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ADDITIONS AND RENOVATIONS TO ASBURY HOSPICE HOUSE

FORREST GENERAL HOSPITAL
HATTIESBURG, MISSSISSIPPI

CN 24-4063C

OCTOBER 10, 2025

PROJECT MANUAL
SET NO

_____

5211 Old Highway 11, Hattiesburg, MS 39402 • Phone 601.271.7711 • Email: staff@llgarch.com

SECTION 00 00 03 – MEP INDEX

SECTION NUMBER	SECTION NAME	PAGES
DIVISION TWENTY-ONE – FIRE SUPPRESSION		
21 01 00	FIRE PROTECTION GENERAL PROVISIONS	
21 05 47	SEISMIC RESTRAINT OF FIRE PROTECTION EQUIPMENT AND SUSPENDED UTILITIES	
21 11 19	FIRE DEPARTMENT CONNECTION	
21 13 13	AUTOMATIC SPRINKER SYSTEMS	
DIVISION TWENTY-TWO – PLUMBING		
22 01 00	PLUMBING GENERAL PROVISIONS	
22 07 19	PLUMBING INSULATION	
22 11 16	DOMESTIC WATER PIPING AND VALVES	
22 11 19	DIMESTIC WATER BACKFLOW PREVENTERS, TRAP PRIMERS, AND SHOCK ABSORBERS	
22 13 16	SANITARY WASTE AND VENT PIPING	
22 13 19	SANITARY WASTE PIPING SPECIALTIES	
22 33 30	RESIDENTIAL, STORAGE ELECTRIC DOMESTIC WATER HEATERS	
22 43 13	HEALTHCARE PLUMBING FIXTURES	
DIVISION TWENTY-THREE – HEATING, VENTILATING, AND AIR CONDITIONING		
23 01 00	GENERAL PROVISIONS OF HVAC SYSTEMS	
23 05 13	ELECTRIC MOTORS	
23 05 49	BASIC MATERIALS AND METHODS FOR HVAC	
23 05 93	TESTING, ADJUSTING, AND BALANCING	
23 07 10	INSULATION	
23 09 23	DIRECT DIGITAL CONTROL BUILDING AUTOMATION SYSTEM	
23 23 00	REFIDERANT PIPING SYSTEM	
23 29 23	VARIABLE FREQUENCY MOTOR CONTROLLERS	
23 31 10	SHEET METAL DUCTOWRK LOW PRESSURE	
23 31 11	SHEET METAL DUCTWORK MEDIUM PRESSURE	
23 33 10	SHEET METAL SPECIALTIES	
23 34 50	SQUARE CENTRIFUGAL IN LINE FANS	
23 63 13	AIR-COOLED CONDENSING UNITS	
23 73 13	AIR HANDING UNIT MEDIUM OR LOW PRESSURE	
23 75 56	MULTI INDOOR UNIT VARIABLE REFRIGERANT FLOW SYSTEM	
23 81 26	SPLIT SYSTEM A/C UNITS	
DIVISION TWENTY-SIX – ELECTRICAL		
26 01 00	GENERAL PROVISIONS FOR ELECTRICAL SYSTEMS	
26 05 19	CONDUCTORS 600 VOLT AND BELOW	
26 05 26	GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS	
26 05 29	SUPPORTING DEVICES AND HANGERS	
26 05 34	RACEWAYS AND CONDUIT SYSTEMS	
26 05 37	OUTLET BOXES	
26 05 38	PULL AND JUNCTION BOXES	

26 05 45 PAD TRANSFORMER ELECTRIC SERVICE
26 24 16 PANELBOARDS
26 27 26 WIRING DEVICES
26 28 18 SAFETY SWITCHES
26 29 13 INDIVIDUAL STARTERS AND CONTROLS
26 33 25 EMERGENCY BATTERY POWER STATION
26 43 00 SURGE PROTECTIVE DEVICES
26 51 00 INTERIOR LIGHTING AND LAMPS
26 56 00 EXTERIOR LIGHTING AND LAMPS

DIVISION TWENTY-SEVEN – COMMUNICATIONS

27 00 00 COMMUNICATIONS 2
27 05 26 GROUNDING AND BONDING FOR COMMUNICATIONS
27 05 28 FIRESTOPPING FOR COMMUNICATIONS

DIVISION TWENTY-EIGHT – ELECTRONIC SAFETY AND SECURITY

28 31 00 FIRE ALARM SYSTEM
28 37 00 LOW VOLTAGE ROUGH IN

SECTION 00 00 05 – CIVIL INDEX

SECTION NUMBER	SECTION NAME	PAGES
DIVISION ZERO – PROCUREMENT AND CONTRACTING REQUIREMENTS		
00 00 07	SMALL CONSTRUCTION STORM WATER GENERAL PERMIT AND SWPPP NARRATIVE	12
DIVISION ONE - GENERAL REQUIREMENTS		
01 57 13	TEMPORARY EROSION & SEDIMENTATION CONTROL	11
01 71 23	CONSTRUCTION LAYOUT AND SURVEYING	1
DIVISION TWENTY-TWO – PLUMBING		
22 34 23	SUBMERSIBLE EFFLUENT PUMP	1
DIVISION THIRTY-ONE – EARTHWORK		
31 00 00	SITE EARTHWORK	7
31 10 00	SITE CLEARING	3
DIVISION THIRTY-TWO – EXTERIOR IMPROVEMENTS		
32 13 00	CAST IN PLACE CONRETE PAVING AND EXTERIOR SLABS	16
32 13 13.50	CONCRETE FORMWORK – PAVING	3
32 13 13.51	CONCRETE REINFORCEMENT – PAVING	2
32 16 00	CONCRETE CURBS, GUTTERS, AND WALKS	5
32 17 23	PAVEMENT MARKINGS	1
DIVISION THIRTY-THREE – UTILITIES		
33 11 00	WATER UTILITY DISTRIBUTION PIPING	10
33 30 00	SANITARY SEWERAGE SYSTEM (SITE WORK)	24
33 40 00	STORM DRAINAGE UTILITIES	4

STORM WATER POLLUTION PREVENTION PLAN (SWPPP)
&
SMALL CONSTRUCTION NOTICE OF INTENT (SCNOI)

FOR

Asbury Hospice House
Additions and Renovations
304 S 40th Ave
Hattiesburg, Mississippi

July, 2025

PREPARED BY:

the WALKER ASSOCIATES
1051 Jackson Road, Hattiesburg, MS 39402 (601)583-2127

TABLE OF CONTENTS

SECTION		PAGE NO.
I.	**Introduction**	2
II.	**Site Information**	
	A. Site Description	2
	B. Drainage Patterns	2
	C. Description of Work	2
	D. Potential Pollution Sources	3
	E. Non-Storm Water Discharges	3
	F. Non-Storm Water Solid Materials	3
III.	**Best Management Practices**	
	A. General	3
	B. Vegetative Controls	3
	C. Structural Controls	4
	D. Housekeeping Practices	4
	E. Post Construction Storm Water Management Measures	4
IV.	**Implementation Sequence**	5
V.	**Inspections, Maintenance and Reporting**	
	A. Inspections	5
	B. Maintenance	5
	C. Reporting	6
VI.	**Revisions**	6

Appendix A – Vegetative Seeding Schedule

Appendix B – Small Construction Forms Package

Appendix C – U.S.G.S Quadrangle Map and Aerial Map with Project Location

Appendix D – SWPPP Drawings

DRAWINGS

1. SWPPP
2. SWPPP Details

I. INTRODUCTION

The purpose of the Storm Water Pollution Prevention Plan (SWPPP) is to provide a site specific description of the best management practices to prevent contamination of the storm water with potential pollutants from construction activities related to the proposed project. The storm-water pollution prevention plan has been prepared as required by the City of Hattiesburg in accordance with the Mississippi Department of Environmental Quality regulations for construction projects that disturb between one (1) and five (5) acres of disturbed area.

This SWPPP is to be incorporated into the routine construction activities at the development. The potential sources of pollution have been identified at the site and are described in this plan. Several pollution control measures are specified in the plan to prevent contamination of storm water runoff from those sources. The plan also outlines implementation, inspection, and maintenance requirements. The erosion and sediment control practices should be monitored and the plan revised if the quality of storm water runoff is not satisfactory.

All personnel engaging in construction activities will follow this SWPPP.

II. SITE INFORMATION

A. **Site Description:** The site is located at Asbury Hospice House, 304 S 40th Avenue, Hattiesburg MS.
This site has an existing storm water detention pond to the north and southeast of the subject property. Storm water drains from the north half of the site to the detention pond to the north, storm water from the south half of the site flows to the detention pond at the southeast corner of the property. According to the Web Soil Survey website maintained by the Natural Resources Conservation Service, this site slopes range from two to five percent (2 - 5%). The site consists of the soil type Falkner-Susquehanna-Urban land complex. The property is located in Flood Zone "X" as per Flood Insurance Rate Map (FIRM) Numbers 28035C0103D having an effective date March 2nd, 2010. Zone "X" is designated on said FIRM as "Areas Determined to be Outside the 0.2% Annual Chance Floodplain".

B. **Drainage Patterns:** Proposed site improvements will cause runoff from the north half of the project site to discharge into the existing north storm water detention basin, and the runoff from the south half of the project site to discharge into a different existing south storm water detention basin. Which flows into a branch of Gordons Creek which flows east before confluencing with the Leaf River.

C. **Description of Work:** Initial earthwork operations will consist of establishment of erosion control measures, followed by completion of on-site grading/excavation. Erosion control measures will be implemented to prevent the off-site runoff of sediment from disturbed areas. Phases of construction include topsoil stripping, site grading/excavation, installation of proposed

storm drains, installation of utilities, pavement construction, and building construction. The total disturbed area for the development is estimated at 0.93 acres.

D. Potential Pollution Sources: The most significant potential pollutants are soil particles subject to removal by storm water. Other potential pollutants subject to removal by storm water are spilled fuel and lubricants. Material may also be inadvertently tracked off-site or blown off-site when distributed by hauling equipment.

E. Non-Storm Water Discharges: Potential non-storm water discharges consist of irrigation water and water used for dust control. No significant impact is anticipated from these sources, and all discharged water is expected to be detained in the existing detention basin prior to discharge.

F. Non-Storm Water Solid Materials: The on-site generation of solid materials will be minimal, and its proper disposal will be closely monitored. All solid waste will be taken off-site for proper disposal.

III. BEST MANAGEMENT PRACTICES AND CONTROLS

A. General: In order to prevent contamination of storm water by the potential pollutants previously discussed, erosion and sediment controls during construction will be designed to prevent and minimize erosion and retain sediment onsite to the extent practical, and to ensure that no significant changes occur in the volume or characteristics of storm water runoff to receiving waters. All erosion and sediment control measures will be properly selected, installed, and maintained in accordance with the manufacturer's specifications and sound engineering practices. These measures shall be installed in accordance with the details provided and located at periodic intervals. All disturbed areas shall be grassed, and existing vegetation on undisturbed areas shall be maintained as long as possible.

The storm water which leaves the site shall meet the non-numeric limitations of being free from the following:

- oil, scum, debris and other floating materials; eroded soils and other materials that will settle out of the storm water to form objectionable deposits in receiving waters;
- suspended solids, turbidity and color levels inconsistent with the receiving waters; and
- chemicals in concentrations what would cause violations of the State Water Quality Criteria in the receiving waters.

B. Vegetative Controls: Existing trees will be preserved where possible. All diversions will be seeded (permanent seeding) immediately after completion of construction. Topsoil will be stockpiled for use in landscaping. Grass-lined waterways will be dressed with a thin layer of topsoil, seeded and mulched

immediately after completion of construction. Temporary straw-net liners may be required on steeper ditches and slopes to facilitate vegetative growth. Steeper ditch slopes may require permanent treatment such as solid sod or concrete paving of the inverts to prevent erosion. All 3:1 cut slopes will be roughened by disking prior to seeding. After rough grading or installation of storm drainage and utilities, all disturbed areas where construction activities have temporarily ceased and will not resume for a period of fourteen (14) days or more, shall be immediately seeded and mulched. After final grading, all disturbed areas will be stabilized immediately after completion of final grading.

See Appendix A for seeding, fertilizing, and mulching rates.

C. Structural Controls: Prior to establishment of permanent vegetation on reclaimed areas, temporary controls will be established and maintained during construction. Where possible, upslope waters shall be diverted around disturbed areas. Intermittent berms and turn-outs shall be used on steep haul roads slopes as a means to minimize longitudinal erosion and to provide drainage relief.

Silt fence shall be placed along the downstream side of excavation areas and to protect the ditches from erosion. Silt fences shall also be installed along the toe of fill slopes and around the perimeter of topsoil stockpiles to prevent off-site sediment runoff. Wattles shall be used to stabilize slopes and protect ditches from erosion. Inlet protection (wattles) will be installed around drainage structures to form a barrier. A construction entrance will be placed at a designated location, and any accumulation of mud on vehicle tires will be washed, if needed, during muddy conditions. Mulch and or matting will be placed around the building perimeter to prevent erosion from roof drainage prior to installation of downspouts.

D. Housekeeping Practices: All equipment maintenance and repair will occur off-site. Trash cans or dumpsters will be placed at convenient locations throughout site. The main trash collection bin will be located for convenient use and pickup by disposal entity. Paints, solvents, fertilizers, or any other potentially toxic materials will not be stored on-site. Portable sanitary facilities will be provided for construction workers during construction. Concrete truck drivers will be instructed to return any materials to the concrete batch plant and complete final washing procedures at that location.

E. Post-Construction Storm Water Management Measures. All disturbed areas shall be stabilized with a complete stand of grass. Any sediment collected in the existing detention basin shall be removed an permanent vegetation shall be established.

IV. IMPLEMENTATION SEQUENCE

The owner or prime contractor shall prepare an orderly listing which coordinates the timing of all major land-disturbing activities together with the necessary erosion and sedimentation control measures planned for the project. For the purposes of this project, the Implementation Sequence is described below:

1. *Construction Entrance*
2. *Storage Areas*
3. *Install Silt Fence Downslope of Disturbed Area*
4. *Strip and Stockpile Topsoil with Silt Fence Barrier around Topsoil Pile*
5. *Site Grading and Excavation*
6. *Storm Drainage Installation with Inlet/Outlet Protection and Wattles Along Swales*
7. *Plant Temporary Vegetation on Disturbed Areas*
8. *Install Utilities*
9. *Complete Concrete Paving and Integral Curb*
10. *Building and Sidewalk Construction*
11. *Install Mulch or Other Matting at Building Dripline*
12. *Apply Topsoil to Disturbed Areas and Plant Permanent Vegetation and Ditch Treatment As Needed (Sod, Concrete Ditch Paving, Etc.)*
13. *After Site is Stabilized, Remove All Temporary Measures (Silt Fence, Wattles, Construction Entrance, Etc.)*

V. INSPECTIONS, MAINTENANCE AND REPORTING

A. Inspections: Inspections of the best management practices and other storm water pollution prevention plan requirements shall be performed by the contractor or owner as follows:

1. At least once weekly.
2. After the occurrence of all rain events significant enough to produce a discharge.
3. As often as necessary to insure that appropriate erosion and sediment controls have been properly constructed and maintained.

B. Maintenance: Any deficiencies noted during the inspection process should be repaired or remedied within 24 hours. Remove sediment from structural controls (i.e., inlet protection devices, wattles, silt fences, etc.) when accumulated sediment has reach one-third to one-half the height of the control. Replace non-functional silt fence. Maintain all vegetated areas to provide

proper ground cover; reseed, fertilize and mulch as needed to minimize erosions and sedimentation.

C. Reporting: The Contractor must inspect, as described in above section, and maintain controls and keep all reports on file noting damages or deficiencies and corrective measures, using the form provided in the appendix of this plan. No reports should be submitted to the Mississippi Department of Environmental Quality unless specifically requested. As previously stated, all records, reports, and information resulting from activities required by this plan and your permit should be retained for at least three years from the date of the CNOI, inspection or report.

A rain gauge is recommended to be placed in a central location on the site and used to obtain rainfall amounts. This information will assist with proper completion of the inspection report.

VI. REVISIONS

The storm water prevention plan will be kept current by the company representative and will be revised as changes in site conditions warrant. The company representative may notify the SWPPP developer for assistance when necessary. Factors that would compel the SWPPP to be modified include:

- Significant inadequacies revealed by routine inspections;
- Changes in identified sources, non-storm water discharges, or non-storm water solid wastes; or
- MDEQ or local agency notification that the plan does not meet one or more of the minimum requirements.
- An increase in the scope of the project outside of the original plan. If the site footprint and disturbed area is increased but remains below five (5) acres, then a revised SWPPP and SCNOI shall be prepared by the Owner and kept on file. If the site footprint and disturbed area is increased to equal or above five (5) acres, then before construction activities commence on the expanded area, an updated SWPPP and Large Construction Notice of Intent (LCNOI) shall be prepared and submitted to the MDEQ for storm water coverage.

A plan revision will be completed within 30 days of the date is determined that a revision is warranted. If the modification is in response to a request by the MDEQ, the permittee must submit to the MDEQ certification that the requested changes have been made.

APPENDIX B

Small Construction Forms Package

Submit only upon request from MDEQ

MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY

SMALL CONSTRUCTION NOTICE OF INTENT (SCNOI)

GENERAL NPDES PERMIT MSR15 __ __ __ __ (Number to be assigned by MDEQ if submitted)

Prior to the commencement of small construction activity (see Small Construction General Permit ACT11, T-17), the owner or operator of a small construction project must complete this form and develop a Storm Water Pollution Prevention Plan (SWPPP) as required by ACT5 of Mississippi's Small Construction General Permit. **This SCNOI and SWPPP shall be submitted to the Mississippi Department of Environmental Quality (MDEQ) only upon request from MDEQ; however, the SCNOI and SWPPP must be maintained at the permitted site or locally available in case inspector review is necessary.** Attachments with this SCNOI must include: a USGS quad map or copy showing site location (only if required to be submitted to MDEQ) and a Storm Water Pollution Prevention Plan (SWPPP). All questions must be answered – answer "NA" if the question is not applicable.

PROJECT INFORMATION

OWNER CONTACT PERSON: Charlie Williamson

OWNER COMPANY NAME: Forrest General Hospital

OWNER STREET (P.O. BOX): 6051 US Hwy 49

OWNER CITY: Hattiesburg

STATE: MS **ZIP:** 39401

OWNER PHONE # (INCLUDE AREA CODE): 601-288-2792

OPERATOR (if different from owner) CONTACT PERSON:

OPERATOR COMPANY:

OPERATOR STREET (P.O. BOX):

OPERATOR CITY:

STATE: **ZIP:**

OPERATORPHONE # (INCLUDE AREA CODE):

PROJECT NAME: Asbury Hospice House Additions and Renovations

DESCRIPTIONOF CONSTRUCTION ACTIVITY: Clearing and Grubbing, Topsoil Stripping, parking lot construction Intallation of Storm Drainage and Utilities, and Building Construction

ACREAGE DISTURBED (to be covered by this permit, area must be less than five (5) acres): 0.87

PHYSICAL SITE ADDRESS (If not available, indicate the nearest named road. For linear projects, indicate the beginning of the project and identify all counties the project traverses.):

STREET: 304 S 40th Ave

CITY: Hattiesburg **COUNTY:** Forrest **ZIP:** 39402

NEAREST NAMED RECEIVING STREAM: Gordons Creek

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature[1] **Date Signed**

Printed Name **Title**

[1]This application shall be signed according to the Small Construction General Permit, ACT10, T-4.

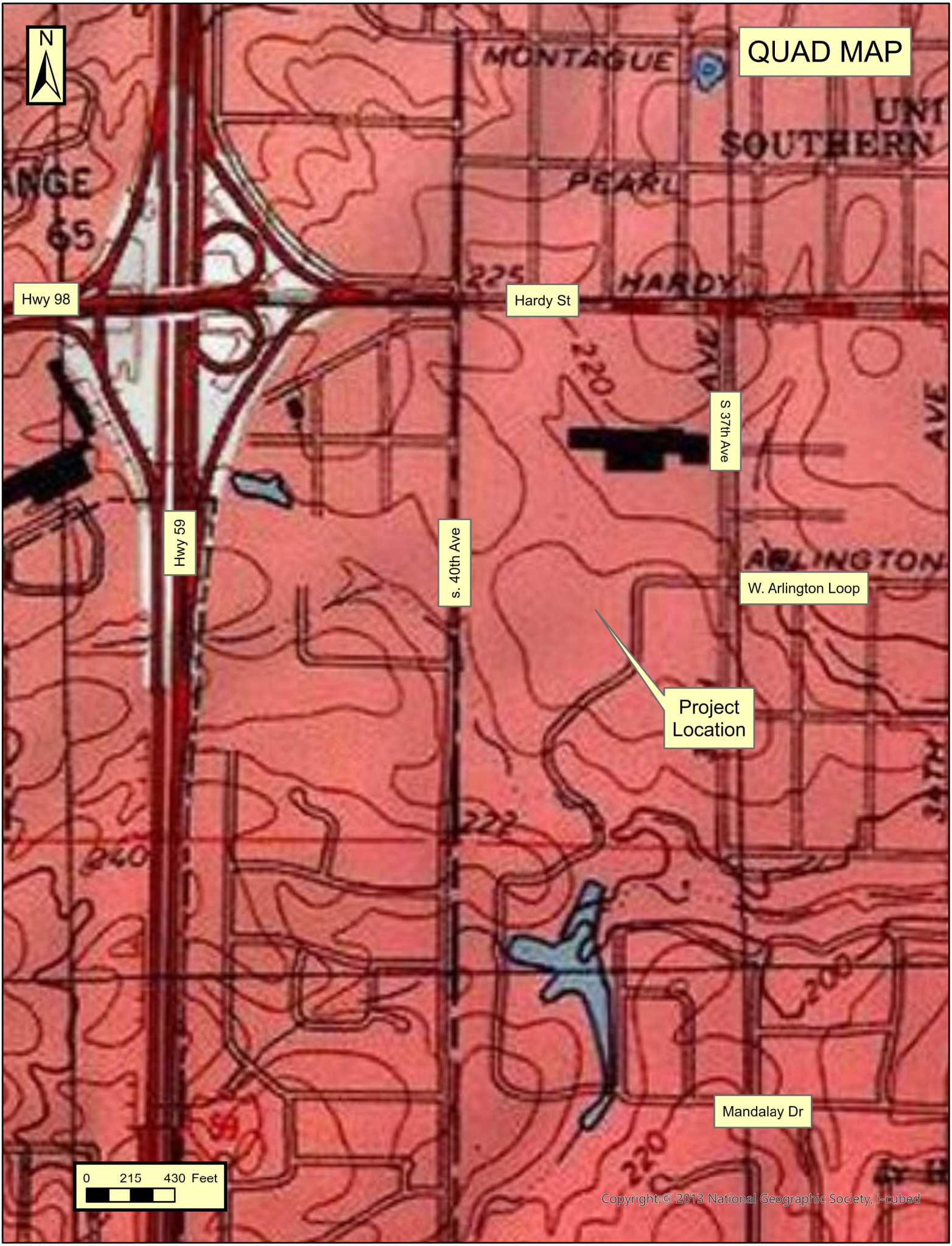
If requested, please submit this form to:

Chief, Environmental Permits Division
MDEQ, Office of Pollution Control
P.O. Box 2261
Jackson, Mississippi 39225

APPENDIX C

U.S.G.S. Quadrangle and Aerial Maps

(With Project Location)


QUAD MAP
N
MONTAGUE
SOUTHERN
PEARL
HARDY
Hwy 98
Hardy St
S 37th Ave
Hwy 59
s. 40th Ave
W. Arlington Loop
Project Location
Mandalay Dr
0 215 430 Feet
Copyright © 2013 National Geographic Society, i-cubed

AERIAL MAP
N
Hwy 98
Hardy St
S 37th Ave
Hwy 59
s. 40th Ave
W. Arlington Loop
Project Location
Mandalay Dr
0 215 430 Feet
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community, Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community, Copyright © 2013 National Geographic Society, i-cubed

SECTION 00 01 15 LIST OF DRAWING SHEETS

A. CONTRACT DRAWINGS

1.1 Drawings consist of the Contract Drawings and other drawings listed on the Table of Contents page of the separately bound drawing set, as modified by subsequent Addenda and Contract modifications:

