical pulling devices.
   2. Allowable Deflection: Maximum allowable pipe deflection shall not exceed 5 percent of nominal inside diameter.
   3. Mandrel: Mandrel, go/no-go, device shall be cylindrical in shape and constructed with either 9 or 16 evenly spaced arms or prongs. Mandrels with fewer arms will be rejected as not sufficiently accurate.

Contact length of mandrel's arms shall equal or exceed nominal inside diameter of sewer to be inspected. Critical mandrel dimensions shall carry tolerance of 0.01-inch maximum. Contractor shall provide mandrel and necessary equipment for mandrel test.

4. Procedure: Mandrel shall be hand-pulled through flexible pipe sewer lines no earlier than 30 days after trench has been completely backfilled. Sections of sewer not passing mandrel shall be uncovered and rebedded, rerounded, or replaced to satisfaction of Owner or governing agency. Repaired section shall be retested.

I. Hydrostatic Test: Force main piping shall be hydrostatically tested at 150 psi in accordance with AWWA C 600.

J. Provide measuring devices, meters, water, materials, and labor for making the required tests.

K. Tests shall be conducted in the presence of the Owner or his designee. Test data shall be submitted to the Engineer for review and approval.

END OF SECTION

SECTION 334000 - STORM DRAINAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Storm sewer drainage piping, fittings, and accessories.
2. Storm drainage structures.

1.2 Related Requirements:
1. Louisiana Department of Transportation and Development (DOTD) Standards and Specifications (LSSRB), latest edition.
2. Section 02300 – Earthwork: Excavation, trenching, backfill, and compaction.
3. Section 02370 – Erosion and Sedimentation Control (Including SWPPP).
4. Section 02536 - Sewer Manholes, Frames, and Covers.

1.3 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

B. American Association of State Highway and Transportation Officials (AASHTO):
1. AASHTO M 170 – Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
2. AASHTO M 190 - Bituminous Coated Corrugated Metal Culvert Pipe and Arches.
3. AASHTO M 252 - Corrugated Polyethylene Drainage Tubing, 3 to 10 Inch Diameter.
4. AASHTO M 294 - Corrugated Polyethylene Drainage Tubing, 12 to 60 Inch Diameter.
5. AASHTO M 306 - Drainage, Sewer, Utility, and Related Casting
6. AASHTO M 330 - Polypropylene Pipe, 300- to 1500-mm (12- to 60-in) Diameter

C. ASTM International (ASTM):
1. ASTM A 74 - Cast Iron Soil Pipe and Fittings.
2. ASTM A 185 - Steel welded Wire Fabric, Plain, for Concrete Reinforcement.
3. ASTM A 615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
4. ASTM A 674 – Polyethylene Encasement for Ductile Iron Pipe for Water or Other Liquids.
5. ASTM A 746 - Ductile Iron Gravity Sewer Pipe.
6. ASTM A 760 - Corrugated Steel Pipe, Metallic-Coated For Sewers And Drains.
7. ASTM A 796 - Structural Design Of Corrugated Steel Pipe, Pipe-Arches, And Arches For Storm And Sanitary Sewers And Other Buried Applications.
8. ASTM A 798 - Factory-Made Corrugated Steel Pipe For Sewers And Other Applications.
9. ASTM A 929 - Steel Sheet, Metallic-Coated By The Hot-Dip Process For Corrugated Steel Pipe.
10. ASTM C 76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
11. ASTM C 150 - Portland Cement.
12. ASTM C 206 - Finished Hydrated Lime.
13. ASTM C 443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
14. ASTM C 564 - Rubber Gasket for Cast Iron Soil Pipe and Fittings.
15. ASTM C 924 - Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.
16. ASTM C 969 - Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
17. ASTM C 990 - Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.
18. ASTM C 1628 – Joints for Concrete Gravity Flow Sewer Pipe, Using Rubber Gaskets.
19. ASTM D 2321 - Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications
20. ASTM D 3034 - Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.
21. ASTM D 3212 - Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

22. ASTM F 477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
23. ASTM F 949 - Poly (Vinyl Chloride)(PVC) Corrugated Sewer Pipe with Smooth Interior and Fittings.
24. ASTM F 1417 - Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air.
25. ASTM F 2306 - 12 to 60 Annular Corrugated Profile Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications.
26. ASTM F 2487 – Infiltration and Exfiltration Acceptance Testing of Installed Corrugated High Density Polyethylene Pipelines.
27. ASTM F 2736 - 6 to 30 in. (152 to 762 mm) Polypropylene (PP) Corrugated Single Wall Pipe and Double Wall Pipe.
28. ASTM F 2764 - 30 to 60 in. Polypropylene (PP) Triple Wall Pipe and Fittings for Non-Pressure Sanitary Sewer Applications.
29. ASTM F 2881 - 12 to 60 in. Polypropylene (PP) Dual Wall Pipe and Fittings for Non-Pressure Storm Sewer Applications