A. Titled: Additions and Renovations to Asbury Hospice House

B. Dated: 10/10/25

1.2 LIST OF DRAWINGS:

A. Civil Engineer:

1. The Walker Associates, P.E., 1051 Jackson Rd., Hattiesburg, Mississippi 39402

2. Responsible for:

C1.1 NOTES, LEGEND, AND ABBREVIATIONS

C2.1 EXISTING CONDITIONS AND DEMOLITION PLAN

C2.2 EROSION CONTROL PLAN

C3.1 SITE PLAN

C4.1 GRADING AND DRAINAGE PLAN

C5.1 UTILITY PLAN

C6.1 EROSION CONTROL DETAILS

C6.2 SEWER AND WATER DETAILS

C6.3 MISCELLANEOUS DETAILS

B. Landscape:

1. Christian Preus Landscape Architecture, 307 De La Mare Avenue, Fairhope, AL 36532

3. Responsible for:

L1.0 LANDSCAPE PLAN

L2.0 LANDSCAPE DETAILS

I1.0 IRRIGATION PLANS

I2.0 IRRIGATION DETAILS

C. Architectural:

1. Landry Lewis Germany Architects, P.A., 5211 Old Highway 11, Hattiesburg, Mississippi 39402

2. Responsible for:

COVER SHEET

A0.1 NEW WORK REFERENCE SITE PLAN

A0.2 OVERALL REFERENCE FLOOR PLANS AND WORK NOTES

AA1.1 PHARMACY - FLOOR PLAN, SCHEDULES, LEGENDS, AND NOTES

AA1.2 PHARMACY - ROOF PLAN AND DETAILS

AA1.3 PHARMACY - REFLECTED CEILING PLAN, LEGEND, NOTES, AND DETAILS

AA2.1 PHARMACY - EXTERIOR ELEVATIONS

AA3.1 PHARMACY - BUILDING SECTIONS AND DETAILS

AA4.1 PHARMACY - WALL SECTIONS AND DETAILS

AA4.2 PHARMACY - WALL SECTIONS AND DETAILS

AA4.3 PHARMACY - WALL SECTIONS AND DETAILS

AA4.4 PHARMACY - WALL SECTIONS

AA4.5 PHARMACY - WALL SECTIONS AND DETAILS

AA5.1 PHARMACY - DETAILS

AA6.1 PHARMACY - DOOR TYPE SCHEDULE, WINDOW TYPE SCHEDULE, EXTERIOR LOUVER ELEVATION, DETAILS

AA7.1 PHARMACY - MILLWORK ELEVATIONS AND SECTIONS

AA7.2 PHARMACY - CASEWORK ELEVATIONS

AA7.3 PHARMACY - CASEWORK SECTIONS

AA8.1 PHARMACY - LIFE SAFETY PLAN AND CODE REVIEW

BA1.1 PAVILION - PLANS, ELEVATIONS, AND LEGEND

BA2.2 PAVILION - BUILDING SECTIONS AND WALL SECTIONS

CA1.1 INTERIOR RENOVATIONS - DEMO FLOOR PLANS, FLOOR PLANS, REFLECTIVE CEILING PLAN, LEGENDS, AND SCHEDULES

CA1.2 INTERIOR RENOVATIONS - ELEVATIONS, WALL SECTIONS AND DETAILS

D. Interior Designer:

1. Taylor Design Group, Inc., 193 Sidecamp Rd., Inlet Beach, FL 32461

2. Responsible for:

ID1.1 INTERIOR FINISH LEGEND AND NOTES

E. Structural Engineer:

1. Second Moment Structural Engineering, LLC, 228 Zelma Lane, Florence, Mississippi 39073

2. Responsible for:

S0.1 NOTES
S0.2 3D VIEWS - NORTHWEST
AS1.4 FOUNDATION PLAN - PHARMACY ADDITION
AS1.5 ROOF BEAM FRAMING PLAN PHARMACY
AS1.6 PHARMACY ADDITION ROOF FRAMING PLAN
AS2.2 BUILDING SECTIONS
AS2.3 BUILDING ELEVATIONS
AS3.1 FOUNDATION DETAILS
BS1.1 FOUNDATION PLAN - NEW CANOPY
BS1.2 ROOF BEAM PLAN - NEW CANOPY
BS1.3 ROOF FRAMING PLAN - NEW CANOPY
BS2.1 BUILDING SECTIONS
S3.1 FOUNDATION DETAILS

F. Plumbing Engineer:

1. I.C. Thomasson Associates, Inc., 215 North First Street, Brookhaven, MS 39601

2. Responsible for:

P0.1 LEGENDS - PLUMBING
P0.2 CLINIC ENLARGED PLANS -PLUMBING
P1.1 PHARMACY FLOOR PLAN - PLUMBING
P2.1 UNDERGROUND PHARMACY PLAN - SANITARY
P2.2 PHARMACY FLOOR PLAN - SANITARY
P2.3 ROOF PLAN - SANITARY
P3.1 RISER - PLUMBING
P4.1 DETAILS - PLUMBING
P4.2 DETAILS - PLUMBING
P5.1 SCHEDULES – PLUMBING

G. Fire-Protection Engineer:

1. I.C. Thomasson Associates, Inc., 215 North First Street, Brookhaven, MS 39601
2. Responsible for:

FP0.1 LEGENDS - FIRE PROTECTION
FP0.2 CLINIC ENLARGED PLANS - FIRE PROTECTION
FP1.1 PHARMACY FLOOR PLAN - FIRE PROTECTION

H. Mechanical Engineer:

1. I.C. Thomasson Associates, Inc., 215 North First Street, Brookhaven, MS 39601
2. Responsible for:

M0.1 MECHANICAL LEGENDS
M0.2 CLINIC ENLARGED PLANS - MECHANICAL
M1.1 PHARMACY FLOOR PLAN - HVAC
M2.1 PHARMACY FLOOR PLAN - HVAC PIPING
M3.1 VRF DIAGRAMS - HVAC
M4.1 MECHANICAL DETAILS
M4.2 MECHANICAL DETAILS
M5.1 MECHANICAL SCHEDULES
M6.1 MECHANICAL CONTROLS
M6.2 MECHANICAL CONTROLS

I. Electrical Engineer:

1. I.C. Thomasson Associates, Inc., 215 North First Street, Brookhaven, MS 39601
2. Responsible for:

E0.1 LEGENDS - ELECTRICAL
E0.2 CLINIC ENLARGED PLANS - ELECTRICAL
E0.3 NEW SITE PLAN - ELECTRICAL
E1.1 PHARMACY FLOOR PLAN - LIGHTING
E2.1 PHARMACY FLOOR PLAN - POWER
E3.1 PHARMACY FLOOR PLAN - SYSTEMS
E4.1 DETAILS - ELECTRICAL
E4.2 DETAILS - ACCESS CONTROL
E5.1 POWER RISER - ELECTRICAL
E6.1 PANEL SCHEDULES

END OF SECTION

SECTION 00 11 13 ADVERTISEMENT FOR BIDS

THE BOARD OF TRUSTEES OF FORREST COUNTY GENERAL HOSPITAL WILL RECEIVE SEALED PROPOSALS FOR THE FOLLOWING:

ASBURY HOSPICE HOUSE ADDITIONS AND RENOVATIONS

CN 24-4063J

SEALED BIDS

TIME FOR RECEIPT: SEALED BIDS WILL BE RECEIVED UNTIL **10:00 A.M. CST, ON WEDNESDAY, DECEMBER 17, 2025**.

LOCATION FOR RECEIPT:
THE EAGLE ROOM
FORREST GENERAL HOSPITAL SUPPORT SERVICES BUILDING, ON 3RD FLOOR
125 SOUTH 28TH AVENUE
HATTIESBURG, MISSISSIPPI 39402

ELECTRONIC BIDDING OPTION:
BIDS MAY BE SUBMITTED IN PERSON OR, FOR THOSE INTERESTED, BIDS CAN BE ELECTRONICALLY SUBMITTED AT WWW.LLGARCHPLANS.COM UNDER THE PROJECT NAME.

BID OPENING: BIDS RECEIVED ON TIME WILL BE OPENED PUBLICLY AND READ ALOUD IN THE **EAGLE ROOM** OF THE FORREST GENERAL HOSPITAL - SUPPORT SERVICES BUILDING, ON 3RD FLOOR, PROMPTLY AFTER TIME FOR RECEIPT.

A VOLUNTARY PRE-BID CONFERENCE WILL BE HELD AT 10:00 A.M. CST, ON WEDNESDAY DECEMBER 10, 2025 AT THE FOLLOWING LOCATION:

THE EAGLE ROOM
FORREST GENERAL HOSPITAL - SUPPORT SERVICES BUILDING, ON 3RD FLOOR
125 SOUTH 28TH AVENUE
HATTIESBURG, MISSISSIPPI 39402

PROJECT DESCRIPTION

THE ADDITIONS TO ASBURY HOSPICE HOUSE INCLUDE A NEW STAND-ALONE PHARMACY BUILDING, COVERED OUTDOOR CONNECTING BREEZEWAY, PAVILION FOR ACTIVITIES LOCATED BEHIND THE EXISTING FACILITY, AND SOME INTERIOR RENOVATIONS AS INDICATED ON THE DRAWINGS.

CONTRACTING ARRANGEMENT: A SINGLE LUMP SUM CONTRACT SHALL BE LET FOR THE COMPLETE WORK DESCRIBED IN THE BIDDING DOCUMENTS.

DOCUMENTS

PLAN HOLDERS ARE REQUIRED TO REGISTER AND ORDER BID DOCUMENTS AT WWW.LLGARCHPLANS.COM. BID DOCUMENTS ARE NON-REFUNDABLE AND MUST BE PURCHASED THROUGH THE WEBSITE. ALL PLAN HOLDERS ARE REQUIRED TO HAVE A VALID EMAIL ADDRESS FOR REGISTRATION. PLEASE CONTACT PLAN HOUSE PRINTING, 1A CHURCHILL STREET, HATTIESBURG, MS, 39402, 601-336-6378 FOR QUESTIONS REGARDING WEBSITE REGISTRATION AND ONLINE ORDERS. THE COST OF BID DOCUMENTS SHALL BE $400.00 PER HARD COPY AND $200.00 PER DIGITAL COPY.

BIDDING REQUIREMENTS

BIDS SHALL BE SUBMITTED IN DUPLICATE ONLY UPON THE BLANK BID FORMS PROVIDED WITH THE PROJECT MANUAL AND MUST BE ACCOMPANIED BY BID SECURITY IN THE FORM OF A CERTIFIED CHECK OR ACCEPTABLE BID BOND IN AN AMOUNT EQUAL TO AT LEAST FIVE PERCENT (5%) OF THE BASE BID. SAID SECURITY TO BE FORFEITED, AS LIQUIDATED DAMAGES, NOT PENALTY, BY A BIDDER WHO MAY BE AWARDED THE CONTRACT, BUT WHO FAILS TO CARRY OUT THE TERMS OF THE PROPOSAL, EXECUTE THE CONTRACT, AND POST THE REQUIRED PERFORMANCE AND PAYMENT BONDS IN THE FORM AND AMOUNT, AND WITHIN THE TIME SPECIFIED. THE BID BOND, OR THE CERTIFIED CHECK, IF USED IN LIEU THEREOF, SHALL BE PAYABLE UNCONDITIONALLY TO FORREST COUNTY GENERAL HOSPITAL.

BIDS ON THE PROJECT MUST BE RECEIVED ON OR BEFORE THE TIME SPECIFIED ABOVE, AND NO BID MAY BE WITHDRAWN AFTER THE SCHEDULED CLOSING TIME AND DATE FOR THE RECEIPT OF BIDS FOR A PERIOD OF FORTY-FIVE (45) DAYS. ALL BIDS SUBMITTED MUST COMPLY WITH THE REQUIREMENTS OF CHAPTER 3, TITLE 31 (SECTIONS 31-3-1, ET. SEQ.) OF THE MISSISSIPPI CODE OF 1972, AS AMENDED, AND THE PERFORMANCE OF ANY CONTRACT AWARDED SHALL BE BONDED IN ACCORDANCE WITH CHAPTER 5, TITLE 31 OF THE MISSISSIPPI CODE OF 1972, AS AMENDED.

BIDDERS WHO ARE NON-RESIDENTS OF THE STATE OF MISSISSIPPI MUST ALSO COMPLY WITH THE PROVISIONS OF SECTION 31-3-21(3) OF THE MISSISSIPPI CODE OF 1972, AS AMENDED.

THE BOARD RESERVES THE RIGHT TO REJECT ANY AND ALL BIDS AND TO WAIVE INFORMALITIES.

DATED THIS 19TH DAY OF NOVEMBER, A.D. 2025.
CHARLIE WILLIAMSON, EXECUTIVE DIRECTOR, FACILITIES SERVICES, PROPERTY MANAGEMENT, FORREST GENERAL HOSPITAL

PUBLISH WEDNESDAY NOVEMBER 19 AND NOVEMBER 26, 2025

END OF SECTION

SECTION 00 50 00 CONTRACT FORMS AND SUPPLEMENTS

PART 1 GENERAL

1.01 AGREEMENT AND CONDITIONS OF THE CONTRACT

A. The Agreement form is AIA A101.

B. The General Conditions form is AIA A201.

C. Power of Attorney: Attorneys in fact who sign contract bonds must file with each bond a certified and effectively dated copy of their Power of Attorney.

1.02 FORMS

A. Use the following forms for the specified purposes unless otherwise indicated elsewhere in Contract Documents.

B. Bond Forms:

1. Bid Bond Form: AIA A310.
2. Performance and Payment Bond Form: AIA A312. Bond shall include payment of taxes.

C. Post-Award Certificates and Other Forms:

1. Schedule of Values Form: AIA G703.
2. Application for Payment Forms: AIA G702 with AIA G703 (for Contractors).

D. Clarification and Modification Forms:

1. Architect's Supplemental Instructions Form: AIA G710.
2. Construction Change Directive Form: AIA G714.
3. Change Order Form: AIA G701.

1.03 REFERENCE STANDARDS

A. AIA A101 - Standard Form of Agreement Between Owner and Contractor where the basis of Payment is a Stipulated Sum 2017.

B. AIA A201 - General Conditions of the Contract for Construction 2017.

C. AIA A310 - Bid Bond 2010.

D. AIA A312 - Performance Bond and Payment Bond 2010.

E. AIA G701 - Change Order 2017.

F. AIA G702 - Application and Certificate for Payment 1992.

G. AIA G703 - Continuation Sheet 1992.

H. AIA G704 – Certificate of Substantial Completion 2017.

I. AIA G710 - Architect's Supplemental Instructions 2017.

J. AIA G714 - Construction Change Directive 2017.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 00 72 00 GENERAL CONDITIONS

FORM OF GENERAL CONDITIONS

1.01 Document A-201, issued by the American Institute of Architects, 2017 edition, relates to the work of this project and is hereby made part of this Contract, a copy of which follows.

A. The Contractor is hereby specifically directed, as a condition of the Contract, to obtain the necessary number of copies of Document A 201, to acquaint himself with the Articles contained therein and to notify and apprise all subcontractors, suppliers, and any other parties to the contract or individuals or agencies engaged on the work as to its contents.

B. No contractual adjustments shall be due or become exigent as a result of failure on the part of the contractor to fully acquaint himself and all other parties to the contract with the conditions of Document A 201.

RELATED REQUIREMENTS

2.01 SECTION 007300 - Supplementary Conditions.

2.02 SECTION 014216 - Definitions.

SUPPLEMENTARY CONDITIONS

3.01 REFER TO DOCUMENT 007300 - Supplementary Conditions FOR AMENDMENTS TO THESE GENERAL CONDITIONS.

END OF SECTION

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

Additions and Renovations to
Asbury Hospice House
Forrest General Hospital
Hattiesburg, Mississippi
CN 24-4063C

THE OWNER:
(Name, legal status and address)

Forrest General Hospital
6051 US Highway 49
Hattiesburg, Mississippi 39401

THE ARCHITECT:
(Name, legal status and address)

Landry Lewis Germanry Architects, P.A
5211 Old Highway 11
Hattiesburg, Mississippi 3940

ADDITIONS AND DELETIONS:
The author of this document may have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™–2017, Guide for Supplementary Conditions.

TABLE OF ARTICLES

1 GENERAL PROVISIONS

2 OWNER

3 CONTRACTOR

4 ARCHITECT

5 SUBCONTRACTORS

6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

7 CHANGES IN THE WORK

8 TIME

9 PAYMENTS AND COMPLETION

10 PROTECTION OF PERSONS AND PROPERTY

11 INSURANCE AND BONDS

12 UNCOVERING AND CORRECTION OF WORK

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13 MISCELLANEOUS PROVISIONS

14 TERMINATION OR SUSPENSION OF THE CONTRACT

15 CLAIMS AND DISPUTES

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INDEX

(Topics and numbers in bold are Section headings.)

Acceptance of Nonconforming Work
9.6.6, 9.9.3, **12.3**
Acceptance of Work
9.6.6, 9.8.2, 9.9.3, 9.10.1, 9.10.3, 12.3
Access to Work
3.16, 6.2.1, 12.1
Accident Prevention
10
Acts and Omissions
3.2, 3.3.2, 3.12.8, 3.18, 4.2.3, 8.3.1, 9.5.1, 10.2.5, 10.2.8, 13.3.2, 14.1, 15.1.2, 15.2
Addenda
1.1.1
Additional Costs, Claims for
3.7.4, 3.7.5, 10.3.2, 15.1.5
Additional Inspections and Testing
9.4.2, 9.8.3, 12.2.1, **13.4**
Additional Time, Claims for
3.2.4, 3.7.4, 3.7.5, 3.10.2, 8.3.2, **15.1.6**
Administration of the Contract
3.1.3, **4.2**, 9.4, 9.5
Advertisement or Invitation to Bid
1.1.1
Aesthetic Effect
4.2.13
Allowances
3.8
Applications for Payment
4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5.1, 9.5.4, 9.6.3, 9.7, 9.10
Approvals
2.1.1, 2.3.1, 2.5, 3.1.3, 3.10.2, 3.12.8, 3.12.9, 3.12.10.1, 4.2.7, 9.3.2, 13.4.1
Arbitration
8.3.1, 15.3.2, **15.4**
ARCHITECT
4
Architect, Definition of
4.1.1
Architect, Extent of Authority
2.5, 3.12.7, 4.1.2, 4.2, 5.2, 6.3, 7.1.2, 7.3.4, 7.4, 9.2, 9.3.1, 9.4, 9.5, 9.6.3, 9.8, 9.10.1, 9.10.3, 12.1, 12.2.1, 13.4.1, 13.4.2, 14.2.2, 14.2.4, 15.1.4, 15.2.1
Architect, Limitations of Authority and Responsibility
2.1.1, 3.12.4, 3.12.8, 3.12.10, 4.1.2, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.2.7, 4.2.10, 4.2.12, 4.2.13, 5.2.1, 7.4, 9.4.2, 9.5.4, 9.6.4, 15.1.4, 15.2
Architect's Additional Services and Expenses
2.5, 12.2.1, 13.4.2, 13.4.3, 14.2.4
Architect's Administration of the Contract
3.1.3, 3.7.4, 15.2, 9.4.1, 9.5
Architect's Approvals
2.5, 3.1.3, 3.5, 3.10.2, 4.2.7
Architect's Authority to Reject Work
3.5, 4.2.6, 12.1.2, 12.2.1
Architect's Copyright
1.1.7, 1.5
Architect's Decisions
3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 4.2.14, 6.3, 7.3.4, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4.1, 9.5, 9.8.4, 9.9.1, 13.4.2, 15.2
Architect's Inspections
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 13.4
Architect's Instructions
3.2.4, 3.3.1, 4.2.6, 4.2.7, 13.4.2
Architect's Interpretations
4.2.11, 4.2.12
Architect's Project Representative
4.2.10
Architect's Relationship with Contractor
1.1.2, 1.5, 2.3.3, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5, 3.7.4, 3.7.5, 3.9.2, 3.9.3, 3.10, 3.11, 3.12, 3.16, 3.18, 4.1.2, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3, 12, 13.3.2, 13.4, 15.2
Architect's Relationship with Subcontractors
1.1.2, 4.2.3, 4.2.4, 4.2.6, 9.6.3, 9.6.4, 11.3
Architect's Representations
9.4.2, 9.5.1, 9.10.1
Architect's Site Visits
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.4
Asbestos
10.3.1
Attorneys' Fees
3.18.1, 9.6.8, 9.10.2, 10.3.3
Award of Separate Contracts
6.1.1, 6.1.2
Award of Subcontracts and Other Contracts for Portions of the Work
5.2
Basic Definitions
1.1
Bidding Requirements
1.1.1
Binding Dispute Resolution
8.3.1, 9.7, 11.5, 13.1, 15.1.2, 15.1.3, 15.2.1, 15.2.5, 15.2.6.1, 15.3.1, 15.3.2, 15.3.3, 15.4.1
Bonds, Lien
7.3.4.4, 9.6.8, 9.10.2, 9.10.3
Bonds, Performance, and Payment
7.3.4.4, 9.6.7, 9.10.3, **11.1.2**, 11.1.3, **11.5**
Building Information Models Use and Reliance
1.8
Building Permit
3.7.1
Capitalization
1.3
Certificate of Substantial Completion
9.8.3, 9.8.4, 9.8.5
Certificates for Payment
4.2.1, 4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1, 9.10.3, 14.1.1.3, 14.2.4, 15.1.4
Certificates of Inspection, Testing or Approval
13.4.4
Certificates of Insurance
9.10.2
Change Orders

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1.1.1, 3.4.2, 3.7.4, 3.8.2.3, 3.11, 3.12.8, 4.2.8, 5.2.3, 7.1.2, 7.1.3, **7.2**, 7.3.2, 7.3.7, 7.3.9, 7.3.10, 8.3.1, 9.3.1.1, 9.10.3, 10.3.2, 11.2, 11.5, 12.1.2
Change Orders, Definition of
7.2.1
CHANGES IN THE WORK
2.2.2, 3.11, 4.2.8, **7**, 7.2.1, 7.3.1, 7.4, 8.3.1, 9.3.1.1, 11.5
Claims, Definition of
15.1.1
Claims, Notice of
1.6.2, 15.1.3
CLAIMS AND DISPUTES
3.2.4, 6.1.1, 6.3, 7.3.9, 9.3.3, 9.10.4, 10.3.3, **15**, 15.4
Claims and Timely Assertion of Claims
15.4.1
Claims for Additional Cost
3.2.4, 3.3.1, 3.7.4, 7.3.9, 9.5.2, 10.2.5, 10.3.2, **15.1.5**
Claims for Additional Time
3.2.4, 3.3.1, 3.7.4, 6.1.1, 8.3.2, 9.5.2, 10.3.2, **15.1.6**
Concealed or Unknown Conditions, Claims for
3.7.4
Claims for Damages
3.2.4, 3.18, 8.3.3, 9.5.1, 9.6.7, 10.2.5, 10.3.3, 11.3, 11.3.2, 14.2.4, 15.1.7
Claims Subject to Arbitration
15.4.1
Cleaning Up
3.15, 6.3
Commencement of the Work, Conditions Relating to
2.2.1, 3.2.2, 3.4.1, 3.7.1, 3.10.1, 3.12.6, 5.2.1, 5.2.3, 6.2.2, 8.1.2, 8.2.2, 8.3.1, 11.1, 11.2, **15.1.5**
Commencement of the Work, Definition of
8.1.2
Communications
3.9.1, **4.2.4**
Completion, Conditions Relating to
3.4.1, 3.11, 3.15, 4.2.2, 4.2.9, 8.2, 9.4.2, 9.8, 9.9.1, 9.10, 12.2, 14.1.2, 15.1.2
COMPLETION, PAYMENTS AND
9
Completion, Substantial
3.10.1, 4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, 9.8, 9.9.1, 9.10.3, 12.2, 15.1.2
Compliance with Laws
2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 10.2.2, 13.1, 13.3, 13.4.1, 13.4.2, 13.5, 14.1.1, 14.2.1.3, 15.2.8, 15.4.2, 15.4.3
Concealed or Unknown Conditions
3.7.4, 4.2.8, 8.3.1, 10.3
Conditions of the Contract
1.1.1, 6.1.1, 6.1.4
Consent, Written
3.4.2, 3.14.2, 4.1.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 13.2, 15.4.4.2
Consolidation or Joinder
15.4.4
CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS
1.1.4, **6**
Construction Change Directive, Definition of
7.3.1
Construction Change Directives
1.1.1, 3.4.2, 3.11, 3.12.8, 4.2.8, 7.1.1, 7.1.2, 7.1.3, **7.3**, 9.3.1.1
Construction Schedules, Contractor's
3.10, 3.11, 3.12.1, 3.12.2, 6.1.3, 15.1.6.2
Contingent Assignment of Subcontracts
5.4, 14.2.2.2
Continuing Contract Performance
15.1.4
Contract, Definition of
1.1.2
CONTRACT, TERMINATION OR SUSPENSION OF THE
5.4.1.1, 5.4.2, 11.5, **14**
Contract Administration
3.1.3, 4, 9.4, 9.5
Contract Award and Execution, Conditions Relating to
3.7.1, 3.10, 5.2, 6.1
Contract Documents, Copies Furnished and Use of
1.5.2, 2.3.6, 5.3
Contract Documents, Definition of
1.1.1
Contract Sum
2.2.2, 2.2.4, 3.7.4, 3.7.5, 3.8, 3.10.2, 5.2.3, 7.3, 7.4, **9.1**, 9.2, 9.4.2, 9.5.1.4, 9.6.7, 9.7, 10.3.2, 11.5, 12.1.2, 12.3, 14.2.4, 14.3.2, 15.1.4.2, **15.1.5, 15.2.5**
Contract Sum, Definition of
9.1
Contract Time
1.1.4, 2.2.1, 2.2.2, 3.7.4, 3.7.5, 3.10.2, 5.2.3, 6.1.5, 7.2.1.3, 7.3.1, 7.3.5, 7.3.6, 7, 7, 7.3.10, 7.4, 8.1.1, 8.2.1, 8.2.3, 8.3.1, 9.5.1, 9.7, 10.3.2, 12.1.1, 12.1.2, 14.3.2, 15.1.4.2, 15.1.6.1, 15.2.5
Contract Time, Definition of
8.1.1
CONTRACTOR
3
Contractor, Definition of
3.1, 6.1.2
Contractor's Construction and Submittal Schedules
3.10, 3.12.1, 3.12.2, 4.2.3, 6.1.3, 15.1.6.2
Contractor's Employees
2.2.4, 3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3, 11.3, 14.1, 14.2.1.1
Contractor's Liability Insurance
11.1
Contractor's Relationship with Separate Contractors and Owner's Forces
3.12.5, 3.14.2, 4.2.4, 6, 11.3, 12.2.4
Contractor's Relationship with Subcontractors
1.2.2, 2.2.4, 3.3.2, 3.18.1, 3.18.2, 4.2.4, 5, 9.6.2, 9.6.7, 9.10.2, 11.2, 11.3, 11.4
Contractor's Relationship with the Architect
1.1.2, 1.5, 2.3.3, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5.1, 3.7.4, 3.10, 3.11, 3.12, 3.16, 3.18, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6,

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10.3, 11.3, 12, 13.4, 15.1.3, 15.2.1
Contractor's Representations
3.2.1, 3.2.2, 3.5, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.8.2
Contractor's Responsibility for Those Performing the Work
3.3.2, 3.18, 5.3, 6.1.3, 6.2, 9.5.1, 10.2.8
Contractor's Review of Contract Documents
3.2
Contractor's Right to Stop the Work
2.2.2, 9.7
Contractor's Right to Terminate the Contract
14.1
Contractor's Submittals
3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 9.2, 9.3, 9.8.2, 9.8.3, 9.9.1, 9.10.2, 9.10.3
Contractor's Superintendent
3.9, 10.2.6
Contractor's Supervision and Construction Procedures
1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.4, 7.3.6, 8.2, 10, 12, 14, 15.1.4
Coordination and Correlation
1.2, 3.2.1, 3.3.1, 3.10, 3.12.6, 6.1.3, 6.2.1
Copies Furnished of Drawings and Specifications
1.5, 2.3.6, 3.11
Copyrights
1.5, **3.17**
Correction of Work
2.5, 3.7.3, 9.4.2, 9.8.2, 9.8.3, 9.9.1, 12.1.2, **12.2**, 12.3, 15.1.3.1, 15.1.3.2, 15.2.1
Correlation and Intent of the Contract Documents
1.2
Cost, Definition of
7.3.4
Costs
2.5, 3.2.4, 3.7.3, 3.8.2, 3.15.2, 5.4.2, 6.1.1, 6.2.3, 7.3.3.3, 7.3.4, 7.3.8, 7.3.9, 9.10.2, 10.3.2, 10.3.6, 11.2, 12.1.2, 12.2.1, 12.2.4, 13.4, 14
Cutting and Patching
3.14, 6.2.5
Damage to Construction of Owner or Separate Contractors
3.14.2, 6.2.4, 10.2.1.2, 10.2.5, 10.4, 12.2.4
Damage to the Work
3.14.2, 9.9.1, 10.2.1.2, 10.2.5, 10.4, 12.2.4
Damages, Claims for
3.2.4, 3.18, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 10.3.3, 11.3.2, 11.3, 14.2.4, 15.1.7
Damages for Delay
6.2.3, 8.3.3, 9.5.1.6, 9.7, 10.3.2, 14.3.2
Date of Commencement of the Work, Definition of
8.1.2
Date of Substantial Completion, Definition of
8.1.3
Day, Definition of
8.1.4
Decisions of the Architect
3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 6.3, 7.3.4, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4, 9.5.1, 9.8.4, 9.9.1, 13.4.2, 14.2.2, 14.2.4, 15.1, 15.2
Decisions to Withhold Certification
9.4.1, **9.5**, 9.7, 14.1.1.3
Defective or Nonconforming Work, Acceptance, Rejection and Correction of
2.5, 3.5, 4.2.6, 6.2.3, 9.5.1, 9.5.3, 9.6.6, 9.8.2, 9.9.3, 9.10.4, 12.2.1
Definitions
1.1, 2.1.1, 3.1.1, 3.5, 3.12.1, 3.12.2, 3.12.3, 4.1.1, 5.1, 6.1.2, 7.2.1, 7.3.1, 8.1, 9.1, 9.8.1, 15.1.1
Delays and Extensions of Time
3.2, **3.7.4**, 5.2.3, 7.2.1, 7.3.1, **7.4**, **8.3**, 9.5.1, **9.7**, 10.3.2, **10.4**, 14.3.2, **15.1.6**, 15.2.5
Digital Data Use and Transmission
1.7
Disputes
6.3, 7.3.9, 15.1, 15.2
Documents and Samples at the Site
3.11
Drawings, Definition of
1.1.5
Drawings and Specifications, Use and Ownership of
3.11
Effective Date of Insurance
8.2.2
Emergencies
10.4, 14.1.1.2, **15.1.5**
Employees, Contractor's
3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3.3, 11.3, 14.1, 14.2.1.1
Equipment, Labor, or Materials
1.1.3, 1.1.6, 3.4, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2
Execution and Progress of the Work
1.1.3, 1.2.1, 1.2.2, 2.3.4, 2.3.6, 3.1, 3.3.1, 3.4.1, 3.7.1, 3.10.1, 3.12, 3.14, 4.2, 6.2.2, 7.1.3, 7.3.6, 8.2, 9.5.1, 9.9.1, 10.2, 10.3, 12.1, 12.2, 14.2, 14.3.1, 15.1.4
Extensions of Time
3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3, 7.4, 9.5.1, 9.7, 10.3.2, 10.4, 14.3, 15.1.6, **15.2.5**
Failure of Payment
9.5.1.3, **9.7**, 9.10.2, 13.5, 14.1.1.3, 14.2.1.2
Faulty Work
(See Defective or Nonconforming Work)
Final Completion and Final Payment
4.2.1, 4.2.9, 9.8.2, **9.10**, 12.3, 14.2.4, 14.4.3
Financial Arrangements, Owner's
2.2.1, 13.2.2, 14.1.1.4
GENERAL PROVISIONS
1
Governing Law
13.1
Guarantees (See Warranty)
Hazardous Materials and Substances
10.2.4, **10.3**
Identification of Subcontractors and Suppliers
5.2.1
Indemnification
3.17, **3.18**, 9.6.8, 9.10.2, 10.3.3, 11.3
Information and Services Required of the Owner

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2.1.2, **2.2**, 2.3, 3.2.2, 3.12.10.1, 6.1.3, 6.1.4, 6.2.5, 9.6.1, 9.9.2, 9.10.3, 10.3.3, 11.2, 13.4.1, 13.4.2, 14.1.1.4, 14.1.4, 15.1.4
Initial Decision
15.2
Initial Decision Maker, Definition of
1.1.8
Initial Decision Maker, Decisions
14.2.4, 15.1.4.2, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5
Initial Decision Maker, Extent of Authority
14.2.4, 15.1.4.2, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5
Injury or Damage to Person or Property
10.2.8, 10.4
Inspections
3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 12.2.1, 13.4
Instructions to Bidders
1.1.1
Instructions to the Contractor
3.2.4, 3.3.1, 3.8.1, 5.2.1, 7, 8.2.2, 12, 13.4.2
Instruments of Service, Definition of
1.1.7
Insurance
6.1.1, 7.3.4, 8.2.2, 9.3.2, 9.8.4, 9.9.1, 9.10.2, 10.2.5, **11**
Insurance, Notice of Cancellation or Expiration
11.1.4, 11.2.3
Insurance, Contractor's Liability
11.1
Insurance, Effective Date of
8.2.2, 14.4.2
Insurance, Owner's Liability
11.2
Insurance, Property
10.2.5, 11.2, 11.4, 11.5
Insurance, Stored Materials
9.3.2
INSURANCE AND BONDS
11
Insurance Companies, Consent to Partial Occupancy
9.9.1
Insured loss, Adjustment and Settlement of
11.5
Intent of the Contract Documents
1.2.1, 4.2.7, 4.2.12, 4.2.13
Interest
13.5
Interpretation
1.1.8, 1.2.3, **1.4**, 4.1.1, 5.1, 6.1.2, 15.1.1
Interpretations, Written
4.2.11, 4.2.12
Judgment on Final Award
15.4.2
Labor and Materials, Equipment
1.1.3, 1.1.6, **3.4**, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2
Labor Disputes
8.3.1
Laws and Regulations
1.5, 2.3.2, 3.2.3, 3.2.4, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 9.9.1, 10.2.2, 13.1, 13.3.1, 13.4.2, 13.5, 14, 15.2.8, 15.4
Liens
2.1.2, 9.3.1, 9.3.3, 9.6.8, 9.10.2, 9.10.4, 15.2.8
Limitations, Statutes of
12.2.5, 15.1.2, 15.4.1.1
Limitations of Liability
3.2.2, 3.5, 3.12.10, 3.12.10.1, 3.17, 3.18.1, 4.2.6, 4.2.7, 6.2.2, 9.4.2, 9.6.4, 9.6.7, 9.6.8, 10.2.5, 10.3.3, 11.3, 12.2.5, 13.3.1
Limitations of Time
2.1.2, 2.2, 2.5, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2.7, 5.2, 5.3, 5.4.1, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 12.2, 13.4, 14, 15, 15.1.2, 15.1.3, 15.1.5
Materials, Hazardous
10.2.4, **10.3**
Materials, Labor, Equipment and
1.1.3, 1.1.6, 3.4.1, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1.2, 10.2.4, 14.2.1.1, 14.2.1.2
Means, Methods, Techniques, Sequences and Procedures of Construction
3.3.1, 3.12.10, 4.2.2, 4.2.7, 9.4.2
Mechanic's Lien
2.1.2, 9.3.1, 9.3.3, 9.6.8, 9.10.2, 9.10.4, 15.2.8
Mediation
8.3.1, 15.1.3.2, 15.2.1, 15.2.5, 15.2.6, **15.3**, 15.4.1, 15.4.1.1
Minor Changes in the Work
1.1.1, 3.4.2, 3.12.8, 4.2.8, 7.1, **7.4**
MISCELLANEOUS PROVISIONS
13
Modifications, Definition of
1.1.1
Modifications to the Contract
1.1.1, 1.1.2, 2.5, 3.11, 4.1.2, 4.2.1, 5.2.3, 7, 8.3.1, 9.7, 10.3.2
Mutual Responsibility
6.2
Nonconforming Work, Acceptance of
9.6.6, 9.9.3, **12.3**
Nonconforming Work, Rejection and Correction of
2.4, 2.5, 3.5, 4.2.6, 6.2.4, 9.5.1, 9.8.2, 9.9.3, 9.10.4, 12.2
Notice
1.6, 1.6.1, 1.6.2, 2.1.2, 2.2.2., 2.2.3, 2.2.4, 2.5, 3.2.4, 3.3.1, 3.7.4, 3.7.5, 3.9.2, 3.12.9, 3.12.10, 5.2.1, 7.4, 8.2.2 9.6.8, 9.7, 9.10.1, 10.2.8, 10.3.2, 11.5, 12.2.2.1, 13.4.1, 13.4.2, 14.1, 14.2.2, 14.4.2, 15.1.3, 15.1.5, 15.1.6, 15.4.1
Notice of Cancellation or Expiration of Insurance
11.1.4, 11.2.3
Notice of Claims
1.6.2, 2.1.2, 3.7.4, 9.6.8, 10.2.8, **15.1.3**, 15.1.5, 15.1.6, 15.2.8, 15.3.2, 15.4.1
Notice of Testing and Inspections
13.4.1, 13.4.2
Observations, Contractor's

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3.2, 3.7.4
Occupancy
2.3.1, 9.6.6, 9.8
Orders, Written
1.1.1, 2.4, 3.9.2, 7, 8.2.2, 11.5, 12.1, 12.2.2.1, 13.4.2, 14.3.1
OWNER
2
Owner, Definition of
2.1.1
Owner, Evidence of Financial Arrangements
2.2, 13.2.2, 14.1.1.4
Owner, Information and Services Required of the
2.1.2, **2.2**, 2.3, 3.2.2, 3.12.10, 6.1.3, 6.1.4, 6.2.5, 9.3.2, 9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2, 13.4.1, 13.4.2, 14.1.1.4, 14.1.4, 15.1.4
Owner's Authority
1.5, 2.1.1, 2.3.32.4, 2.5, 3.4.2, 3.8.1, 3.12.10, 3.14.2, 4.1.2, 4.2.4, 4.2.9, 5.2.1, 5.2.4, 5.4.1, 6.1, 6.3, 7.2.1, 7.3.1, 8.2.2, 8.3.1, 9.3.2, 9.5.1, 9.6.4, 9.9.1, 9.10.2, 10.3.2, 11.4, 11.5, 12.2.2, 12.3, 13.2.2, 14.3, 14.4, 15.2.7
Owner's Insurance
11.2
Owner's Relationship with Subcontractors
1.1.2, 5.2, 5.3, 5.4, 9.6.4, 9.10.2, 14.2.2
Owner's Right to Carry Out the Work
2.5, 14.2.2
Owner's Right to Clean Up
6.3
Owner's Right to Perform Construction and to Award Separate Contracts
6.1
Owner's Right to Stop the Work
2.4
Owner's Right to Suspend the Work
14.3
Owner's Right to Terminate the Contract
14.2, 14.4
Ownership and Use of Drawings, Specifications and Other Instruments of Service
1.1.1, 1.1.6, 1.1.7, **1.5**, 2.3.6, 3.2.2, 3.11, 3.17, 4.2.12, 5.3
Partial Occupancy or Use
9.6.6, **9.9**
Patching, Cutting and
3.14, 6.2.5
Patents
3.17
Payment, Applications for
4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5, 9.6.3, 9.7, 9.8.5, 9.10.1, 14.2.3, 14.2.4, 14.4.3
Payment, Certificates for
4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1, 9.10.3, 14.1.1.3, 14.2.4
Payment, Failure of
9.5.1.3, **9.7**, 9.10.2, 13.5, 14.1.1.3, 14.2.1.2
Payment, Final
4.2.1, 4.2.9, **9.10**, 12.3, 14.2.4, 14.4.3
Payment Bond, Performance Bond and
7.3.4.4, 9.6.7, 9.10.3, **11.1.2**
Payments, Progress
9.3, **9.6**, 9.8.5, 9.10.3, 14.2.3, 15.1.4
PAYMENTS AND COMPLETION
9
Payments to Subcontractors
5.4.2, 9.5.1.3, 9.6.2, 9.6.3, 9.6.4, 9.6.7, 14.2.1.2
PCB
10.3.1
Performance Bond and Payment Bond
7.3.4.4, 9.6.7, 9.10.3, **11.1.2**
Permits, Fees, Notices and Compliance with Laws
2.3.1, **3.7**, 3.13, 7.3.4.4, 10.2.2
PERSONS AND PROPERTY, PROTECTION OF
10
Polychlorinated Biphenyl
10.3.1
Product Data, Definition of
3.12.2
Product Data and Samples, Shop Drawings
3.11, **3.12**, 4.2.7
Progress and Completion
4.2.2, **8.2**, 9.8, 9.9.1, 14.1.4, 15.1.4
Progress Payments
9.3, **9.6**, 9.8.5, 9.10.3, 14.2.3, 15.1.4
Project, Definition of
1.1.4
Project Representatives
4.2.10
Property Insurance
10.2.5, **11.2**
Proposal Requirements
1.1.1
PROTECTION OF PERSONS AND PROPERTY
10
Regulations and Laws
1.5, 2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 9.9.1, 10.2.2, 13.1, 13.3, 13.4.1, 13.4.2, 13.5, 14, 15.2.8, 15.4
Rejection of Work
4.2.6, 12.2.1
Releases and Waivers of Liens
9.3.1, 9.10.2
Representations
3.2.1, 3.5, 3.12.6, 8.2.1, 9.3.3, 9.4.2, 9.5.1, 9.10.1
Representatives
2.1.1, 3.1.1, 3.9, 4.1.1, 4.2.10, 13.2.1
Responsibility for Those Performing the Work
3.3.2, 3.18, 4.2.2, 4.2.3, 5.3, 6.1.3, 6.2, 6.3, 9.5.1, 10
Retainage
9.3.1, 9.6.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3
Review of Contract Documents and Field Conditions by Contractor
3.2, 3.12.7, 6.1.3
Review of Contractor's Submittals by Owner and Architect
3.10.1, 3.10.2, 3.11, 3.12, 4.2, 5.2, 6.1.3, 9.2, 9.8.2
Review of Shop Drawings, Product Data and Samples by Contractor

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3.12
Rights and Remedies
1.1.2, 2.4, 2.5, 3.5, 3.7.4, 3.15.2, 4.2.6, 5.3, 5.4, 6.1, 6.3, 7.3.1, 8.3, 9.5.1, 9.7, 10.2.5, 10.3, 12.2.1, 12.2.2, 12.2.4, **13.3**, 14, 15.4
Royalties, Patents and Copyrights
3.17
Rules and Notices for Arbitration
15.4.1
Safety of Persons and Property
10.2, 10.4
Safety Precautions and Programs
3.3.1, 4.2.2, 4.2.7, 5.3, **10.1**, 10.2, 10.4
Samples, Definition of
3.12.3
Samples, Shop Drawings, Product Data and
3.11, **3.12**, 4.2.7
Samples at the Site, Documents and
3.11
Schedule of Values
9.2, 9.3.1
Schedules, Construction
3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.6.2
Separate Contracts and Contractors
1.1.4, 3.12.5, 3.14.2, 4.2.4, 4.2.7, 6, 8.3.1, 12.1.2
Separate Contractors, Definition of
6.1.1
Shop Drawings, Definition of
3.12.1
Shop Drawings, Product Data and Samples
3.11, **3.12**, 4.2.7
Site, Use of
3.13, 6.1.1, 6.2.1
Site Inspections
3.2.2, 3.3.3, 3.7.1, 3.7.4, 4.2, 9.9.2, 9.4.2, 9.10.1, 13.4
Site Visits, Architect's
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.4
Special Inspections and Testing
4.2.6, 12.2.1, 13.4
Specifications, Definition of
1.1.6
Specifications
1.1.1, **1.1.6**, 1.2.2, 1.5, 3.12.10, 3.17, 4.2.14
Statute of Limitations
15.1.2, 15.4.1.1
Stopping the Work
2.2.2, 2.4, 9.7, 10.3, 14.1
Stored Materials
6.2.1, 9.3.2, 10.2.1.2, 10.2.4
Subcontractor, Definition of
5.1.1
SUBCONTRACTORS
5
Subcontractors, Work by
1.2.2, 3.3.2, 3.12.1, 3.18, 4.2.3, 5.2.3, 5.3, 5.4, 9.3.1.2, 9.6.7
Subcontractual Relations
5.3, 5.4, 9.3.1.2, 9.6, 9.10, 10.2.1, 14.1, 14.2.1
Submittals
3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 7.3.4, 9.2, 9.3, 9.8, 9.9.1, 9.10.2, 9.10.3
Submittal Schedule
3.10.2, 3.12.5, 4.2.7
Subrogation, Waivers of
6.1.1, **11.3**
Substances, Hazardous
10.3
Substantial Completion
4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, **9.8**, 9.9.1, 9.10.3, 12.2, 15.1.2
Substantial Completion, Definition of
9.8.1
Substitution of Subcontractors
5.2.3, 5.2.4
Substitution of Architect
2.3.3
Substitutions of Materials
3.4.2, 3.5, 7.3.8
Sub-subcontractor, Definition of
5.1.2
Subsurface Conditions
3.7.4
Successors and Assigns
13.2
Superintendent
3.9, 10.2.6
Supervision and Construction Procedures
1.2.2, **3.3**, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.4, 8.2, 8.3.1, 9.4.2, 10, 12, 14, 15.1.4
Suppliers
1.5, 3.12.1, 4.2.4, 4.2.6, 5.2.1, 9.3, 9.4.2, 9.5.4, 9.6, 9.10.5, 14.2.1
Surety
5.4.1.2, 9.6.8, 9.8.5, 9.10.2, 9.10.3, 11.1.2, 14.2.2, 15.2.7
Surety, Consent of
9.8.5, 9.10.2, 9.10.3
Surveys
1.1.7, 2.3.4
Suspension by the Owner for Convenience
14.3
Suspension of the Work
3.7.5, 5.4.2, 14.3
Suspension or Termination of the Contract
5.4.1.1, 14
Taxes
3.6, 3.8.2.1, 7.3.4.4
Termination by the Contractor
14.1, 15.1.7
Termination by the Owner for Cause
5.4.1.1, **14.2,** 15.1.7
Termination by the Owner for Convenience
14.4
Termination of the Architect
2.3.3
Termination of the Contractor Employment
14.2.2

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TERMINATION OR SUSPENSION OF THE CONTRACT
14
Tests and Inspections
3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 10.3.2, 12.2.1, **13.4**
TIME
8
Time, Delays and Extensions of
3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4, **8.3**, 9.5.1, 9.7, 10.3.2, 10.4, 14.3.2, 15.1.6, 15.2.5
Time Limits
2.1.2, 2.2, 2.5, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2, 5.2, 5.3, 5.4, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 12.2, 13.4, 14, 15.1.2, 15.1.3, 15.4
Time Limits on Claims
3.7.4, 10.2.8, 15.1.2, 15.1.3
Title to Work
9.3.2, 9.3.3
UNCOVERING AND CORRECTION OF WORK
12
Uncovering of Work
12.1
Unforeseen Conditions, Concealed or Unknown
3.7.4, 8.3.1, 10.3
Unit Prices
7.3.3.2, 9.1.2
Use of Documents
1.1.1, 1.5, 2.3.6, 3.12.6, 5.3
Use of Site
3.13, 6.1.1, 6.2.1
Values, Schedule of
9.2, 9.3.1
Waiver of Claims by the Architect
13.3.2
Waiver of Claims by the Contractor
9.10.5, 13.3.2, **15.1.7**
Waiver of Claims by the Owner
9.9.3, 9.10.3, 9.10.4, 12.2.2.1, 13.3.2, 14.2.4, **15.1.7**
Waiver of Consequential Damages
14.2.4, 15.1.7
Waiver of Liens
9.3, 9.10.2, 9.10.4
Waivers of Subrogation
6.1.1, **11.3**
Warranty
3.5, 4.2.9, 9.3.3, 9.8.4, 9.9.1, 9.10.2, 9.10.4, 12.2.2, 15.1.2
Weather Delays
8.3, 15.1.6.2
Work, Definition of
1.1.3
Written Consent
1.5.2, 3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.10.3, 13.2, 13.3.2, 15.4.4.2
Written Interpretations
4.2.11, 4.2.12
Written Orders
1.1.1, 2.4, 3.9, 7, 8.2.2, 12.1, 12.2, 13.4.2, 14.3.1

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

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§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon written protocols governing the transmission and use of, and reliance on, Instruments of Service or any other information or documentation in digital form.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to written protocols governing the use of, and reliance on, the information contained in the model shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

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ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

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§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the

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purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

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§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct,

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but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

.1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

.2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

.3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as

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constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The

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Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the

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Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

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§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

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§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

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§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

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§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

.1 The change in the Work;

.2 The amount of the adjustment, if any, in the Contract Sum; and

.3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is 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, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

.2 Unit prices stated in the Contract Documents or subsequently agreed upon;

.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

.4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;

.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

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.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and

.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

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§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others

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whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- **.4** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- **.5** damage to the Owner or a Separate Contractor;
- **.6** reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay;

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or

.7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

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§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

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§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

.1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;

.2 failure of the Work to comply with the requirements of the Contract Documents;

.3 terms of special warranties required by the Contract Documents; or

.4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

.1 employees on the Work and other persons who may be affected thereby;

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.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and

.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed

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by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve

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the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to

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fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

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§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or

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approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

.2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;

.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or

.4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in

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Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

.1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

.2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;

.3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or

.4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

.1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 Accept assignment of subcontracts pursuant to Section 5.4; and

.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

.1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

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§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

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.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner

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may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially

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similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

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SECTION 01 29 00 - SCHEDULES, REPORTS, PAYMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-l Specification sections, apply to work of this section.