D. American Concrete Institute (ACI):
1. ACI 301 - Structural Concrete for Buildings.

E. UNI-Bell PVC Pipe Association:
1. UNI-B-6 – Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe.

1.4 SUBMITTALS

A. Project Record Documents:
1. Submit manufacturer information on all pipe, fittings, seals, etc. that will be used for the installation of the system.
2. Accurately record actual locations of pipe runs, connections, catch basins, cleanouts, and invert elevations.
3. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.

1.5 PROJECT CONDITIONS

A. Coordinate work with termination of storm sewer connection outside building including connection to municipal storm sewer system.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Pipe and joint materials specified below for storm drainage shall be strictly limited to the extent shown or allowed on the drawings or as specified in Part 3 hereinafter.

B. Reinforced Concrete Pipe (RCP): ASTM C 76, Class III unless noted otherwise on Drawings.
1. Joint Material: Provide joints to the extent allowable in Part 3 Joints.
a. Rubber O-ring Gasket: ASTM C 443, ASTM C 1628.
b. Bitumen or Butyl-Rubber Sealant: ASTM C990.
2. Flared End Sections: ASTM C 76 or, for sections with toe wall, AASHTO M 170.

C. Ductile Iron Pipe (DIP): ASTM A 746.
1. Fittings: Cast iron, ASTM A 74.
2. Joint Material: Rubber Gasket, ASTM C 564 for compression joints.

D. Polypropylene Pipe (PP): AASHTO M 330, ASTM F 2881, F2736, and F2764. Use only where specifically indicated on Drawings.
1. Joint Material: As shown in table in Part 3 for the type of joint allowed.
a. Rubber Gasket: ASTM F477
b. Rubber Gasket Joints: ASTM 3212.

E. High Density Polyethylene Pipe (HDPE): AASHTO M 252 Type S or SP, M 294 Type S or SP, or ASTM F 2306 smooth interior/annular exterior. Use only where specifically indicated on Drawings.
   1. Joint Material: As shown in table in Part 3 for the type of joint allowed.
      a. Rubber Gasket: ASTM F477
      b. Rubber Gasket Joints: ASTM 3212.
      c. Corrugated Coupling Bands: As recommended by manufacturer.

F. Polyvinyl Chloride (PVC) Pipe: ASTM D 3034, rated SDR 35, or ASTM F 949 for Profile Pipe, continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM D3034 classification. Only permitted when specifically indicated on Drawings.
   1. Joint Material: As shown in table in Part 3 for the type of joint allowed.
      a. Rubber Gasket: ASTM F477
      b. Rubber Gasket Joints: ASTM 3212.

G. Corrugated Steel (Metal) Pipe (CSP or CMP): ASTM A 760, pipe gauge shall be as shown on the drawings. Galvanized, aluminized (Type 1R), or bituminous coated as specified on Drawings. Use only where specifically indicated on Drawings. Corrugated steel pipe may be round pipe, arch pipe, or slotted drainpipe as indicated on Drawings. Slotted drainpipe shall have 1.75-inches wide drain waterway openings and 6 inches minimum height drain guide.
   1. CSP, bands and appurtenances shall be uniformly coated inside and outside with a 0.05 inch minimum thickness bituminous coating in accordance with AASHTO M 190.
   2. CSP shall be supplied with paved inverts or fully lined to provide a smooth interior, smooth flow lining only as indicated on the drawings.
   3. Joint Material:
      a. Semi-corrugated “Hugger” type bands and “O” ring gaskets.
      b. Semi-corrugated “Hugger” type bands.

H. Spiral Rib Metal Pipe: ASTM A760 Type 1R or Type IIR. Coatings shall meet requirements of ASTM A 929 and shall be galvanized, aluminized, or bituminous coated as specified on Drawings. Use only where specifically indicated on Drawings.
   1. Pipe gauge shall be as shown on the construction drawings. Standard corrugated steel pipe (CMP or CSP) shall not be substituted for Spiral Rib Metal Pipe.
   2. Acceptable manufacturers: Provide the following or approved equal:
      a. Ultra Flo or Ultra Flo II by Contech, Inc.
      b. Max Flow by Southeast Culvert, Inc.
      c. Max Flow by St. Regis Culvert, Inc.
      d. Max Flow by Thompson Culvert, Inc.
   3. Joint Material: Provide joints to the extent allowable in Part 3 Joints.
      a. Semi-corrugated “Hugger” type bands and “O” ring gaskets.
   4. Semi-corrugated “Hugger” type bands.