1.2 PROGRESS SCHEDULE:

A. Bar-Chart Schedule: Not more than 14 days after date established for "Notice to Proceed", submit a bar-chart type progress schedule indicating a time bar for each major category or unit of work to be performed at site, properly sequenced and intermeshed and showing completion of the work sufficiently in advance of date established for "substantial completion of the work".

B. Distribution: Following initial submittal to and response by Architect, print and distribute progress schedule to Architect, Engineers, Owner, separate contractors (if any), principal subcontractors and suppliers or fabricators, and others with a need-to-know schedule-compliance requirement. Distribute and post subsequent updated issues to same entities, when revisions are made; except delete entities from distribution when they have completed assigned work and are no longer involved in performance of scheduled work.

1.3 SCHEDULE OF VALUES:

A. General: Prepare schedule of values, as required by General Conditions. Provide breakdown of Contract Sum in sufficient detail to facilitate continued evaluation of payment requests and progress reports. Break down principal subcontract amounts into several line items. For anything exceeding $2000.00 in value each item shall be separated into labor, material, and equipment where applicable. Round off to nearest whole dollar, but with total equal to Contract Sum. Submit copy of schedule of values to Architect and Engineers.

B. Time Coordination: In coordination of initial submittals and other administrative "start up" activities, submit schedule of values to Architect at earliest feasible date, but in no case later than 7 days before initial payment request is to be submitted.

C. Listing: Arrange schedule with columns to indicate generic name of item, change orders (numbers) which have affected value, dollar value of item, and percentage of Contract Sum (to nearest one-hundredth percent and adjusted to total l00 percent).

1.4 PAYMENT REQUESTS:

A. General: Except as otherwise indicated, sequence of progress payments is to be regular, and each must be consistent with previous applications and payments. It is recognized that certain applications involve extra requirements, including initial application, application at times of substantial completion, and final payment application.

B. Application Transmittal: Submit 3 executed copies of each payment application, each copy of which is completed with waivers of lien and similar attachments. Transmit each copy with a transmittal form listing those attachments, and recording appropriate information related to application in a manner acceptable to Architect. Transmit to Architect by means ensuring receipt within 24 hours.

C. Payment Application Times: The "period" for each progress payment is from the twenty-sixth (26th) of the month to the twenty-fifth (25th). Payment shall be made by the tenth (10th).

D. Payment Application Forms: AIA Document G702 and Continuation Sheets; 1992 form, available from "Publications, a Division of the AIA Service Corporation", 1735 New York Ave. NW., Washington, DC, 20006 (also available at most local AIA chapter offices).

E. Application Preparation: Except as otherwise indicated, complete every entry provided for on the form, including notarization and execution by authorized persons. Incomplete applications will be returned by Architect without action. Entries must match current data of schedule of values and progress schedule and report. Listing must include amounts of change orders issued prior to last day of the "period of construction" covered by application.

F. Waivers of Lien: For each payment application, submit waivers of lien to the owner.

G. Extension of Time: See Supplementary Conditions §8.3 Delays and Extension of Time

H. Extension of Time: The Contractor must submit each month, with his application for payment, a separate letter stating that he is requesting an extension of time or that he had no need for an extension for that period of time. No payment on a monthly application will be made until the letter is received. Complete justification on a specific day by day basis, which shall include, but is not limited to, weather reports, site condition reports, a listing of which trades are delayed and which trades are not delayed (with verification from each trade), photo of the site and appropriate correspondence. The receipt of this request and data will be evaluated and accepted or rejected with the processing of the application for payment. The final determination as to the granting of an extension of time will be in the sole discretion of Architect/Owner, and Contractor agrees that this is a reasonable and appropriate method of resolution and agrees to abide by the decision of Architect. Weather delays for work to be performed inside of the building, shall not be allowed after the building reaches the enclosure stage unless Contractor can furnish clean and convincing proof that such an extension would be justified and Architect grants such extension.

I. Affidavit Certifying Payment to all Subcontractors.
   1. See attached document at end of this section.

J. Application at Time of Substantial Completion:
   1. See Section 01 77 00 - Project Closeout.

K. Final Payment Application:
   1. See Section 01 77 00 - Project Closeout.

END OF SECTION

SECTION 01 42 00 - DEFINITIONS AND STANDARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

1.2 DEFINITIONS:

A. General Explanation: A substantial amount of specification language constitutes definitions for terms found in other contract documents, including drawings which must be recognized as diagrammatic in nature and not completely descriptive of requirements indicated thereon. Certain terms used in the contract documents are defined generally in this article. Definitions and explanations of this section are not necessarily either complete or exclusive, but are general for the work to extent not stated more explicitly in another provision of contract documents.

B. General Requirements: The provisions or requirements of Division-1 sections. General Requirements apply to entire work of Contract and, where so indicated, to other elements which are included in the project.

C. Indicated: The term "Indicated" is a cross-reference to graphics, notes or schedules on drawings, to other paragraphs or schedules in the specifications, and to similar means of recording requirements in contract documents. Where terms such as "shown", "noted", "scheduled", and "specified" are used in lieu of "indicated", it is for purpose of helping reader locate cross-reference, and no limitation of location is intended except as specifically noted.

D. Directed, Requested, Etc.: Where not otherwise explained, terms such as "directed", "requested", "authorized", "selected", "approved", "required", "accepted", and "permitted" mean "directed by Architect/Engineer", "requested by Architect/Engineer", etc. However, no such implied meaning will be interpreted to extend Architect's responsibility into Contractor's area of construction supervision.

E. Approve: Where used in conjunction with Architect's response to submittals, requests, applications, inquiries, reports and claims by Contractor, the meaning of term "approved" will be held to limitations of Architect's responsibilities and duties as specified in General and Supplementary Conditions. In no case will "approval" by Architect be interpreted as a release of Contractor from responsibilities to fulfill requirements of contract documents.

F. Project Site: The space available to Contractor for performance of the work, either exclusively or in conjunction with others performing other work as part of the project. The extent of project site is shown on drawings, and may or may not be identical with description of land upon which project is to be built.

G. Furnish: Except as otherwise defined in greater detail, term "furnish" is used to mean supply and deliver to project site, ready for unloading, unpacking, assembly, installation, etc., as applicable in each instance.

H. Install: Except as otherwise defined in greater detail, term "install" is used to describe operations at project site including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing protecting, cleaning and similar operations, as applicable in each instance.

I. Provide: Except as otherwise defined in greater detail, term "provide" means furnish and install, complete and ready for intended use, as applicable in each instance.

J. Installer: The entity (person or firm) engaged by Contractor or its subcontractor or subcontractor for performance of a particular unit of work at project site, including installation, erection, application and similar required operations. It is a general requirement that such entities (Installers) be expert in operations they are engaged to perform.

K. Testing Laboratory: An independent entity engaged to perform specific inspections or tests of the work, either at project site or elsewhere; and to report and (if required) interpret results of those inspections or tests.

1.3 SPECIFICATION EXPLANATIONS:

A. Overlapping and Conflicting Requirements: Where compliance with 2 or more industry standards or sets of requirements is specified, and overlapping of those different standards or requirements establishes different or conflicting minimums or levels of quality, most stringent requirement (which is generally recognized to be also most costly) is intended and will be enforced, unless specifically detailed language written into contract documents (not by way of reference to an industry standard) clearly indicates that a less stringent requirement is to be fulfilled. Refer apparently-equal-but-different requirements, and uncertainties as to which level of quality is more stringent, to Architect for a decision before proceeding.

B. Contractor's Options: Except for overlapping or conflicting requirements, where more than one set of requirements are specified for a particular unit of work, option is intended to be Contractor's regardless of whether specifically indicated as such.

C. Minimum Quality/Quantity: In every instance, quality level or quantity shown or specified is intended as minimum for the work to be performed or provided. Except as otherwise specifically indicated, actual work may either comply exactly with that minimum (within specified tolerances), or may exceed that minimum within reasonable limits. In complying with requirements, indicated numeric values are either minimums or maximums as noted or as appropriate for context of requirements. Refer instances of uncertainty to Architect for decision before proceeding.

D. Specialists; Assignments: In certain instances, specification text requires (or at least implies) that specific work be assigned to specialists or expert entities, who must be engaged for performance of those units of work. These must be recognized as special requirements over which Contractor has no choice or option. These assignments must not be confused with (and are not intended to interfere with) normal application of regulations, union jurisdictions and similar conventions. One purpose of such assignments is to establish which party or entity involved in a specific unit of work is recognized as "expert" for indicated construction processes or operations. Nevertheless, final responsibility for fulfillment of entire set of requirements remains with Contractor.

E. Trades: Except as otherwise indicated, the use of titles such as "carpentry" in specification text, implies neither that the work must be performed by an accredited or unionized tradespeople of corresponding generic name (such as "carpenter"), nor that specified requirements apply exclusively to work by tradespeople of that corresponding generic name.

F. Abbreviations: The language of specifications and other contract documents is of the abbreviated type in certain instances, and implies words and meanings which will be appropriately interpreted. Actual word abbreviations of a self-explanatory nature have been included in texts. Specific abbreviations have been established, principally for lengthy technical terminology and primarily in conjunction with coordination of specification requirements with notations on drawings and in schedules. Trade association names and titles of general standards are frequently abbreviated. Singular words will be interpreted as plural and plural words will be interpreted as singular where applicable and where full context of the contract documents so indicates.

1.4 DRAWING SYMBOLS:

A. General: Except as otherwise indicated, graphic symbols used on drawings are those symbols recognized in the construction industry for purposes indicated. Where not otherwise noted, symbols are defined by "Architectural Graphic Standards", published by John Wiley & Sons, Inc., eighth edition.

B. M/E Drawings: Graphic symbols used on mechanical/electrical drawings are generally aligned with symbols recommended by ASHRAE, supplemented by more specific symbols were appropriate as recommended by other recognized technical associations including ASME, ASPE, IEEE, and similar organizations. Refer instances of uncertainty to Architect/Engineer for clarification before proceeding.

1.5 INDUSTRY STANDARDS:

A. General Applicability of Standards: Applicable standards of construction industry have same force and effect (and are made a part of contract documents by reference) as if copied directly into contract documents, or as if published copies were bound herewith.

B. Referenced standards (referenced directly in contract documents or by governing regulations) have precedence over non-referenced standards which are recognized in industry for applicability to work.

C. Non-referenced standards recognized in the construction industry are hereby defined, except as otherwise limited in contract documents, to have direct applicability to the work,

D. and will be so enforced for performance of the work.

E. Publication Dates: Except as otherwise indicated, where compliance with an industry standard is required, comply with standard in effect as of date of contract documents.

F. Copies of Standards: Provide where needed for proper performance of the work; obtain directly from publication sources.

G. Abbreviations and Names: Where acronyms or abbreviations are used in specifications or other contract documents, they are defined to mean the industry recognized name of trade association, standards generating organization, governing authority or other entity applicable to context of text provision. Refer to "Encyclopedia of Associations," published by Gale Research Co., available in large libraries.

1.6 GOVERNING REGULATIONS/AUTHORITIES:

A. General: The procedure followed by Architect has been to contact governing authorities where necessary to obtain information needed for the purpose of preparing contract documents; recognizing that such information may or may not be of significance in relation to Contractor's responsibilities for performing the work. Contact governing authorities directly for necessary information and decision having a bearing on the performance of the work including but not limited to facilities to protect the public during construction.

PART 2 - PRODUCTS (not applicable)

PART 3 - EXECUTION (not applicable)

END OF SECTION

SECTION 01 45 29 - QUALITY CONTROL SERVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF REQUIREMENTS:

A. General: Required inspection and testing services are intended to assist in the determination of probable compliance of the work with requirements specified or indicated. These required services do not relieve the Contractor of responsibility for compliance with these requirements or for compliance with requirements of the contract documents.

B. Definitions: The requirements of this section relate primarily to customized fabrication and installation procedures, not to the production of standard products. Quality control services include inspections and tests and related actions including reports, performed by independent agencies and governing authorities, as well as directly by the Contractor. These services do not include Contract enforcement activities performed directly by the Architect.

C. Specific quality control requirements for individual units of work are specified in the sections of these specifications that specify the individual element of the work. These requirements, including inspections and tests, cover both production of standard products, and fabrication of customized work. These requirements also cover quality control of the installation procedures.

D. Inspections, tests and related actions specified in this section and elsewhere in the contract documents are not intended to limit the Contractor's own quality control procedures which facilitate overall compliance with requirements of the contract documents.

E. Requirements for the Contractor to provide quality; control services as required by the Architect, the Owner, governing authorities or other authorized entities are not limited by the provisions of this section.

1.3 RESPONSIBILITIES:

A. Contractor Responsibilities: Except where they are specifically indicated as being the Owner's responsibility, or where they are to be provided by another identified entity, inspections, tests and similar quality control services are the Contractor's responsibility these services also include those specified to be performed by an independent agency and not directly by the Contractor. Costs for these services shall be included in the Contract Sum. The Contractor shall employ and pay an independent agency, testing laboratory or other qualified firm to perform quality control services specified.

B. The Owner will engage and pay for the services of an independent agency to perform inspections and tests that are specified as the Owner's responsibility.

C. Retest Responsibility: Where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance of related work with the requirements of the contract documents, then retests are the responsibility of the Contractor regardless of whether the original test was the Contractor's responsibility. Retesting of work revise or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original work.

D. Responsibility for Associated Services: The Contractor is required to cooperate with the independent agencies performing required inspections, tests and similar services. Provide such auxiliary services as are reasonably requested. Notify the testing agency sufficiently in advance of operations to permit assignment of personnel. These auxiliary services include but are not necessarily limited to the following:

1. Providing access to the work.
2. Taking samples or assistance with taking samples.
3. Delivery of samples to test laboratories.
4. Security and protection of samples and test equipment at the project site.

E. Coordination: The Contractor and each independent agency engaged to perform inspections, tests and similar services for the project shall coordinate the sequence of their activities so as to accommodate required services with a minimum of delay in the progress of the work. In addition the Contractor and each independent testing agency shall coordinate their work so as to avoid the necessity of removing and replacing work to accommodate inspections and tests. The Contractor is responsible for scheduling times for inspections, tests, taking of samples and similar activities. Qualification for Service Agencies: Except as otherwise indicate, engage inspection and test service agencies, including independent testing laboratories, which are prequalified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories, and which are recognized in the industry as specialized in the types of inspections and tests to be performed.

1.4 SUBMITTALS:

A. General: Refer to Division-1 section on "Submittals" for the general requirements on submittals. Submit a certified written report of each inspection, test or similar service, directly to the Architect/Engineer, in duplicate, unless the Contractor is responsible for the service. If the Contractor is responsible for the service, submit a certified written report of each inspection, test or similar service through the Contractor, in duplicate. Submit additional copies of each written report directly to the governing authority, when the authority so directs.

B. Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to the following:

1. Name of testing agency or test laboratory.
2. Dates and locations of samples and tests or inspections.
3. Names of individuals making the inspection or test.
4. Designation of the work and test method.
5. Complete inspection or test data.
6. Test results.
7. Interpretations of test results.
8. Notation of significant ambient conditions at the time of sample-taking and testing.

9. Comments or professional opinion as to whether inspected or tested work complies with requirements of the contract documents.
10. Recommendations on retesting, if applicable.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION:

A. General: Upon completion of inspection, testing, sample-taking and similar services performed on the work, repair damaged work and restore substrates and finishes to eliminate deficiencies, including deficiencies in the visual qualities of exposed finishes. Protect work exposed by or for quality control service activities, and protect repaired work. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION

SECTION 02 30 00 - SOIL INVESTIGATION DATA

PART 1 - GENERAL

1.1 DESCRIPTION

A. Soil Investigation: A report has been prepared. This report was obtained only for use by the Architect in design and is not a part of the contract documents.

B. Examination: A copy of this report has been included herein and is available for contractor's information only and is not a warranty of subsurface conditions.

C. Additional Investigation:

1. Contractor should visit the site and acquaint himself with conditions.

D. Prior to bidding, the contractor may make his own investigations to satisfy himself with site and subsurface conditions.

END OF SECTION

SECTION 031500 - CONCRETE ACCESSORIES

PART 1 – GEN ERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install concrete accessories.
   2. The types of concrete accessories required include the following:
      a. Construction joints.
      b. Expansion joints and fillers.
      c. Control joints.

B. General: All joints subject to hydrostatic pressure shall be provided with continuous water stop.

C. Related Work Specified Elsewhere:

   1. Section 033001 - Concrete Formwork.

1.2 QUALITY ASSURANCE

A. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified:
   1. ACI 301, Specifications for Structural Concrete for Buildings, Chapter 6, Joints and Embedded Items.
   2. ASTM A 36, Structural Steel.
   3. ASTM D 1752, Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.
   4. ASTM B 164, Nickel-Copper Alloy Rod and Bar.

B. All manufactured items shall be installed in accordance with manufacturer's instructions.

1.3 SUBMITTALS

A. Samples: Submit for approval the following samples:
   1. Cork expansion joint fillers.
   2. Multipolymer plastic bearing strips.

B. Shop Drawings: Submit for approval the following:
   1. Manufacturer's specifications and installation instructions for all materials required.
   2. Layout of all construction joint locations prior to the submittal of steel reinforcing drawings.

PART 2 - PRODUCTS

2.1 PREMOLDED EXPANSION JOINT FILLER

A. Premolded joint filler (PJF) for interior expansion joints shall be self-expanding cork consisting of preformed strips that have been formed from clean granulated cork particles securely bound together by a synthetic resin of an insoluble nature. The PJF shall be capable of expanding 140 percent of its original thickness, which shall be 3/4-inch unless shown otherwise on the Drawings. The PJF shall meet the specification requirements of the latest revision of Corps of Engineers' Specification CRD-C 509, Type III and ASTM D 1752 Type III. Manufacturers meeting the specification requirements are: Sealtight Products by W.R. Meadows, Inc., P.O. Box 543, Elgin, IL 60120, (312) 683-4500 and Tex-Mastic Products by J & P Petroleum Products, Inc., P.O. Box 4206, Dallas, TX 75208, (214) 331-5401. Other products shall not be used without prior review and acceptance by the Engineer.

B. Premolded joint filler (PJF) for exterior expansion joints between concrete slabs and structural walls, where specifically shown on the Drawings shall be asphalt impregnated fiber board conforming to the latest revision of ASTM D 1751. Thickness of the PJF shall be 3/4-inch unless otherwise shown on the Drawings. Manufacturers meeting the specification requirements are: Sealtight Products by W.R. Meadows, Inc., P.O. Box 543, Elgin, IL 60120, (312) 683-4500 and Tex-Mastic Products by J & P Petroleum Products, Inc., P.O. Box 4206, Dallas, TX 75208, (214) 331-5401. Other products shall not be used without prior review and acceptance by the Engineer.

2.2 CONCRETE CONSTRUCTION JOINT ROUGHENER

A. Provide a water-soluble non-flammable, surface-retardant roughener.

B. Product and Manufacturer: Provide one of the following:
1. Rugasol-S by Sika Chemical Corporation, for horizontal joints only.
2. EAC-S by Preco Industries, Ltd., for horizontal joints only.
3. Tuf-Cote (Deep Etch) by Preco Industries Ltd., for vertical joints.
4. Or equal.

2.4 EPOXY BONDING AGENT

A. Provide an epoxy-resin bonding agent, two component, polyamide type.

B. Product and Manufacturer: Provide one of the following:
1. Sikadur Hi-Mod by Sika Chemical Corporation
2. Epoxtite Binder (Code #2390) by A.C. Horn, Inc.
3. Or equal.

2.5 PREFORMED BEARING STRIPS

A. Provide a multipolymer plastic bearing strip with a coefficient of friction less than .01. Bearing strip to be 1/8 inch thick by nine inches wide.

B. Product and Manufacturer:
1. Korolath bearing strips by Koro Corporation.
2. Or equal.

ANCHOR BOLTS

A. Set all anchor bolts by template, rigidly secure the bolts in place to prevent their displacement, and verify all bolt locations before placing concrete, so that the bolt locations in the completed foundations will conform accurately to the bolt setting dimensions indicated on the foundation drawings.

2.7 Backer-rod shall be high-grade extruded closed-cell polyethylene foam that is completely compatible with polysulfide and urethane type sealants. Backer-rod shall also be ultraviolet stable, resistant to oils, chemicals, ozone and weathering. The size of the rod shall be 1 inch diameter for 3/4 inch wide joints. To the extent possible only full length rods shall be used; splices shall be minimized. Acceptable manufacturers are: Sonofoam by Sonneborn Building Products, 7711 Computer Avenue, Minneapolis, MN 55435, (612) 835-3434 and Tex-Mastic Products by J & P Petroleum Products, Inc., P.O. Box 4206, Dallas, TX 75208, (214) 331-5401. Other products shall not be used without prior review and acceptance by the Engineer.

2.8 Mastic used to prevent bond at joints indicated on the Drawings shall be Igas joint system by Sika Corporation, Box 297, Lyndurst, NJ 07071, (201) 933-8801 or approved equal. Primer shall be as recommended by the manufacturer.

2.9 Materials for forming joints and load transfer devices for installation in street and roadway pavement slabs shall be in accordance with MDOT Specifications, Section 707.

PART 3 - EXECUTION

3.1 INSPECTION

Examine conditions under which joints are to be installed, and notify ENGINEER in writing of unsatisfactory conditions existing. Do not proceed with the Work until unsatisfactory conditions or deficiencies have been corrected in a manner acceptable to ENGINEER.

3.2 CONSTRUCTION JOINTS

A. Comply with ACI 301, Chapter 6, and as specified below.

B. Locate and install construction joints as shown.

C. Horizontal Joints:

1. Roughen concrete at the interface of construction joints in accordance with instructions of the manufacturer of joint roughener. Immediately before placing fresh concrete, thoroughly clean the existing contact surface using a stiff brush or other tools and a stream of water under pressure. The surface shall be clean and wet, but free from pools of water at the moment the fresh concrete is placed.

2. Remove laitance, waste mortar or other substance which may prevent complete adhesion.

3. Place a 2-inch thick coat of mortar, of similar proportions to the mortar in the concrete, over the contact surface of the old con¬crete. Place fresh concrete before the mortar has attained its initial set.

D. Vertical Joints:

1. Apply roughener to the form in a thin, even film by brush, spray or roller in accordance with the manufacturer's instructions. After roughener is dry, concrete may be placed.

2. When concrete has been placed and the form removed, wash loosened material off with high pressure water spray to obtain roughened surface subject to approval by ENGINEER.

E. Place two layers of 1/8 inch thick bearing strips on concrete bearing surface prior to placing concrete slab to provide sliding bearing as shown.

3.3 EXPANSION JOINTS

A. Comply with ACI 301, Chapter 6, and as specified below.

B. Locate and install expansion joints as shown. Install cork filler in accordance with manufacturer's instructions.

3.4 BONDING WITH EPOXY ADHESIVE

A. Use adhesive for the following:
1. Bonding of fresh concrete to concrete cured at least 28 days or to existing concrete.

2. Bonding of horizontal construction joints where these are required by the Drawings or approved by ENGINEER for foundation mats that are five feet thick or greater.

B. Handle and store epoxy adhesive in compliance with the manufacturers printed instructions, including safety precautions.

C. Mix the epoxy adhesive in complete accordance with the instructions of the manufacturer.

D. Before placing fresh concrete, thoroughly roughen and clean hardened concrete surfaces and coat with epoxy grout not less than 1/16-inch thick. Place fresh concrete while the epoxy material is still tacky, without removing the in-place grout coat, and as directed by the epoxy manufacturer.

3.5 WATERSTOPS

A. Install waterstops for all joints indicated on the Drawings. Waterstops shall be continuous around all corners and intersections so that a continuous, water-tight seal is provided.

END OF SECTION

SECTION 03 30 00 - CAST IN PLACE CONCRETE

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 specified in this section.

B. Vapor Barriers are specified in SECTION 07 25 00

C. Concrete Reinforcement is specified in SECTION 03 30 02

D. Concrete Formwork is specified in SECTION 03 30 01

1.2 DESCRIPTION OF WORK:

A. The extent of concrete work shown on drawings.

B. Above Grade

C. Slabs on fill

D. Concrete foundations, walls, and footings.

1.3 QUALITY ASSURANCE:

A. Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified:

1. American Concrete Institute (ACI):

2. ACI 301 "Specifications for Structural Concrete for Buildings".

3. ACI 318 "Building Code Requirements for Reinforced Concrete".

4. ACI 315 "Manual of Standard Practice for Detaining Reinforced Concrete Structures".

5. ACI 347 "Recommended Practice for Concrete Formwork".

6. American Society for Testing & Materials (ASTM):

7. ASTM A 615 "Deformed and Plain Billet Steel Bar for Concrete Reinforcement".

8. ASTM A 185 "Welded Steel Wire Fabric for Concrete Reinforcement".

9. ASTM C 33 "Concrete Aggregates".

10. ASTM C 94 "Ready-Mixed Concrete".

11. ASTM C 150 "Portland Cement".

12. ASTM C 260 "Air-Entraining Admixtures".

13. ASTM C 309 "Liquid Membrane Forming Compounds for Curing Concrete".

14. ASTM C 494 "Chemical Admixture for Concrete".

1.4 CONCRETE TESTING:

A. Quality Control

1. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

2. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

3. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

4. Testing Agency Qualifications: An independent agency, acceptable to the Architect, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

5. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.

6. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

B. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

C. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

D. ACI 301, "Specification for Structural Concrete,"

E. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

F. Concrete Testing Service: Contractor shall employ at his expense a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

G. The contractor shall furnish all concrete mix designs to the Architect for review.

H. Test and Testing

1. Materials and installed work may require testing and retesting, as directed by the Architect at any time during progress of work. Allow free access to material during progress of work. Allow free access to material stockpiles and facilities. Tests, including retesting of rejected materials and installed work, shall be done at Contractor's expense.

2. The testing laboratory providing quality control has total authority and responsibility for the concrete exiting the truck. Any alteration of the concrete in the truck including addition of water, admixtures, or any other product will be allowed only at the discretion of the testing laboratory.

3. The quality control laboratory has total authority of rejection of concrete prior to placement for duration of time since departure from batch plant, or any inconsistency or deviation from standards set forth herein.

I. Required Test:

1. Compression Test Specimens: ASTM C31; one set is defined as 6 standard cylinders for each compressive strength test, unless otherwise indicated or directed. Mold and store cylinders for laboratory cured test specimens except field-cure one test specimen.

2. Compressive Strength Tests: ASTM C39; a minimum of one set as follows or fraction thereof, of each concrete class placed in any one day. 2 specimen tested at 7 days, 3 specimen tested at 28 days Test , 1 cylinder held as a test back up cylinder at 56 days or as directed by Architect.

Grade Beams:	1 set for each 100 cubic yards
Slabs on Grade:	1 set for each 100 cubic yards or any one pour for each 5000 sq. ft.
Concrete Masonry Units (Foundation walls, lintels, piers, bond beams):	1 set for each 25 cubic yards
Concrete Paving:	1 set for each 25 cubic yards
Concrete Walks:	Not Required
Concrete Curb Gutters:	Not Required
Manholes, Catch Basins, Junction Boxes, Fence Post, Light Pole Supports, Headwalls:	Not Required

3. Slump: ASTM C143; one test for each concrete load at point of discharge; and one test for each set of compressive strength test specimens.

4. Air Content: ASTM C173, volumetric method for normal weight for each concrete load at point of discharge; and one test for each set of compressive strength test specimens.

5. Concrete Temperature: Test hourly when air temperature is 40 degrees F and below; and when 80 degrees and above; and each time a set of compression test specimens made.

6. When strength of field-cured cylinders is less than 85% of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protection and curing in-place concrete.

7. Test results will be reported in writing to Architect and Contractor on same day that tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placements, name of concrete testing service, concrete type and class design mix identification, locations of concrete batch in structure shall be described so that it is easily determined where and to what extent it is in the project. Design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of test results shall be considered satisfactory if they equal 70% of the 28-day design requirements at a 7-day break.

8. Additional Tests: The testing service will make additional test of in-place concrete when test results indicate specified concrete strength and other characteristics have not been attained in the structure, as directed by Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods as directed. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

1.5 CEMENT MIXES

A. Ready-Mix Concrete: Comply with requirements of ANSI/ASTM C94, and as herein specified.

B. Concrete Design mix is to be established to provide concrete of ten percent (10%) higher strength than the specified job strength.

C. CONCRETE STRENGTHS FOR VARIOUS COMPONENTS AND LOCATIONS ARE INDICATED ON THE DRAWINGS.

D. Design mixes to provide required strengths concrete with the following properties for the:

1. 3500 psi 28-day compressive strength. For slabs on grade, – no entrained air. See notes on structural drawings.

2. 3000 psi 28-day compressive strength. For grade beams – no entrained air. See Notes on structural drawings.

E. Proportions shall be made by weight and shall be uniformly and accurately controlled and inspected by the testing laboratory.

F. During hot weather or under conditions contributing to rapid setting of concrete a shorter mixing time than specified in ANSI/ASTM C 94, may be required.

1.6 SUBMITTALS:

A. Product Data: Submit manufacturer's product data with application and installation instructions for proprietary materials and items, admixtures, patching compounds, curing compounds, and others as requested by Architect.

B. Submit for review sets of detailed shop drawings showing layout, sizes, arrangements, bar supports, etc., for reinforcing steel, all reinforcing for grade beams, walls, etc. shall be shown in elevations so as to indicate bar lengths, locations of splices, etc.

C. Submit layout of construction joints in site paving for Architect review.

D. Samples: Submit samples of materials as specified and as otherwise requested by Architect, including names, sources and descriptions.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS:

A. Portland Cement: ANSI/ASTM C 150, Type I.

1. Use one brand of cement throughout project, unless otherwise acceptable to Architect.

B. Aggregates: ANSI/ASTM C 33, maximum size one inch (1").

C. Water: Potable, clean free of oil, alkali, or other deleterious substances.

D. Air-Entraining Admixture: ANSI/ASTM C260.

E. Water-Reducing Admixture: ANSI/ASTM C494, Type A and contain not more than 1% chloride ions.

F. Water Reducing: Accelerator Admixture L ASTM C494, Type C or E

1. Subject to compliance with requirements, provide one of the following:
   a. Accelguard HE; Euclid Chemical Co.
   b. Pozzolith 122-HE; Master Builders
   c. Darex; W.R. Grace
   d. Sikacrete; Sika Chemical Co.

G. Superplasticizer:

1. Subject to compliance with requirements, provide one of the following:
   a. R. Grace
   b. Monex

2.2 RELATED MATERIALS:

A. Non-Shrink Grout: ASTM C1107, factory pre-mixed grout.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Type D, Non-metallic
      1) "Masterflow 713"; Master Builders.
      2) "Sonogrout"; Sonneborn-Contech.
      3) "Euco-NS"; Euclid Chemical Co.
      4) "Five-Star Grout"; U.S. Grout Co.
      5) "Duragrout"; L & M Const. Chemical Co.

B. Curing Hardener, Sealer: Acrylic base compound equal to Sonneborne's Gray Kure-N-Seal. Use this material for curing and sealing of exposed finished concrete floors as noted in Finish Schedule as "Concrete (Sealed)".

C. Moisture-Retaining Cover: One of the following, complying with ANSI/ASTM C 171.

1. Polyethylene film. 6 Mil

D. Bonding Compound: Polyvinyl acetate, rewettable type.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. "Weldcrete"; Larson Products.
   b. "Everbond"; L & M Construction Chemicals.
   c. "EucoWeld"; Euclid Chemical Co.
   d. "Daraweld C"; W.R. Grace.
   e. "Sonocrete"; Sonneborn-Contech.

E. Epoxy Adhesive: 100% solids, two component materials suitable for use on dry or damp surfaces.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. "Thiopoxy"; W.R. Grace.
   b. "Sikadur Hi-Mod"; Sika Chemical Corp.
   c. "Euco Epoxy"; Euclid Chemical Co.

F. Floor Leveling Compound: Ardex K-15 and primer Ardex P-51.

G. Waterstop: Performed plastic adhesive waterstop as per FS SS-S-00210A and shall have a cross sectional area of approximately one (1) square inch manufactured by SYNKO-FLEX PRODUCTS, INC.

H. Chemical Anchors: Adhesive anchor capsules and threaded anchor rods or reinforcing bars equal to "HILTI HVA Adhesive Anchors" or "RAWL CHEM - Stud Anchors" to be installed in accordance with manufacturer's recommendations.

I. Admixtures:

1. Use accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees F.

2. Use Air-entraining admixture in exterior exposed concrete, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate.

3. Use admixtures for water-reducing and set-control in strict compliance with manufacturer's directions.

J. Superplasticizer:

1. Use superplasticizer in concrete slabs at contractor’s option.

2. Foundations, columns, at contractors’ option.

3. Cement content shall not be reduced with use of superplasticizer.

4. Use manufacturer’s recommendations for quantity per cubic yard not to exceed a slump of 9”.

K. Slump Limit: Proportion and design mixes to result in concrete slum at point of placement as follows:

1. Ramp and Sloping Surfaces: Not more than 3".

2. Reinforced Foundation Systems: Not less than 3" and not more than 5".

3. Slab: Not less than 4" nor more than 5".

4. Other Concrete: Not less than 4" and not more than 5".

L. Fly ash shall be used, not more than 20% of the cement, by weight, may be replaced by fly ash. Fly ash shall be ASTM C-618, Class C or F. Class F shall be per MDOT specifications.

M. Calcium chloride shall not be used.

N. When air temperature is between 85 and 90 degrees F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 degrees F reduce mixing and delivery time to 60 minutes.

O. In cold weather, concrete operation may be assisted by using hot water or by preheating the aggregates prior to mixing operation or a combination thereof to insure that concrete is maintained at a temperature of 40 degrees or more.

P. All concrete design mixes shall have the mix number indicated on the submittal to the Architect. The delivery ticket left at the job site shall also bear the design mix number.

Q. Refer to drawings for compressive strength requirements.

PART 3 - EXECUTION

3.1 PREPARATION OF FORM SURFACES:

A. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.

B. Thin form-coating compounds only with thinning agent of type, and in amount, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

3.2 CONCRETE PLACEMENT:

A. Pre-placement Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used.

B. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.

C. General:

1. Comply with ACI 304, and as herein specified.

2. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.

D. Placing Concrete in Forms:

1. Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

2. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping.

3. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practices.

4. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

E. Placing Concrete Slabs:

1. Deposit and consolidate concrete slabs in a continuous operation within limits of construction joints until the placing of a panel or section is completed.

2. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

3. Bring slab surfaces to correct level with straightedge and strike off. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.

4. Maintain reinforcing in proper position during concrete placement operations.

F. Cold Weather Placing:

1. Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.
   a. When air temperature has fallen to or is expected to fall below 40 degrees F. (4 degrees C), do not place concrete.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.

G. Hot Weather Placing:

1. When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305.

2. Wet forms thoroughly before placing concrete.

3. Use water-reducing retarding admixture (Type D) when required by high temperatures,

4. If the testing laboratory technician, at the job site, determines that water is to be added to a load of concrete, the drum shall be turned 60 to 80 revolutions at 12 to 15 revolutions per minute after the water has been added. The slump is then to be rechecked.

3.3 FINISH OF FORMED SURFACES:

A. Rough Form Finish:

B. For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4" in height rubbed down or chipped off.

C. Smooth Form Finish:

1. For formed concrete surfaces exposed-to-view, or that are to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, painting or other similar system. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and

symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.

2. Moisten concrete surfaces and rub with Carborundum brick or other abrasive until a uniform color and texture is produced. Do not apply cement grout other than that created by the rubbing process.

D. Rubbed Concrete:

1. Provide rubbed finish to concrete surfaces which are in view in interior and exterior locations, or as indicated on the plans.

2. Combine one part Portland cement to 1-1/2 parts fine sand by volume, and mix with water to consistency of thick paint. Use of proprietary additives may be used at contractor's option. Blend standard Portland cement and white Portland cement, amounts determined by trial patches, so that final color of dry grout will closely match adjacent surfaces.

3. Thoroughly wet concrete surfaces and apply grout to coat surfaces and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least 36 hours after rubbing.

E. Related Uniformed Surfaces:

1. At tops of walls, horizontal offsets surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces.

2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.4 MONOLITHIC SLAB FINISHES:

A. Float Finish:

1. Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo, and as otherwise indicated.

2. After screening, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to a tolerance not exceeding 1/4" in 10' when tested with a 10' straightedge. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

B. Trowel Finish:

1. Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, paint or other thick film finish coating system.

2. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding 1/8" in 10' when tested with a 10' straightedge. Grind smooth surface defects which would telegraph through applied floor covering system.

C. Non-Slip Broom Finish:

1. Apply non-slip broom finish to exterior concrete platforms, steps and ramps, and elsewhere as indicated.

2. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

D. Curing Hardener Sealer:

1. Apply three (3) coats of chemical-hardener finish to interior concrete floors where indicated. Apply liquid chemical hardener for curing of the concrete surface. Evenly apply each coat, and allow 24 hours for drying between first two (2) coats. Apply 3rd coat just prior to occupancy.

2. Apply proprietary chemical hardeners in accordance with manufacturer's printed instructions.

3. After final coat of chemical hardener solution is applied and dried, remove surplus hardener by scrubbing and mopping with water.

3.5 CONCRETE CURING AND PROTECTION:

A. General:

1. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

2. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than seven days.

3. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least seven days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

B. Provide moisture-cover curing as follows:

1. Cover concrete surfaces with moisture-retaining cover for curing concrete placed in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

C. Curing Formed Surfaces:

1. Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by using curing compound.

3.6 MISCELLANEOUS CONCRETE ITEMS:

A. Filling-In:

1. Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as herein specified to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

2. All areas under concrete floor slab shall have moisture barrier with joints lapped at least 12". Take care to lay material smooth and even, and avoid tearing or puncturing. Seal tightly at all expansion joints and spaces around pipes, conduits and other penetrations using coal, tar, pitch, or asphalt mastic.

3. The general contractor is to VERIFY the sizes and locations of all required floor and roof openings, equipment supports, etc. with the various subcontractors. Any conditions which require revisions or additions to the structural framing are to be brought to the attention of the architect and structural engineer prior to any construction. Any cost for the required changes will be borne by the general contractor..

3.7 CONCRETE SURFACE REPAIRS:

A. Patching Defective Areas:

1. Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Architect.

2. Cut out honeycomb, rock pockets, voids over 1/4" in any dimension, and holes left by tie rods and bolts, down to solid concrete but, in no case to a depth of less than one inch (1"). Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water and brush-coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.

3. For exposed-to-view surfaces, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

B. Repair of Formed Surfaces:

1. Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.

2. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

C. Repair of Unformed Surfaces:

1. Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface planes to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having required slope.

2. Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01" wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.

3. Correct high areas in unformed surfaces by grinding, after concrete has cured at least fourteen days.

4. Correct low areas in unformed surfaces during, or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching and floor leveling compounds may be used when acceptable to Architect.

5. Repair defective areas, except random cracks and single holes not exceeding one-inch (1") diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

6. Repair isolated random cracks and single holes not over one inch (1") in diameter by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than seventy-two (72) hours.

7. Use epoxy-based mortar for structural repairs, where directed by Architect.

8. Repair methods not specified above may be used, subject to acceptance of Architect.

END OF SECTION

SECTION 03 30 01 - CONCRETE FORM WORK

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 specified in this section.

1.2 DESCRIPTION OF WORK:

A. Formwork for cast-in-place concrete with shoring, bracing and anchorage. Form accessories and stripping forms.

1.3 QUALITY ASSURANCE:

A. Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified:

1. ACI 301 "Specifications for Structural Concrete for Buildings".

2. ACI 347 "Recommended Practice for Concrete Formwork".

3. PS 1 "Construction and Industrial Plywood"

B. Design, engineer, and construct formwork, shoring, and bracing to meet design and code requirements, so that resultant concrete conforms to required shapes, lines and dimensions.

C. The design and engineering of the formwork, as well as its construction, shall be the responsibility of the General Contractor and in accordance with ACI 301 and ACI 347.

D. Design formwork for loads, lateral pressures, and allowable stresses outlined in Section 102 and 103 of ACI-347. Recommended Practices for Concrete Formwork and wind loads so specified by the governing building code.

E. Forms shall conform to the shapes, lines, and dimensions of the members as called for on the plans, and shall be constructed as to ensure that the concrete surfaces will conform to the tolerances of ACI-347, Section 203.1.

PART 2 - PRODUCTS

2.1 FORM MATERIALS:

A. Lumber: Southern Yellow Pine species; #2 S4S grade with grade stamp clearly visible. Use only on unexposed surfaces.

B. Form for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.

C. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.

2.2 FORMWORK ACCESSORIES:

A. Form Ties: Removable and Snap-off metal of fixed or adjustable length; 1-1/2 inch break back dimension; free of defects that will leave holes no larger than one-inch diameter in concrete surface.

B. Use removable ties for exposed finish surface only.

C. Form Release Agent: Colorless material which will not stain concrete, absorb moisture; or impair natural bonding.

D. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Size as required; of strength and character to maintain formwork in place while placing concrete.

PART 3 - EXECUTION

3.1 FORMS:

A. Construct forms to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.

B. Construction joints in grad beams shall have two horizontal rows of keys, of tapered 2x4’s.

C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.

D. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.

E. Chamfer exposed corners and edges as indicated, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

F. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.

1. Unless otherwise indicated, provide ties so portion remaining within concrete after removal is at least 1-1/2" inside concrete.

2. Unless otherwise shown, provide form ties which will not leave holes larger than 1" diameter in concrete surface.

G. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms.

H. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retighten forms and bracing after concrete placement is required to eliminate mortar leaks and maintain proper alignment.

3.2 INSTALLATION OF EMBEDDED ITEMS:

A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto.

B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.

3.3 PREPARATION OF FORM SURFACES:

A. Coat contact surfaces of forms with a form-coating compound before reinforcment is placed.

B. Thin form-coating compounds only with thinning agent of type, and in amount, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

3.4 REMOVAL OF FORMS:

A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F. (10 degrees C.) for twenty-four hours after placing concrete, provided concrete is sufficiently

hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

3.5 RE-USE OF FORMS:

A. Clean and repair surfaces of forms to be reused in work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Architect.

END OF SECTION

SECTION 03 30 02 - CONCRETE REINFORCEMENT

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 specified in this section.

1.2 DESCRIPTION OF WORK:

A. Reinforcing steel bars, welded steel wire fabric for cast-in-place concrete.

B. Support chairs, bolsters, bar supports, spacers, and other devices for supporting reinforcements.

1.3 QUALITY ASSURANCE:

A. Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified:

1. ACI 301 "Specifications for Structural Concrete for Buildings".

2. ACI 315 "Details and Detailing of Concrete for Reinforcing.

3. ANSI/ASTM A185 - "Welded Steel Wire Fabric for Concrete Reinforcement".

4. ASTM A615 - "Deformed and Plain Billet-Steel Bars for Concrete Reinforcement".

5. CRSI - "Manual of Practice".

6. CRSI 63 - "Recommended Practice for Placing Reinforcing Bars".

7. CRSI 65 - "Recommended Practice for Placing Bar Supports, Specifications and Nomenclature".

1.4 SUBMITTALS:

A. Shop Drawings; Reinforcement: Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, splicing, stirrup spacing, diagrams of bent bars, arrangement of concrete reinforcement include special reinforcement required and openings through concrete structures.

B. Submit shop drawings to the Architect that show approval of the Contractor. The Contractor and/or steel fabricator is urged to contact the Structural Engineer to resolve any questions that might arise during preparation of the shop drawings. If it is apparent to the Architect or Structural Engineer that the Contractor has not thoroughly checked the shop drawings prior to submittal, the Contractor will be notified to resubmit a set that has been properly checked and

the previous submittal will be abandoned. Only complete sets of shop drawings will be reviewed unless an agreement to check partial submittals is obtained prior to the first submittal. Do not fabricate any material until approval of the Architect has been obtained.

1.5 PRODUCT HANDLING

A. Deliver reinforcing to project site in bundles marked with metal gages indicating contents of bundle keyed to fabrication schedule.

B. Handle and store materials to prevent contamination and deterioration.

PART 2 - PRODUCTS

2.1 REINFORCING MATERIALS:

A. Reinforcing Steel: ASTM A615, Grade 60 billet-steel deformed bars, uncoated finish.

B. Steel Wire: ANSI/ASTM A 82, plain, cold-drawn, steel.

C. Welded Wire Fabric: ANSI/ASTM A 185, welded steel wire fabric.

D. Tie Wire: Minimum 18 gage annealed type.

E. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI recommendations, unless otherwise acceptable. All bolsters, chairs, etc. to be plastic tipped.

F. Other Supports: Concrete bricks may be used in bottom of earth formed grade beams to support reinforcing steel.

2.2 FABRICATION:

A. Fabricate in accordance with ACI 315, providing concrete cover specified in Section 03300.

B. Locate reinforcing Splices not indicated on Drawings at points of minimum stress. Indicate location of splices on shop drawings.

PART 3 - EXECUTION

3.1 PLACING REINFORCEMENT:

A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.

C. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.

D. Place reinforcement to obtain at least minimum coverage's for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

E. Install vertical dowel steel before placing concrete. Provide template to assure proper location and alignment.

F. Refer to Structural Drawings for additional requirements.

END OF SECTION

SECTION 04 05 13 - ADHERED MASONRY VENEER SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Adhered masonry veneer system, including the following:

1. Manufactured stone veneer.
2. Installation Products: adhesives, mortars, grouts, and sealants.
3. Waterproofing membranes for ceramic tile work.

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

1.3 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

1.4 SYSTEM DESCRIPTION

A. Scope of Work: Provide manufactured adhered stone (unit size, thickness and color to match existing building), veneer installation materials, and accessories as indicated on drawings, as specified herein, and as required for complete and proper installation.

1. Adhered Stone Veneer installed over concrete masonry unit substrate with waterproofing membrane, latex Portland cement mortar, and latex Portland cement pointing mortar.
2. Adhered Stone Veneer over steel framing, exterior-rated sheathing, water-resistant barrier, wire lath, floated latex Portland cement mortar, waterproofing membrane, latex Portland cement mortar, and latex Portland cement pointing mortar
3. Adhered Stone Veneer installed over steel framing, exterior-rated sheathing, cement backer board, waterproofing membrane, latex Portland cement mortar, and latex Portland cement pointing mortar

B. Environmental Performance Criteria: The following criteria are required for products included in this section. Refer to Division 1 for additional requirements:

1. Products manufactured regionally within a 500 mile radius (804 km) of the Project site;
2. Adhesive products shall meet or exceed the VOC limits of South Coast Air Quality Management District Rule (SCAQMD) #1168 and Bay Area Air Quality Management District (BAAQMD) Reg. 8, Rule 51.

1.5 RELATED SECTIONS

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 03 39 00 - Concrete Curing.

C. Section 03 41 10 - Plant-Precast Structural Concrete*.

D. Section 03 53 00 - Concrete Topping.

E. Section 04 20 00 - Unit Masonry.

F. Section 04 40 00 - Stone Assemblies.

G. Section 07 13 00 - HDPE Membrane Waterproofing.

H. Section 07 14 00 - Fluid-Applied Waterproofing.

I. Section 07 50 00 - Membrane Roofing -Membrane Roofing.

J. Section 07 91 26 - Joint Fillers.

K. Section 09 01 20.91 - Plaster Restoration.

L. Section - Gypsum Board.

1.6 ALLOWANCES

1.7 ALTERNATES

1.8 REFERENCES

A. American Iron and Steel Institute (AISI) Specification for the Design of Cold-Formed Steel Structural Members

B. American National Standards Institute (ANSI):

1. ANSI A137.1 American National Standard Specifications For Ceramic Tile.
2. ANSI A108.01 - A108.17 American National Standard Specifications For The Installation Of Ceramic Tile.
3. ANSI A118.1 - A118.15 American National Standard Specifications For The Installation Of Ceramic Tile.

C. ASTM International (ASTM):

1. ASTM C144 Standard Specification for Aggregate for Masonry Mortar.
2. ASTM C150 Standard Specification for Portland Cement.
3. ASTM C482 Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement.
4. ASTM C503 Standard Specification for Marble Dimension Stone (Exterior).
5. ASTM C794 Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
6. ASTM C847 Standard Specification for Metal Lath.
7. ASTM C920 Standard Specification for Elastomeric Joint Sealants.