I. Subdrains: Perforated, PVC or flexible corrugated HDPE pipe as specified herein of the size indicated on the drawings.

2.2 ACCESSORIES

A. Encasement for Piping: ASTM A 674. Where required for corrosion protection for underground iron pipe and fittings.
   1. Material: High-density, crosslaminated polyethylene (PE) film of 0.004-inch (0.10-mm) minimum thickness.
   2. Form: Sheet or tube.
   3. Color: Black.

2.3 DRAINAGE STRUCTURES

A. Manholes: Conform to Section 02536.

B. Grates and Frames: Provide in accordance with details shown on Drawings or equivalent by one of the following acceptable manufacturers. Project needs vary depending on geographic region. To be connected with the best suited supplier, contact the manufacturer whose territory is nearest Project location.

1. Acceptable Manufacturers:
   a. South, Southeast, East Central: US Foundry (An Eagle Manufacturing Co.). Contact Roy Kohlier, (800) 432-9709 or (786) 402-3435. rkohlier@usfoundry.com
   b. Central, West Central, and East of Mississippi River: EJ Infrastructure Access Solutions d/b/a. East Jordan Iron Works. Contact Joe Lazzati, Director of Sales, (410)-833-6100; mobile (443) 324-4589. joe.lazzati@ejco.com.
   c. West, Northwest, Southwest, West Central: D&L Foundry and Supply (801) 785-5015.
   d. Central, North Central: Deeter Foundry. (800) 234-7466. sales@deeter.com
   e. Northeast: Neenah Foundry. (800) 558-5075.
2. Standard Grates and Frames: Heavy duty grates, AASHTO M 306 load rating of H-20, with maximum slot width of 1-1/8" and minimum width of 1". Where project and regional conditions allow, provide one of the following:
   a. Model 4230V-3 Grate and Frame by East Jordan (WM custom design).

   Model 2512-1002 Grate (2 required) and 2512-0010 Frame by Deeter (WM custom design).
3. Siphonic Break Manhole Grate and Frame: Heavy duty grate, AASHTO M 306 load rating of H-20, with maximum slot width of 1/2" and minimum net open area of 1.5 square feet. Where project and regional conditions allow, provide the following:
   a. Model R-2750 Grate and Frame by Neenah (WM custom design).

C. Concrete: Cast-In-Place concrete for drainage structures including manholes, inlets, catch basins, collars, support blocks, headwalls and paved ditches shall conform to the concrete requirements specified in Section 03311.

D. Cement Mortar used for paving inverts, filling lift holes, joints, patching and anchoring castings shall consist of one part Portland cement, type I, ASTM C 150, 1/4 part hydrated lime, ASTM C 206 and 2-1/2 parts clean, well-graded sand and water free of suspended matter, alkali, and containing no industrial or domestic waste.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that trench cut and excavation is ready to receive work and excavations, dimensions, and elevations are as indicated on Drawings.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over-excavation with bedding material.

B. Remove large stones or other hard matter that could damage piping or impede consistent backfilling or compaction.

C. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by licensed land surveyor and replaced, as necessary, by same.

3.3 INSTALLATION – PIPE

A. Install type of pipe shown on the drawings. Where type of pipe material is not shown or restricted on the drawings, provide only RCP or DIP. Installation provisions herein shall apply to the extent as applicable to the pipe and joints allowed.

B. Inspect pipe for defects and cracks before being lowered into the trench, piece by piece. Remove and replace defective, damaged or unsound pipe or pipe that has had its grade disturbed after laying. Protect open ends with a stopper to prevent earth or other material from entering the pipe during construction. Remove dirt, excess water, and other foreign materials from the interior of the pipe during the pipe laying progress.

C. Excavate pipe trench and place bedding material in accordance with Section 02300.

D. Install pipe in accordance with manufacturer's written recommendations.

E. Thermoplastic Pipe: Install pipe in accordance with pipe manufacturer's installation instructions and ASTM D 2321 and as indicated on the drawings.

F. Corrugated or Spiral Rib Metal Pipe: Install as indicated on the drawings, as recommended by the manufacturer, and in accordance with ASTM A 798 and A 796 as they apply.