8. ASTM C955 Standard Specification for Load Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Board and Metal Plaster Bases.
9. ASTM C1670 -14 - Standard Specification for Adhered Manufactured Stone Masonry Veneer Units.
10. ASTM C1780-14 - Standard Practice for Installation Methods for Adhered Manufactured Stone Masonry Veneer.
11. ASTM D226 Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing And Waterproofing.
12. ASTM D227 Standard Specification for Coal-Tar Saturated Organic Felt Used in Roofing and Waterproofing.
13. ASTM D1248 Standard Test Method for Staining of Porous Substances by Joint Sealants.
14. ASTM D4397 Standard Specification for Polyethylene Sheeting for Construction, Industrial and Agricultural Applications.
15. ASTM D4716 Standard Test Method for Determining the (In Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geo-synthetic Using a Constant Head.
16. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
17. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.

D. Canadian Sheet Steel Building Institute (CSSBI) Lightweight Steel Framing Binder Publication 52M.

E. Federal Housing Administration (FHA) Bulletin No. 750 Impact Noise Control in Multifamily Dwellings.

F. Housing and Urban Development (HUD) TS 28 A Guide to Airborne, Impact and Structure-borne Noise-Control in Multifamily Dwellings.

G. International Organization for Standardization (ISO) 13007 Standards for Grouts and Adhesives.

H. Masonry Veneer Manufacturer's Association (MVMA) Installation Guide - www.ncma.org

I. Materials And Methods Standards Association (MMSA) Bulletins 1-16.

J. Metal Lath/Steel Framing Association (ML/SFA) 540 Lightweight Steel Framing Systems Manual.

K. Steel Stud Manufacturers Association (SSMA) Product Technical Information and ICBO Evaluation Service, Inc. Report ER-4943P.

L. Terrazzo, Tile And Marble Association Of Canada (TTMAC) Specification Guide 09300 Tile Installation Manual.

M. Tile Council Of North America (TCNA) Handbook For Ceramic, Glass, and Stone Tile Installation.

1.9 SYSTEM DESCRIPTION

A. Manufactured stone veneer, installed over walls using latex Portland cement mortar and latex Portland cement grout.

1.10 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation instructions.
4. Maintenance Data: Cleaning methods, cleaning solutions recommended, stain removal methods, as well as polishes and waxes recommended.
5. Submit proof of warranty.

C. Submit shop drawings and manufacturers' product data.

D. Submit samples of each type/style/finish/size/color of manufactured stone veneer.

E. Submit manufacturers' installation instructions.

F. Submit manufacturer's certification that the materials supplied conform to ASTM 1670-14 for Adhered Manufactured Stone Masonry Veneer Units or ANSI A137.1 for ceramic tile.

G. Submit proof of warranty.

H. Submit sample of installation system demonstrating compatibility/functional relationships between adhesives, mortars, grouts and other components. Submit proof from ceramic tile manufacturer or supplier verifying suitability of tile or stone veneer for specific application and use; including dimensional stability, water absorption, freeze/thaw resistance (if applicable), resistance to thermal cycling, and other characteristics that may project may require. These characteristics shall be reviewed and approved by the project design professional(s).

I. Submit a list from the manufacturer of installation system/adhesive/mortar/grout identifying a minimum of three similar projects, each with a minimum of ten years of service.

J. For alternate materials, at least thirty days before bid date submit independent laboratory test results confirming compliance with specifications listed in Part 2 - Products.

1.11 QUALITY ASSURANCE

A. Veneer Manufacturer (Single Source Responsibility): Company specializing in ceramic tile, thin brick, manufactured masonry veneer, mosaic, and trim unit with three years minimum experience. Obtain tile from a single source with resources to provide products of consistent quality in appearance and physical properties.

B. Installation System Manufacturer (Single Source Responsibility): Company specializing in adhesives, mortars, grouts and other installation materials with ten (10) years minimum experience and ISO 9001 certification. Obtain installation materials from single source manufacturer to insure consistent quality and full compatibility.

C. Submit laboratory confirmation of adhesives, mortars, grouts and other installation materials:

D. Identify proper usage of specified materials using positive analytical method.

E. Identify compatibility of specified materials using positive analytical method.

F. Identify proper color matching of specified materials using a positive analytical method.

G. Installer qualifications: company specializing in installation of ceramic tile, thin brick, manufactured masonry veneer, mosaic, and trim unit with five years documented experience with installations of similar scope, materials and design.

H. Mock-Up: Provide mock-up of each type/style/finish/size/color of ceramic tile, thin brick, manufactured masonry veneer, mosaic, and trim unit along with respective installation adhesives, mortars, grouts and other installation materials.

1. Construct areas designated by Architect.
2. Do not proceed with remaining work until material, details and workmanship are approved by Architect.
3. Refinish mock-up area as required to produce acceptable work.
4. As approved by Architect, mockup may be incorporated into finished work.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Acceptance at Site: Deliver and store packaged materials in original containers with seals unbroken and labels, including grade seal, intact until time of use, in accordance with manufacturer's instructions.

B. Store adhered masonry veneer and installation system materials in a dry location; handle in a manner to prevent chipping, breakage, and contamination.

C. Protect latex additives, waterproofing membranes, epoxy adhesives and sealants from freezing or overheating in accordance with manufacturer's instructions; store at room temperature when possible.

D. Store Portland cement mortars and grouts in a dry location.

1.13 PROJECT/SITE CONDITIONS

A. Provide ventilation and protection of environment as recommended by manufacturer.

B. Prevent carbon dioxide damage to ceramic tile, thin brick, manufactured masonry veneer, mosaic, and trim unit as well as adhesives, mortars, grouts and other installation materials, by venting temporary heaters to the exterior.

C. Maintain ambient temperatures not less than 50 degrees F (10 degrees C) or more than 100 degrees F (38 degrees C) during installation and for a minimum of seven days after completion. Setting of Portland cement is retarded by low temperatures. Protect work for extended period of time and from damage by other trades. Installation with latex Portland cement mortars requires substrate, ambient and material temperatures at least 37 degrees F (3 degrees C). There is to be no ice in substrates. Freezing after installation will not damage latex Portland cement mortars. Protect Portland cement based mortars and grouts from direct sunlight, radiant heat, forced ventilation (heat & cold) and drafts until cured to prevent premature evaporation of moisture. Epoxy mortars and grouts require surface temperatures between 60 degrees F (16 degrees C) and 90 degrees F (32 degrees C) at time of installation. It is the General Contractor's responsibility to maintain temperature control.

1.14 PRE-INSTALLATION CONFERENCE

A. Pre-installation conference: At least three weeks prior to commencing the work attend a meeting at the jobsite to discuss conformance with requirements of specification and job site conditions. Representatives of owner, architect, general contractor, adhered masonry veneer subcontractor, adhered masonry veneer manufacturer, Installation System Manufacturer and any other parties who are involved in the scope of this installation shall attend the meeting.

1.15 SEQUENCING AND SCHEDULING

A. Coordinate installation of adhered masonry veneer work with related work.

B. Proceed with adhered masonry veneer work only after curbs, vents, drains, piping, and other projections through substrate have been installed and when substrate construction and framing of openings have been completed.

1.16 WARRANTY

A. The Contractor warrants the work of this Section to be in accordance with the Contract Documents and free from faults and defects in materials and workmanship for a period of 25 years. The manufacturer of adhesives, mortars, grouts and other installation materials shall provide a written twenty five year warranty, which covers materials and labor - reference LATICRETE Warranty Data Sheet 025.0 for complete details and requirements.

B. For exterior facades over steel or wood framing, the manufacturer of adhesives, mortars, grouts and other installation materials shall provide a written fifteen year warranty, which covers materials and labor - reference LATICRETE Warranty Data Sheet 230.15 for complete details and requirements.

1.17 MAINTENANCE

A. Submit maintenance data. Include cleaning methods, cleaning solutions recommended, stain removal methods, as well as polishes and waxes recommended.

B. EXTRA MATERIALS STOCK

C. Upon completion of the work of this Section, deliver to the Owner 2 percent minimum additional adhered masonry veneer and trim shape of each type, color, pattern and size used in the Work, as well as extra stock of adhesives, mortars, grouts and other installation materials for the Owner's use in replacement and maintenance. Extra stock shall be from same production run or batch as original adhered masonry veneer and installation materials.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: LATICRETE International, Inc., which is located at: 1 LATICRETE Park N.; Bethany, CT 06524-3423; Toll Free Tel: 800-243-4788; Tel: 203-393-0010; Fax: 203-393-1684; Email: request info (technicalservices@laticrete.com); Web:www.laticrete.com/Mvis

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 EXTERIOR ADHERED VENEER MANUFACTURERS

A. Subject to compliance with material characteristics and product performance requirements, provide products by one of the following manufacturers:

2.3 EXTERIOR ADHERED VENEER MATERIALS

A. Tile:

B. Grade:

C. Size:

D. Edge:

E. Finish:

F. Color:

G. Special shapes

H. Location:

2.4 INSTALLATION ACCESSORIES - EXTERIOR ADHERED VENEER

A. Waterproofing / Crack Suppression / Air & Water Barrier Membrane to be thin, cold applied, single component liquid and load bearing. Reinforcing fabric to be non-woven rot-proof specifically intended for waterproofing membrane. Waterproofing Membrane to be non-toxic,

non-flammable, and non-hazardous during storage, mixing, application and when cured. It shall be certified by IAPMO and ICC approved as a shower pan liner and shall also meet the following physical requirements:

1. Basis of Design: LATICRETE MVIS™ Air & Water Barrier.
2. Hydrostatic Test (ASTM D4068): Pass.
3. Elongation @ break (ASTM D751): 20-30%.
4. System Crack Resistance (ANSI A118.12): Pass (High).
5. 7 day Tensile Strength (ANSI A118.10): > 265 psi (1.8 MPa).
6. 7 day Shear Bond Strength (ANSI A118.10); > 200 psi (1.4 MPa).
7. 28 Day Shear Bond Strength (ANSI A118.4): > 214 psi (1.48 - 2.4 MPa).
8. Service Rating (TCA/ASTM C627): Extra Heavy.
9. Total VOC Content: < 0.05 mg/m3.

B. Epoxy Waterproofing Membrane/Flashing Mortar to be 3 3-component epoxy, trowel-applied specifically designed to be used under masonry veneer, stone or thin brick and requires only 24 hours before flood testing:

1. Basis of Design: LATAPOXY Waterproof Flashing Mortar.
2. Breaking Strength (ANSI A118.10): 450-530 psi (3.1-3.6 MPa).
3. Waterproofness (ANSI A118.10): No Water penetration.
4. 7 day Shear Bond Strength (ANSI A118.10): 110-150 psi (0.8-1 MPa).
5. 28 Day Shear Bond Strength (ANSI A118.10): 90-120 psi (0.6- 0.83 MPa).
6. 12 Week Shear Bond Strength (ANSI A118.10): 110-130 psi (0.8-0.9 MPa).
7. Total VOC Content: < 3.4 g/L.

C. Sealer (Exterior Masonry Veneers): water-based formula specifically designed for topical application on porous stones in exterior applications.

1. Basis of Design: LATICRETE STONETECH Heavy Duty Exterior Sealer.

D. Galvanized, diamond metal lath: flat expanded type, weighing not less than 3.2 lb. per yd2 (1.4 kg/m2). Metal lath shall comply with ASTM C847.

E. Cleavage membrane: 15 pound asphalt saturated, non-perforated roofing felt complying with ASTM D226, 15 pound coal tar saturated, non-perforated roofing felt complying with ASTM D227 or 4.0 mils (0.1 mm) thick polyethylene plastic film complying with ASTM D4397.

F. Cementitious backer board units: size and thickness as specified, complying with ANSI A118.9.

2.5 INSTALLATION MATERIALS - EXTERIOR ADHERED VENEER

A. Latex Portland Cement Mortar for thick beds, and scratch/plaster coats to be weather, frost, shock resistant and meet the following physical requirements:

1. Basis of Design: LATICRETE MVIS Premium Mortar Bed.
2. Compressive Strength (ANSI A118.7 Modified): > 4000 psi (27.6 MPa).
3. Total VOC Content: < 0.05 mg/m3.

B. Latex Portland Cement Thin Bed Mortar for thin set to be weather, frost, shock resistant, non-flammable and meet the following physical requirements:

1. Basis of Design: LATICRETE MVIS™ Hi-Bond Veneer Mortar.
2. Compressive strength (ASTM C270): >=2900 psi (20 MPa).
3. Shear bond strength (ANSI A118.4 5.2.4): >=300 psi (2.1 MPa).
4. Sag On Wall (EN 1308): 0.0mm.
5. Total VOC Content: < 0.05 mg/m3.

C. Latex Portland Cement Pointing Mortar to be weather, frost and shock resistant, as well as meet the following physical requirements:
1. Basis of Design: LATICRETE MVIS Premium Pointing Mortar.
2. Compressive Strength (ASTM C91): >=4100 psi (28.3 MPa).
3. Total VOC Content: < 0.05 mg/m3.

D. Expansion and Control Joint Sealant to be a one component, neutral cure, exterior grade silicone sealant and meet the following requirements:
1. Basis of Design: LATICRETE MVIS Silicone Sealant.
2. Tensile Strength (ASTM C794): 280 psi (1.9 MPa).
3. Hardness (ASTM D751; Shore A): 25 (colored sealant) /15 (clear sealant).
4. Weather Resistance (QUV Weather-meter): 10000 hours (no change).

PART 3 - EXECUTION

3.1 SUBSTRATE EXAMINATION

A. Verify that surfaces to be covered with ceramic tile, mosaic, masonry veneer, trim unit, and waterproofing are:

1. Sound, rigid and conform to good design/engineering practices;

2. Systems, including the framing system and panels, over which ceramic tile will be installed shall be in conformance with the International Residential Code (IRC) for residential applications, the International Building Code (IBC) for commercial applications, or applicable building codes.

3. Clean and free of dust, dirt, oil, grease, sealers, curing compounds, laitance, efflorescence, form oil, loose plaster, paint, and scale;

4. For adhered veneer installations when a cementitious bonding material will be used, maximum allowable variation in the substrate - for finishes with edges shorter than 15 inches (375 mm), maximum allowable variation is 1/4 inch in 10 feet (6 mm in 3 m) from the required plane, with no more than 1/16 inch variation in 12 inches (1.5 mm variation in 300 mm) when measured from the high points in the surface. For veneers with at least one edge 15 inches (375 mm) in length, maximum allowable variation is 1/8 inch in 10 feet (3 mm in 3 m) from the required plane, with no more than 1/16 inch variation in 24 inches (1.5 mm variation in 600 mm) when measured from the high points in the surface. For modular substrate units, such as exterior glue plywood panels or adjacent concrete masonry units, adjacent edges cannot exceed 1/32 inch (0.8 mm) difference in height. For

thick bed (mortar bed) adhered veneers, ceramic tile and stone installations, maximum allowable variation in the installation substrate to be (1/4 inch in 10 feet (6 mm in 3 m).

5. Not leveled with gypsum or asphalt based compounds

6. Concrete surfaces shall be:

7. Cured a minimum of 28 days at 70 degrees F (21 degrees C), including an initial seven day period of wet curing;

8. Wood float finished, or better, if the installation is to be done by the thin bed method;

B. Advise Contractor and Architect of any surface or substrate conditions requiring correction before tile work commences. Beginning of work constitutes acceptance of substrate or surface conditions.

3.2 SURFACE PREPARATION - EXTERIOR ADHERED VENEERS - FRAMED CONSTRUCTS

A. SHEATHING (e.g. EXTERIOR OSB , EXTERIOR GRADE PLYWOOD, & OTHER EXTERIOR RATED SHEATHING) OVER FRAMING

1. All designs, specifications and construction practices shall be in accordance with industry standards. Refer to latest editions of:
   a. American Iron and Steel Institute (AISI) "Specification for the Design of Cold-Formed Steel Structural Members" [www.steel.org];
   b. Canadian Sheet Steel Building Institute (CSSBI) "Lightweight Steel Framing Binder Publication 52M" [www.cssbi.ca];
   c. Steel Stud Manufacturers Association (SSMA) "Product Technical Information" and "ICBO Evaluation Service, Inc. Report ER-4943P" [www.ssma.com];
   d. Metal Lath/Steel Framing Association "Steel Framing Systems Manual."

2. Prior to commencing work, installer shall submit to Architect/Structural Engineer for approval, shop drawings showing wall/facade construction and attachment details. All attachments shall be designed to prevent transfer of building or structural movement to the wall/facade.

3. Construct all framing with galvanized or other rust resistant steel studs and channels; minimum requirements:
   a. Stud Gauge: 16 gauge (1.5 mm);
   b. Stud Steel: conforming to ASTM A570 with a minimum yield point of 50 ksi (345 MPa);
   c. Stud Spacing: not to exceed 16 inches (400 mm) on center;
   d. Stud Width: 6 inches (150 mm);
   e. Horizontal Bridging: Not to exceed 4 feet (1.2 m) on center; 16 gauge CR channel typical or as specified by structural engineer.

4. Studs shall be seated squarely in the channel tracks with the stud web and flange abutting the track web, plumbed or aligned, and securely attached to the flanges or web of both the upper and lower tracks by welding. Similarly connect horizontal bridging/purlins and

anti-racking diagonal bracing as determined by structural engineer. Grind welds smooth and paint with rust inhibiting paint. Finished frame and components shall be properly aligned, square and true.

5. Provide adequate support of framing elements during erection to prevent racking, twisting or bowing. Lay out the exterior rated sheathing installation so all board edges are supported by metal framing (studs vertically and purlins horizontally). Cut/fit the exterior rated sheathing and add additional framing elements as required to support board edges. Stagger boards in courses to prevent continuous vertical joints and allow 1/8 to 3/16 inch (3 to 5mm) between sheets.

6. Fasten the exterior rated sheathing with 7/8 inch (22 mm) minimum length, non-rusting, self-imbedding screws for metal studs (BUILDEX Catalog item 10-24 17/16 Wafer T3Z or equivalent). Fasten the boards every 6 inches (150 mm) at the edges and every 8 inches (200 mm) in the field. Stagger placement of screws at seams. Place screws no less than 3/8 inch (9 mm), and no more than 1 inch (25 mm), from board edges.

7. Follow board manufacturer's installation instructions.

8. Compliance with design criteria and state and local building codes shall approved and certified by a qualified structural engineer. Use more stringent design criteria when necessary to comply with state and local building code stiffness requirements for thin veneers.

B. CEMENTITIOUS BACKER UNIT (CBU) OVER STEEL FRAMING

1. All designs, specifications and construction practices shall be in accordance with industry standards. Refer to latest editions of:
   a. American Iron and Steel Institute (AISI) "Specification for the Design of Cold-Formed Steel Structural Members" [www.steel.org];
   b. Canadian Sheet Steel Building Institute (CSSBI) "Lightweight Steel Framing Binder Publication 52M" [www.cssbi.ca];
   c. Steel Stud Manufacturers Association (SSMA) "Product Technical Information" and "ICBO Evaluation Service, Inc. Report ER-4943P" [www.ssma.com];
   d. Metal Lath/Steel Framing Association "Steel Framing Systems Manual."

2. Prior to commencing work, installer shall submit to Architect/Structural Engineer for approval, shop drawings showing wall/facade construction and attachment details. All attachments shall be designed to prevent transfer of building or structural movement to the wall/facade.

3. Construct all framing with galvanized or other rust resistant steel studs and channels; minimum requirements:
   a. Stud Gauge: 16 gauge (1.5 mm);
   b. Stud Steel: conforming to ASTM A570 - latest edition with a minimum yield point of 50 ksi;
   c. Stud Spacing: not to exceed 16 inches (400 mm) on center;
   d. Stud Width: 6 inches (150 mm);
   e. Horizontal Bridging: Not to exceed 4 feet (1.2 m) on center; 16 gauge CR channel typical or as specified by structural engineer.

4. Studs shall be seated squarely in the channel tracks with the stud web and flange abutting the track web, plumbed or aligned, and securely attached to the flanges or web of both the upper and lower tracks by welding. Similarly connect horizontal bridging/purlins and anti-racking diagonal bracing as determined by structural engineer. Grind welds smooth and paint with rust inhibiting paint. Finished frame and components shall be properly aligned, square and true.

5. Provide adequate support of framing elements during erection to prevent racking, twisting or bowing. Lay out the CBU installation so all board edges are supported by metal framing (studs vertically and purlins horizontally). Cut/fit CBU and add additional framing elements as required to support board edges. Stagger boards in courses to prevent continuous vertical joints and allow 1/8 to 3/16 inch (3 to 5 mm) between sheets.

6. Fasten the CBU with 7/8 inch (22mm) minimum length, non-rusting, self-imbedding screws for metal studs (BUILDEXSYMBOL 226 "Symbol" 10 Catalog item 10-24 17/16 Wafer T3Z or equivalent). Fasten the boards every 6 inches (150 mm) at the edges and every 8 inches (200 mm) in the field. Stagger placement of screws at seams. Place screws no less than 3/8 inch (9 mm), and no more than 1 inch (25 mm), from board edges.

7. Tape all the board joints with the alkali resistant 2 inches (50 mm) wide reinforcing mesh provided by the CBU manufacturer imbedded in the same mortar used to install the adhered veneer, ceramic tile, mosaic, pavers, brick or stone.

8. Compliance with design criteria and state and local building codes shall approved and certified by a qualified structural engineer. Use more stringent design criteria when necessary to comply with state and local building code stiffness requirements for thin veneers.

3.3 INSTALLATION ACCESSORIES - EXTERIOR ADHERED VENEERS

A. Weather Resistant Barrier (WRB) or equivalent - 2 layers or as detailed and specified by Architect

1. Install per WRB manufacturer's written installation instructions.
2. Use the following LATICRETE System Materials: LATICRETE MVIS Air & Water Barrier

3. Install the vapor permeable air and water barrier in compliance with current revisions of manufacturer's written installation instructions. Review the installation and plan the application sequence. Pre-cut LATICRETE Waterproofing/Anti-Fracture Fabric (if required), allowing 2 inches (50 mm) for overlap at ends and sides to fit the areas as required. Roll up the pieces for easy handling and placement. Shake or stir LATICRETE MVIS™ Air & Water Barrier before using.

4. Pre-Treat Cracks and Joints - Install sheathing panels and treat joints in accord with the respective sheathing panel manufacturer's installation instructions, including installation of board joint treatment. Pack any gaps around pipes, lights or other penetrations with LATAPOXY Waterproof Flashing Mortar and allow to harden. Treat substrate joints and seams up to 1/8 inch (3 mm) by applying a liberal coat of LATICRETE MVIS Air & Water Barrier approximately 8 inches (200 mm) wide over seam using a paint roller

(heavy napped), brush or trowel. While LATICRETE MVIS Air & Water Barrier is still wet embed 6 inches (150 mm) wide LATICRETE Waterproofing/Anti-Fracture Fabric pressing the fabric in firmly so that the LATICRETE MVIS Air & Water Barrier liquid bleeds through the fabric, then immediately apply another liberal coat^ of LATICRETE MVIS Air & Water Barrier liquid over the fabric using a paint roller, brush or trowel. For substrate joints and seams greater than 1/8 inch (3 mm); fill seams to a smooth finish with a LATICRETE Polymer Fortified Veneer Mortar. Allow mortar to set 24 hours, then treat seams by applying a liberal coat of LATICRETE MVIS Air & Water Barrier approximately 8 inches (200 mm) wide over seam. While LATICRETE Air & Water Barrier is still wet embed 6 inches (150 mm) wide LATICRETE Waterproofing/Anti-Fracture Fabric pressing the fabric in firmly so that the LATICRETE MVIS Air & Water Barrier liquid bleeds through the fabric, then immediately apply another liberal coat^ of LATICRETE MVIS Air & Water Barrier liquid over the fabric. LATICRETE MVIS Air & Water Barrier will dry to a uniform olive green color when it's dry to touch.

5. Pre-Treat Coves and Floor/Wall Intersections - Fill all substrate coves and floor/wall transitions to a smooth finish and changes in plane using a LATICRETE latex-fortified thin-set. Alternatively, a liberal coat of LATICRETE MVIS Air & Water Barrier applied with a paint brush or trowel may be used to fill in cove joints and floor/wall transitions < 1/8 inch (3 mm) in width. Apply a liberal coat of LATICRETE MVIS Air & Water Barrier approximately 8 inches (200 mm) wide over substrate cracks, cold joints, and control joints using a paint brush or heavy napped paint roller.

6. Movement Joint Loop (Slip Joint) Treatment - Apply a liberal coat of LATICRETE MVIS Air & Water Barrier, approximately 8 inches (200 mm) wide over the areas. Then immediately embed and loop the 6 inches (152 mm) wide LATICRETE Waterproofing/Anti-Fracture Fabric into the substrate movement joint and allow to bleed through. Then top coat with a second liberal coat of LATICRETE MVIS Air & Water Barrier liquid fully encapsulating the LATICRETE Waterproofing/Anti-Fracture Fabric. Repeat process to ensure that all movement joints receive two layers of LATICRETE Waterproofing/Anti-Fracture Fabric.

7. Main Application - Allow any pre-treated areas to dry to the touch. Apply a liberal coat of LATICRETE MVIS Air & Water Barrier using a paint roller (heavy napped) or paint brush over substrate including pre-treated areas and allow to dry to the touch approximately 1- 2 hours at 70 degrees F (21 degrees C) and 50% RH. Apply a second liberal coat of LATICRETE MVIS Air & Water Barrier over the first coat of LATICRETE MVIS Air & Water Barrier. Let topcoat dry to the touch, approximately 1 to 2 hours at 70 degrees F (21 degrees C) and 50% RH. When last coat has dried to the touch, inspect final surface for pinholes, voids, thin spots or other defects and re-apply as necessary. LATICRETE MVIS Air & Water Barrier will dry to a uniform olive green color when it's dry to touch. Use additional LATICRETE MVIS Air & Water Barrier to seal pinholes, voids, thin spots or other defects and re-apply as necessary. Bring main application of LATICRETE MVIS Air and Water Barrier up to all penetrations through the membrane.

8. Dry coat thickness shall be 20 to 30 mil (0.02 to 0.03 inch or 0.5 to 0.8 mm); consumption per coat is approximately 0.01 gal/ft2 (approx. 0.4 L/m2); coverage is approximately 100 ft2 /gal (approx. 2.5 m2/ L). LATICRETE Waterproofing/Anti-Fracture Fabric shall be used to pre-treat cracks, joints, curves, corners, drains, and penetrations with LATICRETE MVIS™ Air & Water Barrier.

B. Spray Application of LATICRETE MVIS Air & Water Barrier - Follow all installation and surface preparation requirements outlined in this document and TDS 410M "Spraying LATICRETE MVIS Air & Water Barrier". The sprayer being used for the application of LATICRETE MVIS Air & Water Barrier shall be capable of producing a maximum of 3300 psi (22.8 MPa) with a flow rate of 0.95 to 1.6 GPM (3.6 to 6.0 LPM) using a 0.521 or a 0.631 reversible tip. Keep the unit filled with LATICRETE MVIS Air & Water Barrier to ensure continuous application of liquid. The hose length shall not exceed 100 feet (30 m) in length and 3/8 inch (10 mm) in diameter.

1. Apply a continuous LATICRETE MVIS Air & Water Barrier film with an overlapping spray. The wet film has a sage green appearance and dries to a darker olive green color. When the first coat has dried to a uniform olive green color, approximately 45 to 90 minutes at 70 degrees F (21 degrees C), visually inspect the coating for any voids or pinholes. Fill any defects with additional material and apply the second coat at right angles to the first. The wet film thickness shall be checked periodically using a wet film gauge.

2. Check application thickness with a wet film gauge periodically as the LATICRETE MVIS Air & Water Barrier is being applied to ensure that the appropriate thickness and coverage is achieved. Bounce back and overspray will consume more product. To achieve the required film thickness, the coating shall be free from pinholes and air bubbles. Bring main application of LATICRETE Air and Water Barrier up to all penetrations through the membrane. Do not back roll the spray applied coating. Allow the LATICRETE MVIS Air & Water Barrier to cure in accord with the instructions in this document and TDS 410M prior to the installation of finish materials. It is important to note that areas not scheduled to receive the LATICRETE MVIS Air & Water Barrier shall be taped off and protected from any potential overspray.

C. Protection - Provide protection for newly installed membrane, even if covered with a thin-bed stone, masonry veneer, or thin brick installation against exposure to rain or other water for a minimum of 2 hours at 70 degrees F (21 degrees C) and 50% RH. For temperatures between 45 degrees F and 69 degrees F (7 degrees C to 21 degrees C) allow a minimum 24 hour cure period.

3.4 INSTALLATION - EXTERIOR ADHERED VEENERS

A. Pre-float Method (exterior adhered veneers): Over clean, dimensionally stable and sound concrete and masonry substrates, apply latex-Portland cement thick-bed mortar as scratch/leveling coat in compliance with current revision of Masonry Veneer Manufacturer's Association (MVMA) "Installation Guide for Adhered Concrete Masonry Veneer" and/or veneer manufacturer's specific written installation instructions. Float surface of scratch/leveling coat plumb, true and allow mortar to set until firm. For installation of thin brick, masonry veneer, and stone, follow appropriate "Exterior Adhered Veneers Method" for "Stacked Veneer" or "Pointed / Grouted" veneer installations.

1. Use the following LATICRETE System Materials: LATICRETE MVIS™ Premium Mortar Bed.

B. Lath & Plaster Method (exterior adhered veneers): Install cleavage membrane/water resistive barrier complying with current revision of ASTM D226 (No. 15 Type 1), 2 separate layers of

cleavage membrane/water resistive barrier complying with ICC-ES AC38 or a combination of both using corrosion resistant fasteners complying with ASTM C1063 Sec. 7.10.2. Install metal lath complying with the local building code requirements and/or 2.5 lb. (1.1 kg) or 3.4 lb. (1.5 kg) diamond mesh lath (ASTMC847-10, ASTMC1780). Apply latex-Portland cement mortar as scratch/leveling coat over wire lath, concrete or masonry in compliance with current revision of Masonry Veneer Manufacturer's Association (MVMA) "Installation Guide for Adhered Concrete Masonry Veneer" and/or veneer manufacturer's specific written installation instructions and/or ASTM C1780 Standard Practice for Installation Methods for Adhered Manufactured Stone Masonry Veneer. Float surface of scratch/leveling coat plumb, true and allow mortar to set until firm. For installation of thin brick, masonry veneer, or stone, follow the appropriate "Exterior Adhered Veneers" installation method for "Stacked Veneer" or "Pointed / Grouted" veneer installations.

1. Use the following LATICRETE System Materials: LATICRETE MVIS Premium Mortar Bed.

C. Exterior Adhered Veneers (Tile Council of North America / Marble Institute of America Methodology): Install latex Portland cement mortar in compliance with current revisions of ANSI A108.02 (3.11), A108.1B and ANSI A108.5. Use the appropriate trowel notch size to ensure proper bedding of the tile, brick or stone selected. Work the latex Portland cement mortar into good contact with the substrate and comb with notched side of trowel. Spread only as much latex Portland cement mortar as shall be covered while the mortar surface is still wet and tacky. When installing large format (> 8 inches x 8 inches (200 mm x 200 mm) tile/stone, rib/button/lug back tiles, pavers or sheet mounted ceramics/mosaics, spread latex Portland cement mortar onto the back of (i.e. ' back-butter') each piece/sheet in addition to trowelling latex Portland cement mortar over the substrate. Beat each piece/sheet into the latex Portland cement mortar with a beating block or rubber mallet to insure full bedding and flatness. Allow installation to set until firm. Clean excess latex Portland cement mortar from tile or stone face and joints between pieces.

1. Use the following LATICRETE System Materials: LATICRETE MVIS™ Hi-Bond Veneer Mortar.

D. Exterior Adhered Veneers (Pointed/Grouted - Masonry Veneer Manufacturer's Association Methodology): Moisten the back of each veneer unit and the top of the scratch coat so the surfaces appear damp but are free of standing water. Install masonry veneer adhesive mortar in compliance with current revisions of Masonry Veneer Manufacturer's Association (MVMA) "Installation Guide for Adhered Concrete Masonry Veneer" and/or veneer manufacturer's specific written installation instructions. Use the appropriate installation tools to ensure proper bedding of veneer unit. Work the masonry veneer adhesive mortar into good contact with the back of the veneer unit making sure the entire unit is buttered to a nominal 1/2 inch (12 mm) thickness. DO NOT COVER JUST THE PERIMETER! Buttered masonry veneer units shall be firmly worked onto the scratch coat and slid slightly back and forth or with a slight rotating motion. Allow installation to set until firm. Clean excess latex Portland cement mortar from masonry veneer or stone face and joints between pieces. Installing masonry veneer from the top down will minimize cleanup requirements.

1. Use the following LATICRETE System Materials: LATICRETE MVIS Hi-Bond Veneer Mortar.

E. Exterior Adhered Veneers (Stacked Veneer - Masonry Veneer Manufacturer's Association Methodology): Moisten the back of each veneer unit and the top of the scratch coat so the surfaces appear damp but are free of standing water. Install masonry veneer adhesive mortar in compliance with current revisions of Masonry Veneer Manufacturer's Association (MVMA) "Installation Guide for Adhered Concrete Masonry Veneer" and/or veneer manufacturer's specific written installation instructions. Use the appropriate installation tools to ensure proper bedding of veneer unit. Work the masonry veneer adhesive mortar into good contact with the back of the veneer unit making sure the entire unit is buttered to a nominal 1/2 inch (12 mm) thickness. DO NOT COVER JUST THE PERIMETER! Buttered masonry veneer units shall be firmly worked onto the scratch coat and slid slightly back and forth or with a slight rotating motion. Allow installation to set until firm. Clean excess latex Portland cement mortar from masonry veneer or stone face and joints between pieces. Tight fitted masonry veneer shall be applied from the corners toward the middle of the wall, and from the bottom toward the top of the wall.

1. Use the following LATICRETE System Materials:
   a. LATICRETE MVIS Hi-Bond Veneer Mortar

F. Grouting or Pointing (Exterior Adhered Veneers):Pointing Mortar (for joints up to 1/2 inch (12 mm): Allow thin brick, masonry, and stone installations to cure a minimum of 24 hours @ 70 degrees F (21 degrees C). Verify grout joints are free of dirt, debris or tile spacers. Sponge or wipe dust/dirt off veneer face and remove any water standing in joints. Surface temperature shall be between 40 to 90 degrees F (4-32 degrees C). Use 2 quarts (1.9 L) of clean potable water for 25 lb. (11.4 kg) of LATICRETE MVIS™ Premium Pointing Mortar. Place water in a clean mixing container and add mortar slowly. Mix with a slow speed mixer to a smooth stiff consistency. Allow mortar to slake for 5 minutes. Remix mortar. Pointing mortar/grout may be installed using a grout bag, filling the joints to the desired depth, ensuring the mortar is forced into all voids. The curing time will shall vary significantly with temperature and humidity. Once applied allow to firm to "thumbprint" hardness, trowel, rake and/or dry, soft bristled brush to the desired finish.

1. Use the following LATICRETE System Materials: LATICRETE MVIS Premium Pointing Mortar

G. Waterproofing / Flashing: To be designed and detailed by project architect / engineer. The function of wall flashing, or through-wall flashing, is to divert moisture which may penetrate the exterior face of the facade, or divert moisture which may condense within the wall from water vapor migration to or from the interior spaces. Flashings are commonly used at changes in configuration of the facade, and between different components of the wall. Typical locations requiring flashing are at the intersection of roof and wall assemblies, under roof parapet and wall copings, over window and door openings, under window sills, at shelf or relieving angles, and at bases of hollow or cavity walls. Flashings shall always turn up against the area or material which is being protected in order to prevent water penetration. Provision shall be made to divert any trapped water back to the outside and away from the face of the building facade. This is commonly done by placing weep holes, tubes or absorbent wicks from 24 to 33 inches (600 to 840 millimeters) at the base of the flashing. Flashings shall form a drip edge and extend a minimum of 3/8 inch (10 millimeters) beyond the face of the facade to prevent water from dripping down the face of the facade. Check local building code for proper design, placement and implementation of flashing and weep systems. Copings, which protect the top of a parapet wall from water penetration, shall be flashed, at a minimum, at the joints between the coping material (metal, stone, ceramic tile, pre-cast concrete), but preferably continuous along and

beneath the entire length of the coping. Flashings which cannot be adhered or imbedded in the wall construction are either attached to reglets, which are pre-fabricated and pre-cast into the wall assembly, or attached to the wall assembly with mechanical attachments and sealed with sealants. In selecting a flashing, it is very important to verify compatibility of metals used in the window frame and the flashing in order to avoid corrosion from galvanic reactions of dissimilar metals.

H. Weeps / Pressure Equalization Vents: To be designed and detailed by project architect / engineer. Most building codes permit weeps no less than 3/16 inch (5 millimeters) in diameter and spaced no more than 33 inches (840 millimeters) on-center. Wick and tube weep spacing recommended at no more than 16 inches (400 millimeters) on-center. Install weeps and/or vent tubes through movement joints, conforming to the size, type and composition specified and as per weep/vent manufacturer's recommendations, on 2 feet (600 millimeters) centers minimum, and at all locations indicated in shop drawings, plans and details. Ensure that all weeps and/or equalization tubes are properly placed to reach the waterproofing membrane and/or cavity they are designed to drain/vent, and are clear of dirt, debris, sealant or other obstructions.

I. Vapor Barrier: Install vapor barrier, conforming to the type and composition specified and as per vapor barrier manufacturer's recommendations, on the side of wall cavity insulation that will be "warm in winter." Complete vapor barrier within two weeks after enclosure of the building. Placement, composition and detail to be provided by project design professional.

J. Expansion and Control Joints: Provide control or expansion joints as located in contract drawings and in full conformity, especially in width and depth, with architectural details.

1. Substrate joints shall carry through, full width, to surface of tile, brick, masonry veneer or stone.

2. Install expansion joints in tile, brick, masonry veneer or stone work over construction/cold joints or control joints in substrates.

3. Install expansion joints where tile, brick, masonry veneer or stone abut restraining surfaces (such as perimeter walls, curbs and columns), changes in plane and corners.

4. Joint placement depends on application - Follow the Masonry Veneer Manufacturers Association's (MVMA) Installation Guide and Detailing Options for Compliance with ASTM C1780.

5. Joint width: >= 1/8 inch (3mm) and <= 1 inch (25mm).

6. Joint width: depth ~2:1 but joint depth shall be >= 1/8 inch (3 mm) and <= 1/2 inch (12 mm).

7. Layout (field defined by joints): 1:1 length: width is optimum but must be <= 2:1. Remove all contaminants and foreign material from joint spaces/surfaces, such as dirt, dust, oil, water, frost, setting/grouting materials, sealers and old sealant/backer. Use LATICRETE LATASIL 9118 Primer for underwater and permanent wet area applications, or for porous stone (e.g. limestone, sandstone etc.) installations. Install appropriate backing material (e.g. closed cell backer rod) based on expansion joint design and as specified in section 07 91 26 - Joint Fillers. Apply masking tape to face of tile, brick or stone veneer. Use caulking gun, or other applicator, to completely fill joints with

sealant. Within 5-10 minutes of filling joint, ' tool' sealant surface to a smooth finish. Remove masking tape immediately after tooling joint. Wipe smears or excess sealant off the face of non-glazed tile, brick, stone or other absorptive surfaces immediately.

8. LATICRETE Data Sheets: 233.0, 6526.1

9. LATICRETE MSDS: LATICRETE MVIS Silicone Sealant, Primer

10. Use the following LATICRETE System Materials: LATICRETE MVIS Silicone Sealant, LATICRETE LATASIL 9118 Primer

K. Sealer (Exterior Adhered Veneers): Read entire label before using. Use only as directed. Always test in a small inconspicuous area with a 24-hour cure time to determine ease of application and desired results. Allow new grout installations to cure for 72 hours prior to application. Make sure surface is clean and free of waxes and coatings. Sealer may be applied to damp surfaces one hour after standing water has been removed. Surface temperature is to be between 50 degrees Fahrenheit and 80 degrees Fahrenheit (10 degrees Celsius and 26.7 degrees Celsius). Ensure that the area is well-ventilated during application and until the surface is dry. Keep children and pets out of the area until treated surface is dry.

1. Ensure cap is closed and sealed, and shake well before use.

2. Mask off surfaces not intended to be treated.

3. Liberally apply an even coat using a paint pad, paint brush, paint roller, or low-pressure solvent-resistant sprayer. Do not thin before using.

4. Allow sealer to penetrate the surface for 10 to 15 minutes; denser materials may require more time for the sealer to penetrate. During this time, distribute excess sealer over the entire area to ensure even penetration.

5. Thoroughly wipe down the entire surface with a clean, dry cloth to completely remove all excess sealer from the surface. DO NOT ALLOW SEALER TO COMPLETELY DRY ON THE SURFACE.

6. A second coat may be needed for porous, absorbent surfaces. If a second coat is required, it shall be applied one hour after the initial application as directed in steps 2 through 5.

7. If sealer was not completely wiped off and a residue appears, wipe entire surface with a towel dampened with sealer. Use a white, nylon pad to loosen residue and follow with a clean, white absorbent towel to remove.

8. Keep newly sealed installations free from contamination for 6 hours at 70 degrees Fahrenheit / 21 degrees Celsius.

9. A full cure is achieved in 24 to 72 hours at 70 degrees Fahrenheit / 21 degrees Celsius. Use of the treated surface may resume in 6- 8 hours. If use of the surface shall resume sooner, cover the treated surface with red rosin paper to protect it until full cure has been achieved.

10. Rags and equipment that are wet with sealer may be flammable. Clean up promptly after work is completed. Clean equipment with mineral spirits and allow to dry in a well-ventilated area. Allow rags to dry in a well-ventilated area out of reach. When, dry, dispose of in accordance with local waste disposal regulations.

11. Recommended Surfaces: Brick; concrete / masonry; homogeneous granite; veined granite; unpolished, honed and textured limestone; quartzite, bluestone, sandstone, slate, and travertine

12. Storage and Handling Instructions: Avoid prolonged exposure to vapors. Use in a well-ventilated area. Do not ingest. Avoid contact with eyes and skin. KEEP OUT OF THE REACH OF CHILDREN. Do not freeze or store above 100 degrees Fahrenheit /38 degrees Celsius. Do not mix with other chemicals. Do not release to natural waterways.

13. Use the following LATICRETE Systems Materials: LATICRETE STONETECH® Heavy Duty Exterior Sealer.

L. Adjusting: Correction of defective work for a period of one year following substantial completion, return to job and correct all defective work. Defective work includes, without limitation, tiles broken in normal abuse due to deficiencies in setting bed, loose tiles or grout, and all other defects which may develop as a result of poor workmanship.

3.5 CLEANING

A. Clean excess mortar/epoxy 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.

B. PROTECTION

C. Protect finished installation.

D. Due to the slow rate of Portland cement hydration and strength development at low temperatures, protect installations exposed to these conditions from traffic for longer than normal periods. Protection applies to the substrate, the installation of adhesives and joint grouts, post-installation (rain and temperature protection) until suitable cure, and also the storage and handling of the cladding material. Extend period of protection of tile work at lower temperatures, below 60 degrees F (15 degrees C), and at high relative humidity (> 70% R.H.) due to retarded set times of mortar/adhesives. For every 18 degrees F (10 degrees C) below 70 degrees F (21 degrees C) installation materials take twice as long to cure. Large format tiles and stones also require longer curing periods in cooler temperature / high humidity environments.

E. Keep finished work undisturbed until full cure. Suitable protection is to be included in the scope of work.

F. Each component shall reach a proper cure prior to installing the subsequent installation product.

G. Tent / shade and heat areas that will be subjected to the elements, or freezing temperatures, during installation and cure periods.

H. Protect newly installed exterior adhered veneer installations from direct exposure to rain for 7 days at 70 degrees Fahrenheit / 21 degrees Celsius. Protection and corrective action primarily requires temporary enclosures or tarpaulins prior to, during, and immediately after installation to shield from rain. If prolonged exposure occurs, surfaces that appear dry may be saturated internally and require testing to determine suitability of certain overlay substrates, membranes, and adhesives. Protection applies to the substrate, the installation of adhesives and joint grouts, post-installation (rain and temperature protection) until suitable cure, and also the storage and handling of the cladding material.

I. Replace, or restore, work of other trades damaged or soiled by work under this section.

3.6 HEALTH AND SAFETY

A. The use of personal protection such as rubber gloves, suitable dust masks, safety glasses and industrial clothing is highly recommended. Discarded packaging, product wash and waste water shall be disposed of as per local, state or federal regulations.

END OF SECTION

SECTION 05 1200 - STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural steel framing members, support members

B. Base plates.

C. Grouting under base plates.

1.02 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications: Steel fabrications affecting structural steel work.

B. Section 07 8100 - Applied Fireproofing: Fireproof protection to framing.

1.03 REFERENCE STANDARDS

A. AISC (MAN) - Steel Construction Manual; American Institute of Steel Construction, Inc.

B. AISC S303 - Code of Standard Practice for Steel Buildings and Bridges; American Institute of Steel Construction, Inc..

C. AISC S348 - Specification for Structural Joints Using ASTM A325 or A490 Bolts.

D. ASTM A1 - Standard Specification for Carbon Steel Tee Rails.

E. ASTM A36 - Standard Specification for Carbon Structural Steel.

F. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

G. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished.

H. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

I. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

J. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.

K. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

L. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

M. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

N. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.

M. ASTM A992 - Standard Specification for Structural Steel Shapes.

N. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

O. ASTM E94 - Standard Guide for Radiographic Examination.

P. ASTM E164 - Standard Practice for Ultrasonic Contact Examination of Weldments.

Q. ASTM F436 - Standard Specification for Hardened Steel Washers.

R. ASTM F959 - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.

S. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

T. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society.

U. AWS D1.1 - Structural Welding Code - Steel; American Welding Society.

V. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings.

W. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings.

X. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
2. Connections not detailed.

3. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.

C. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.05 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC "Steel Construction Manual."

B. Comply with Section 10 of AISC "Code of Standard Practice for Steel Buildings and Bridges" for architecturally exposed structural steel.

C. Fabricator: Company specializing in performing the work of this section with minimum 5 years of documented experience.

D. Erector: Company specializing in performing the work of this section with minimum 5 years of documented experience.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel Angles and Plates: ASTM A36.

B. Steel W Shapes and Tees: ASTM A992.

C. Rolled Steel Structural Shapes: ASTM A992.

D. Steel Shapes, Plates, and Bars: ASTM A36

E. Cold-Formed Structural Tubing: ASTM A500, Grade B.

F. Hot-Formed Structural Tubing: ASTM A501, seamless or welded.

G. Pipe: ASTM A53, Grade B, Finish black.

H. High-Strength Structural Bolts, Nuts, and Washers: ASTM A325 , Type 1, medium carbon.

I. Unheaded Anchor Rods: ASTM F1554, Grade 36, plain, with matching ASTM A563 nuts and ASTM F436 Type 1 washers.

J. Load Indicator Washers: Provide washers complying with ASTM F959 at all connections requiring high-strength bolts.

K. Welding Materials: AWS D1.1; type required for materials being welded.

L. Grout: Non-shrink, non-metallic aggregate type, complying with ASTM C1107 and capable of developing a minimum compressive strength of 5,000 psi at 28 days.

M. Shop and Touch-Up Primer: Fabricator's standard.

N. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard.

2.02 FABRICATION

A. Shop fabricate to greatest extent possible.

B. Continuously seal joined members by continuous welds. Grind exposed welds smooth.

C. Fabricate connections for bolt, nut, and washer connectors.

2.03 FINISH

A. Prepare structural component surfaces in accordance with SSPC PS 14.

B. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.

2.04 SOURCE QUALITY CONTROL

A. Welded Connections: Visually inspect all shop-welded connections and test at least 5 percent of welds using one of the following:
   1. Radiographic testing performed in accordance with ASTM E94.
   2. Ultrasonic testing performed in accordance with ASTM E164.
   3. Liquid penetrant inspection performed in accordance with ASTM E165.
   4. Magnetic particle inspection performed in accordance with ASTM E709.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

A. Erect structural steel in compliance with AISC "Code of Standard Practice for Steel Buildings and Bridges".

B. Allow for erection loads, and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.

C. Field weld components indicated on shop drawings.

D. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts".

E. Do not field cut or alter structural members without approval of architect and engineer.

F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

G. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch

3.04 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000.

B. High-Strength Bolts: Verify that all bolts are in place, tightened, and are of the correct diameter and type.

C. Welded Connections: Visually inspect all field-welded connections. Test any suspect connection using one of the following:
   1. Radiographic testing performed in accordance with ASTM E94.
   2. Ultrasonic testing performed in accordance with ASTM E164.
   3. Liquid penetrant inspection performed in accordance with ASTM E165.
   4. Magnetic particle inspection performed in accordance with ASTM E709.

END OF SECTION

SECTION 05 1200 - STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural steel framing members, support members

B. Base plates.

C. Grouting under base plates.

1.02 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications: Steel fabrications affecting structural steel work.

B. Section 07 8100 - Applied Fireproofing: Fireproof protection to framing.

1.03 REFERENCE STANDARDS

A. AISC (MAN) - Steel Construction Manual; American Institute of Steel Construction, Inc.

B. AISC S303 - Code of Standard Practice for Steel Buildings and Bridges; American Institute of Steel Construction, Inc..