G. HDPE Pipe: Install pipe in accordance with pipe manufacturer's installation Guidelines for Culvert Storm Drainage Applications and as indicated on the drawings.

H. Install polyethylene corrosion-protection encasement around iron piping as indicated on the drawings, as recommended by the manufacturer, and in accordance with ASTM A 674.

I. Commence installation at the lowest point for each segment of the route. Lay RCP with the groove or bell end upstream. Place riveted CSP with the inside circumferential laps pointing downstream. Repair damaged bituminous coating on CSP by applying bituminous material conforming to AASHTO M190.

J. Lay pipe to the required line and slope gradients with the necessary fittings, bends, manhole, risers and other appurtenances placed at the required location as noted on Drawings.

K. Do not displace or damage pipe when compacting.

L. Do not place pipe in water or when trench conditions are unsuitable for such work.

M. Joints: Construct joints as described herein and in accordance with manufacturer's installation instructions. Provide pipe joint type for soiltight, silttight, or watertight silttight or watertight only watertight only joint performance in accordance with the following table. Rubber gasketed joints shall conform to ASTM D 3212. The table applies only to the extent as applicable to the pipe and joint type and the joint performance as shown or specified.

Pipe and Joint Type	**Joint Performance**		
	Watertight	Silttight	Soiltight
RCP			
Rubber O-Ring Gasket	x	x	x
Bitumen or Butyl Rubber Sealant			x
DIP			
Rubber Gasket	x	x	x
PP			
Rubber Gasket	x	x	x
HDPE			
Rubber Gasket	x	x	x
Corrugated Coupling Bands			x
PVC			
Rubber Gasket	x	x	x
CMP or Spiral Rib Aluminum Pipe			
Hugger Band w/ O Ring Rubber Gasket		x	x
Hugger Band			x

3.4 INSTALLATION – MANHOLES, CATCH BASINS, INLETS, AND JUNCTION BOXES

A. Construct drainage structures in accordance with details shown on Drawings and in accordance with Section 02536 as applicable.

B. Precast Sections:
   1. Install precast section with bases in accordance with Section 02300 and 02536 or as shown on drawings.
   2. Align pipe openings to that of the pipe entering and leaving the manhole, etc. Properly Pipe with connections to manholes, etc. as shown on the drawings.

C. Invert channels shall be smooth and accurately shaped to a semicircular bottom conforming to the inside of the adjacent sewer section. Shape invert channels and structure bottoms with cement mortar. Changes in size and grade of invert shall be made gradually and evenly. Changes in direction of the sewer entering branch or branches shall have a true curve of as large a radius as the manhole will permit.

D. Frames and Covers:
   1. Set frames and covers to the proper elevation. Firmly embed frames in mortar approximately 1 inch thick and align to fit the top section of the structure.
   2. Limit bricks set in mortar and used to adjust the frame to finished grade to no more than four courses.
   3. Adjustment rings used to make adjustments in grade shall be made with the initial ring embedded in mortar and the exterior of the rings pargeted with mortar not less than 1/2 inch thick. No adjustment made in this manner shall exceed 8 inches.

E. Construct concrete cradles as shown on the drawings and in accordance with the strength requirements of the Architectural Structural Specification as needed when crossing over and under sewer pipe or utility lines.

3.5 SUBDRAINS

A. Install subdrains in accordance with the details and at the locations shown on the drawings.

3.6 INSPECTION AND TESTING

A. General:
   1. Clean, inspect, and test Strom sewer systems and culverts, upon completion or at such time as directed. The system or culvert shall have a true grade and line. Actual elevations shall be within 0.08 feet of the elevations given on the drawings.
   2. After completion of the Work, or any part thereof, the job shall be tested to determine that it has been installed in accordance with the drawings and specifications. In general, the Work shall prove to be in good condition, installed in accordance with the drawings and specifications and ready for use.

B. Cleaning and Testing:
   1. Visibly inspect and remove all debris and obstructions from storm pipe.
   2. Test for infiltration and exfiltration by hydrostatic testing per ASTM C 969. Manholes and concrete pipe shall conform to ASTM C 969 leakage criteria.

   3. Test watertight joints in accordance with the requirements of jurisdictional authorities, UNI-B-6 and the following:
      a. Option: Test plastic piping according to ASTM F 1417 or ASTM F 2487.
      b. Option: Test concrete piping according to ASTM C 924 or ASTM C 969.

C. Alignment Test: After backfill has been placed and compacted to a depth not less than one foot above top of pipe, a visual inspection shall be made by flashing a light between manholes. Correct displacement or misalignment of invert.

END OF SECTION