C. AISC S348 - Specification for Structural Joints Using ASTM A325 or A490 Bolts.

D. ASTM A1 - Standard Specification for Carbon Steel Tee Rails.

E. ASTM A36 - Standard Specification for Carbon Structural Steel.

F. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

G. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished.

H. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

I. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

J. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.

K. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

L. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

M. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

N. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.

M. ASTM A992 - Standard Specification for Structural Steel Shapes.

N. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

O. ASTM E94 - Standard Guide for Radiographic Examination.

P. ASTM E164 - Standard Practice for Ultrasonic Contact Examination of Weldments.

Q. ASTM F436 - Standard Specification for Hardened Steel Washers.

R. ASTM F959 - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.

S. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

T. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society.

U. AWS D1.1 - Structural Welding Code - Steel; American Welding Society.

V. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings.

W. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings.

X. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
2. Connections not detailed.

3. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.

C. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.05 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC "Steel Construction Manual."

B. Comply with Section 10 of AISC "Code of Standard Practice for Steel Buildings and Bridges" for architecturally exposed structural steel.

C. Fabricator: Company specializing in performing the work of this section with minimum 5 years of documented experience.

D. Erector: Company specializing in performing the work of this section with minimum 5 years of documented experience.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel Angles and Plates: ASTM A36.

B. Steel W Shapes and Tees: ASTM A992.

C. Rolled Steel Structural Shapes: ASTM A992.

D. Steel Shapes, Plates, and Bars: ASTM A36

E. Cold-Formed Structural Tubing: ASTM A500, Grade B.

F. Hot-Formed Structural Tubing: ASTM A501, seamless or welded.

G. Pipe: ASTM A53, Grade B, Finish black.

H. High-Strength Structural Bolts, Nuts, and Washers: ASTM A325 , Type 1, medium carbon.

I. Unheaded Anchor Rods: ASTM F1554, Grade 36, plain, with matching ASTM A563 nuts and ASTM F436 Type 1 washers.

J. Load Indicator Washers: Provide washers complying with ASTM F959 at all connections requiring high-strength bolts.

K. Welding Materials: AWS D1.1; type required for materials being welded.

L. Grout: Non-shrink, non-metallic aggregate type, complying with ASTM C1107 and capable of developing a minimum compressive strength of 5,000 psi at 28 days.

M. Shop and Touch-Up Primer: Fabricator's standard.

N. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard.

2.02 FABRICATION

A. Shop fabricate to greatest extent possible.

B. Continuously seal joined members by continuous welds. Grind exposed welds smooth.

C. Fabricate connections for bolt, nut, and washer connectors.

2.03 FINISH

A. Prepare structural component surfaces in accordance with SSPC PS 14.

B. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.

2.04 SOURCE QUALITY CONTROL

A. Welded Connections: Visually inspect all shop-welded connections and test at least 5 percent of welds using one of the following:
   1. Radiographic testing performed in accordance with ASTM E94.
   2. Ultrasonic testing performed in accordance with ASTM E164.
   3. Liquid penetrant inspection performed in accordance with ASTM E165.
   4. Magnetic particle inspection performed in accordance with ASTM E709.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

A. Erect structural steel in compliance with AISC "Code of Standard Practice for Steel Buildings and Bridges".

B. Allow for erection loads, and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.

C. Field weld components indicated on shop drawings.

D. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts".

E. Do not field cut or alter structural members without approval of architect and engineer.

F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

G. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch

3.04 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000.

B. High-Strength Bolts: Verify that all bolts are in place, tightened, and are of the correct diameter and type.

C. Welded Connections: Visually inspect all field-welded connections. Test any suspect connection using one of the following:
   1. Radiographic testing performed in accordance with ASTM E94.
   2. Ultrasonic testing performed in accordance with ASTM E164.
   3. Liquid penetrant inspection performed in accordance with ASTM E165.
   4. Magnetic particle inspection performed in accordance with ASTM E709.

END OF SECTION

SECTION 05 40 01 - COLD FORMED METAL FRAMING AND SHEATHING

PART 1 - GENERAL

1.1 SUMMARY:

A. Related work specified elsewhere:

1. Exterior insulation and finish system.

2. Rough carpentry.

1.2 SUBMITTALS:

A. Product data: Include manufacturer's description of framing, load tables, span deflection tables and installation data. Mark material to indicate only products proposed for use.

B. Shop drawings:

1. Submit shop drawings showing fabrication and erection procedures.

2. Shop drawings shall bear the seal of a professional engineer licensed in the State of the project.

3. Show locations, sizes, gauges, spacing and types of framing components, windows, doors and punched openings.

4. Indicate all prefabricated framing, with individual panels shown for each condition. Indicate member properties, details of connections, all erection and permanent bracing required.

5. Indicate supplemental strapping, bracing, splices, bridging, accessories, accessories and details required for installation.

6. Shop drawings shall indicate sequence and method of erection details of all connections of cold formed steel framing to other elements of the building structure.

C. Welder certification: Submit welders' certifications in accord with AWS D1.1-92, current within the previous 12 months, for Architect's information.

D. Structural design calculations: Submit for Architect's information. Indicate compliance with specified design criteria. Calculations shall bear the seal of a professional engineer licensed in the State of the project.

1.3 DELIVERY AND STORAGE:

A. Deliver materials in unbroken bundles with each type of member identified with permanent marking with manufacturer's name, brand, type an gauge. Store in protected area to prevent rusting and damage.

1.4 JOB CONDITIONS:

A. Existing conditions: Inspect structure for compliance with specified erection tolerances.

B. Coordinate installation and location of anchors and inserts with structural system to which cold formed steel framing is attached.

1.5 QUALITY ASSURANCE:

A. Applicable standards; standards of the following, as referenced herein:

1. American Iron and Steel Institute (AISA).

2. American Society for Testing and Materials (ASTM).

3. American Welding Society (AWS).

4. Steel Structures Painting Council (SSPC).

B. Qualifications of welders:

1. Welders employed on the work shall have passed qualification tests within the past 12 months in the position for which employed, using AWS D1.1-92 and AWS D1.3-90 test procedures.

2. Contractor shall require any welder to retake qualification test when, in Architect's opinion, welder's work creates a reasonable doubt as to welder's proficiency. conduct Re-qualification tests at no additional expense to Owner. Make re-certification to Architect after welder has passed retest.

C. Design criteria:

1. Wind loads: Design framing system to withstand wind load pressures in accord with requirements of local codes.

2. Maximum allowable deflection: Comply with manufacturer's product data or design calculations to meet height and load conditions with maximum allowable deflection under full wind load of L/600.

3. Seismic performance: Comply with requirements of state and local building codes.

D. Cold formed steel framing shall be designed in accord with AISI "Cold Formed Steel Design Manual".

E. Framing members shall be manufactured and supplied by one manufacturer and be of the type and size as indicated on drawings and shop drawings.

F. Welding: Welding shall be in accord with applicable standards of the American Welding Society (AWS) and cold-formed steel framing manufacturer's product data.

1.6 WARRANTIES:

A. Fiberglass-faced gypsum sheathing:

B. Provide manufacturer's standard warranty for sheathing to be free of manufacturing defects including, but not limited to, delamination, sagging and warping. Warranty period shall be five years, beginning at Date of substantial Completion.

C. Provide manufacturer's standard warranty for sheathing to remain free of delamination, sagging and warping, and stating that sheathing will remain suitable for its intended purpose under normal weathering conditions when left exposed. Warranty period shall be six months, beginning upon application of sheathing.

PRODUCTS

1.7 COLD FORMED STEEL FRAMING:

A. Acceptable manufacturers:

1. Alabama Metal Industries, Corp.

2. Dale Industries.

3. Dietrich Industries, Inc.

4. The Formetal Co., Inc.

5. Unimast, Inc.

B. Types of Framing included:

1. "C" shaped steel wall studs.

2. "C" shaped steel joists.

C. Cold formed framing:

1. Type: Channel type, roll-formed from steel complying with ASTM C955- 95.

2. Material: Galvanized steel meeting ASTM A653-95, Structural Quality Grade specified, Coating Designation G60, minimum 20 gauge.
   a. Runners, 18 gauge and lighter: Structural Quality Grade 37.
   b. Members, 18 gauge and lighter: Structural Quality Grade 37 minimum.
   c. Members and runners heavier that 18 gauge: Structural Quality Grade 50, Class 1 or 2.

D. Studs and runners (track):

1. Stud size: As indicated on drawings.

2. Stud gauge: Minimum 20 gauge, except where manufacturer's product data requires heavier gauge for heights and conditions of use an as indicated on approved shop drawings and structural design calculations.

3. Runners: 1" deep by widths to receive studs, same gauge as studs.

4. Provide deflection track or slide clips as necessary for structure vertical movement.

E. Joists:

1. Size, gauge, spacing and anchorage of joists shall be as qualified by design and as indicated on approved shop drawings.

2. Components shall be un-punched and continuous without splicing.

F. Non-load-bearing studs: Refer to Gypsum Board Assemblies Section.

1.8 FASTENERS:

A. For fastening cold formed steel framing to metal decking and for fastening cold formed steel framing members to each other: Type S, galvanized, pan head screws in sizes recommended by framing manufacturer for applications indicated.

B. For fastening cold formed steel framing to concrete and masonry surfaces: Powder actuated type galvanized fasteners, capable of withstanding 193 lbs. single shear and 200 lbs. bearing force without exceeding allowable stress design of fastener or member being fastened.

C. For fastening cold formed steel framing to structural steel, clip angles and inserts: Welding, using methods and electrode types in accord with manufacturer's product data.

D. Wire tying of cold formed steel framing shall not be used.

E. For fastening plywood to cold formed steel framing: type S, galvanized, bugle head screws extending a minimum of 1/2" through framing member.

1.9 ACCESSORY MEMBERS:

A. Bracing and bridging: Same material as studs and runners; gauges as required by manufacturer's product data and design analysis.

B. Steel clips, angles and concrete inserts to which cold formed steel framing is attached shall comply with ASTM A36-94.

C. Cold galvanizing compound: Pre-mixed, organic zinc liquid containing 95 percent zinc in dried film.

1.10 FIBERGLASS-FACED GYPSUM SHEATHING:

A. Acceptable product:

1. Georgia-Pacific Corp., Dens-Glass Gold Gypsum Sheathing.

B. Characteristics:

1. Composition: Conforming to ASTM C1177-91; incombustible, silicone treated and water-resistant gypsum core with inorganic fiberglass mat face treated with alkali-resistant polymer coating.

2. Type: 1/2" thickness for stud spacing of 2'-0" o.c./ 4'-0" wide by 8'-0", 9'-0" or 10'-0" length, square ends and edges.

C. Fasteners: Screws for application of fiberglass-faced gypsum sheathing to cold formed metal framing shall be coated bugle head, self-drilling fasteners complying with ASTM C1002-93 and C954-93.

D. Air infiltration barrier for areas to receive preformed metal wall panels:

1. Acceptable products:
   a. Amoco Foam Products Co., Amowrap.
   b. DuPont, Tyvek.
   c. Simplex Products Div., R-Wrap.

2. Provide non-perforated, reinforced plastic fabric/ flame spread of 25 or less when tested in accord with ASTM E84-95.

3. Fasteners: Zinc-coated staples, length to penetrate sheathing face minimum 1/2"; pneumatically applied.

E. Building felt for areas to receive preformed metal wall panels: Meeting ASTM D226-94, Type I, No. 15, non-perforated.

PART 2 - EXECUTION

2.1 WALL INSTALLATION:

A. Install cold formed steel studs secured to structure and runners using specified mechanical fasteners or by welding in accord with cold-formed steel framing manufacturer's product data and approved shop drawings. Coordinate sheathing thickness and masonry reinforcement spacing with stud spacing.

B. Allowable tolerances: Align and plumb framing within tolerances specified for entire height and length of unbroken elevation.

1. Position: +1/4" maximum variation from design location.

2. Alignment: 1/8" in 8'-0"; 1/4" maximum in any continuous wall, line or surface.

3. Surface plane: 1/8" in 12'-0" maximum variation in true surface plane across faces of framing members to receive gypsum sheathing or exposed surfacing material.

C. Studs:

1. Stud spacing: Install studs at 1'-4" o.c. maximum and as indicated on approved shop drawings and structural calculations.

2. Attach full length studs, aligned and plumb, between top and bottom runners, ends in full bearing, and both faces attached to upper and lower runner flanges. Install axial load-bearing studs with ends of studs positioned against runner web with maximum 1/16" gap at upper and lower runner web, prior to stud and runner attachment.

3. Install double studs each side of windows, doors and other punched openings; bridge top and bottom of openings as applicable, in accord with manufacturer's product data. Maintain specified stud spacing above and below opening. Framed wall openings shall include headers and supporting studs as indicated on approved shop drawings.

4. Install jack studs or cripples as necessary to maintain uniform stud spacing.

5. Double studs at interior and exterior corners, expansion joints, panel terminations and as otherwise required by design requirements and manufacturer's product data.

6. Install insulation equal to that specified in Building Insulation Section, at double jamb studs and double header members which will not be accessible to insulation installer.

D. Bracing and bridging:

1. Brace framing diagonally in accord with referenced standards without regard for facing materials, including tension straps both directions. Anchor to prevent uplift and brace back to structure.

2. Provide bridging to comply with referenced standards and manufacturer's product data.

3. Provide temporary bracing to temporarily support framing.

4. Attach wall bridging to provide resistance to minor axis bending and rotation. Equally space bridging rows not to exceed 5'-0" o.c. for wind loading only or 4'-0" o.c. for axial loading.

E. Shear walls: Where indicated as "shear walls" for frame stability and lateral load resistance, position additional studs to resist vertical loads as indicated on approved shop drawings.

F. Splicing: do not splice, cut or notch studs or other axially loaded members.

G. Blocking: Provide intermediate runners and blocking to support edges of facing materials and built-in or attached construction.

H. Provide deflection track or slide clips as necessary for structure vertical movement.

I. Install supplementary framing, blocking and bracing in metal framing system wherever walls, partitions and joists are indicated to support fixtures, equipment, services, casework, heavy trim

and furnishings, and similar work requiring attachment to the wall or partition or joist. Where type of supplementary support is not indicated, comply with cold-formed framing manufacturer's product data in each case, considering weight or loading resulting from item supported.

J. Frame both sides of expansion and control joints with separate framing members. Do not bridge joint with framing system components.

K. Attachment:

1. Studs shall be plumb, aligned and securely attached to flange or web of both upper and lower tracks.

2. Screws: Secure 18 gauge and lighter members using screws, 16 gauge and heavier by welding.

3. Comply with screw manufacturer's product data and ASTM C954-93 for minimum spacing and edge distance requirements and for torque requirements.

4. Screw penetration through joined materials shall be minimum of three exposed screw threads.

5. Welding: when cold formed framing is lighter than 16 gauge, weld attachments to structural steel, utilizing 16 gauge or heavier intermediate clips.

L. Repair of galvanized surfaces: Following erection, clean surfaces from which galvanizing was removed during installation in accord with SSPC-SP2-1989, "Hand Tool Cleaning," and SSPC-SP3-1989, "Power Tool Cleaning." Coat surfaces with cold galvanizing compound, minimum 3.0 mils dry film thickness.

M. Cutting for utilities: do not remove, notch, cut or relocate load-bearing studs or other structural members for utility installation or other cause without prior approval of Architect.

N. Cutting: Perform cutting shall be done with a power-driven saw with an abrasive blade. No hand cutting will be permitted. Cuts shall e clean, accurate and true to line.

2.2 JOIST INSTALLATION:

A. Bear joists directly on bearing surfaces or studs, unless continuous headers are used.

B. Provide web stiffeners at reaction points where indicated on approved shop drawings.

C. Prior to loading joists, provide joist bridging at spacing indicated on approved shop drawings.

D. Provide an additional joist under parallel partitions where partition length exceeds 1/2 joist span and around floor and roof openings which interrupt one or more spanning members unless indicated otherwise on approved shop drawings.

E. Provide end blocking where joist ends are not restrained against rotation.

F. Do not load floor/rafter system beyond limits for which it was designed.

2.3 INSTALLATION OF GYPSUM SHEATHING:

A. Install gypsum sheathing to framing members with specified fasteners spaced at 8" o.c. along each framing member. Locate fasteners 3/8" from ends and edges. Cut sheathing to fit without gaps or voids.

B. Install sheathing material horizontally using material of greatest practicable length to avoid vertical joints. Where vertical joints are required they shall be staggered. Form vertical edges over framing members.

C. Air infiltration barrier for areas to receive preformed metal wall panels:

1. Install air infiltration barrier horizontally, shingle fashion, beginning at lower portion of wall.

2. Install barrier in accord with manufacturer's product data. Overlap barrier minimum 6" on vertical and horizontal seams.

3. Install prior to attachment of masonry ties.

4. Secure in place with specified fasteners.

D. Building felt for areas to receive preformed metal wall panels:

1. Install building felt horizontally, shingle fashion, beginning at lower portion of wall.

2. Lap edges minimum 2" and end joints minimum 4".

3. Install prior to attachment of masonry ties.

4. Secure in place with sheathing fasteners.

E. Fasteners may be reduced during sheathing, building felt and air infiltration barrier installation when attachment of subsequent materials will provide specified attachment spacing and will follow sheathing and air infiltration barrier installation immediately.

2.4 FIELD TOUCH-UP PAINTING:

A. Touch up shop-applied protective coating damaged during handling and installation. For primed surfaces, use primers compatible with shop primers; for galvanized surfaces, touch-up using cold galvanizing repair paint.

END OF SECTION

SECTION 06 10 00 - ROUGH CARPENTRY

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 DESCRIPTION OF WORK:

A. Definition: Rough carpentry includes carpentry work not specified as part of other sections and which is generally not exposed, except as otherwise indicated. Types of work in this section include rough carpentry for:

1. Wood grounds, nailers, blocking, curbs, cants, sleepers etc.

B. Finish carpentry is specified in another section within Division 6.

1.3 REFERENCES:

A. Lumber Standards: Comply with PS 20 and with applicable rules of the respective grading and inspecting agencies for species and products indicated.

B. Plywood Product Standards: Comply with PS 1 (ANSI A 199.1) or, for products not manufactured under PS 1 provisions, with applicable APA Performance Standard for type of panel indicated.

1.4 SUBMITTALS:

A. Wood Treatment Data: Submit treatment manufacturer's instructions for proper use of each type of treated material.

B. Pressure Treatment: For each type specified, include certification by treating plant stating chemicals and process used, net amount of preservative retained and conformance with applicable standards.

1.5 PRODUCT HANDLING:

A. Delivery and Storage: Keep materials dry at all times. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber and plywood, and provide air circulation within stacks.

1.6 JOB CONDITIONS:

A. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow proper attachment of other work.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Lumber, General:

1. Factory-mark each piece of lumber with type, grade, mill and grading agency, except omit marking from surfaces to be exposed with transparent finish or without finish.

2. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.

3. Provide dressed lumber, S4S, unless otherwise indicated.

4. Provide seasoned lumber with 19% maximum moisture content at time of dressing.

B. Miscellaneous Lumber:

1. Provide wood for support or attachment of other work including cant strips, bucks, nails, blocking, furring, grounds, stripping and similar members. Provide lumber of sizes indicated, worked into shapes shown, and as follows:
   a. Moisture content: 19% maximum for lumber items not specified to receive wood
   b. preservative treatment.

C. Grade: Construction Grade light framing size lumber of any species or board size lumber as required. Provide construction grade boards (RIS or WCLB) or No. 2 boards (SPIB or WWPA).

D. Dimension Lumber:

1. Southern Pine No. 2 Grade

2.2 PLYWOOD PANELS:

A. Construction Panel Standards: Comply with PS 1 "U.S. Product Standard for Construction and Industrial Plywood" for plywood panels and, for products not manufactured under PS 1 provisions, with American Plywood Association (APA) "Performance Standard and Policies for Structural-Use Panels", Form No. E445.

B. Trademark: Factory-mark each construction panel with APA trademark evidencing compliance with grade requirements.

C. Concealed APA Performance-Rated Panels: Where construction panels will be used for the following concealed types of applications, provide APA Performance-Rated Panels complying with requirements indicated for grade designation, span rating, exposure durability classification, edge detail (where applicable) and thickness.

2.3 WOOD TREATMENT:

A. FIRE-RETARDANT-TREATED MATERIALS

1. General: Where fire-retardant-treated materials are indicated or specified herein, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

2. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

3. Use treatment that does not promote corrosion of metal fasteners.

4. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.

5. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

6. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

7. Application: Treat items indicated on Drawings, and the following:
   a. Concealed blocking.
   b. Framing for non-load-bearing partitions.
   c. Framing for non-load-bearing exterior walls.
   d. Plywood backing panels.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General:

1. Discard units of material with defects which might impair quality of work, and units which are too small to use in fabricating work with minimum joints or optimum joint arrangements.

2. Set carpentry work accurately to required levels and lines, with members plumb and true and accurately cut and fitted.

3. Securely attach carpentry work to substrate by anchoring and fastening as shown and as required by recognized standards. Countersink nail heads on exposed carpentry work and fill holes.

4. Use common wire nails, except as otherwise indicated. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; pre-drill as required.

B. Wood Grounds, Nailers, and Blocking:

1. Provide whenever shown and where required for proper support of all items which will be attached to gypsum board. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.

2. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise show. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

3. Provide permanent grounds of dressed, preservative treated, key-beveled lumber not less than 1-1/2" wide and of thickness required to bring face of ground to exact thickness of finish material involved. Remove temporary grounds when no longer required.

END OF SECTION

SECTION 07 21 00 - INSULATION

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 DESCRIPTION OF WORK:

A. Extent of insulation work is shown on drawings, and indicated by provisions of this section.

B. Applications of insulation specified in this section include the following:

1. Board-type building insulation.

2. Blanket-type building insulation.

1.3 QUALITY ASSURANCE:

A. Thermal Resistivity: Where thermal resistivity properties of insulation materials are designated by r-values they represent the rate of heat flow through a homogeneous material exactly 1" thick, measured by test method included in referenced material standard or otherwise indicated. They are expressed by the temperature difference in degrees F between the two exposed faces required to cause one BTU to flow through one square foot per hour at mean temperatures indicated.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's product literature and installation instructions for each type of insulation.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. General Protection: Protect insulations from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage, and protection during installation.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. Manufacturers of Extruded Polystyrene Board Insulation:
   a. Amoco Foam Products Co.
   b. Dow Chemical U.S.A.
   c. Minnesota Diversified Products, Inc.
   d. UC Industries.

2. Manufacturers of Glass Fiber Insulation:
   a. CertainTeed Corp.
   b. Knauf Fiber Glass GmbH
   c. Manville Corp.
   d. Owens-Corning Fiberglas Corp.

2.2 INSULATING MATERIALS:

A. General: Provide insulating materials which comply with requirements indicated for materials, compliance with referenced standards, and other characteristics.

1. Preformed Units: Size to fit applications indicated, selected from manufacturer's standard thicknesses, widths and lengths.

B. Extruded Polystyrene Board Insulation: Rigid, cellular thermal insulation with closed-cells and integral high density skin, formed by the expansion of polystyrene base resin in an extrusion process to comply with ASTM C 578 for Type indicated; with 5-year aged r-values of 5.4 and 5 at 40 and 75 degrees F(4.4 and 23.9 degrees C), respectively; and as follows:

1. Type IV 1.6 lb./cu. ft. min. density, unless otherwise indicated.

C. Un-faced Glass Fiber Blanket/Batt Insulation: Thermal insulation produced by combining mineral fibers manufactured from glass with thermosetting resins to comply with ASTM C 665 for Type I.

D. Kraft Faced Glass Fiber Blanket/Batt Insulation: Thermal insulation produced by combining glass fibers manufactured with thermosetting resins to comply with ASTM C 665 for Type II, Class C .

2.3 AUXILIARY INSULATING MATERIALS:

A. Adhesive for Bonding Insulation: Type recommended by insulation manufacturer, and complying with requirements for fire performance characteristics.

B. Mechanical Anchors: Type and size as recommended by insulation manufacturer for type of application and condition of substrate.

PART 3 - EXECUTION

3.1 INSPECTION AND PREPARATION:

A. Require Installer to examine substrates and conditions under which insulation work is to be performed. A satisfactory substrate is one that complies with requirements of the section in which substrate and related work is specified. Obtain Installer's written report listing conditions detrimental to performance of work in this section. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

B. Clean substrates of substances harmful to insulations or vapor retarders, including removal of projections which might puncture vapor retarders.

3.2 INSTALLATION, GENERAL:

A. Comply with manufacturer's instructions for particular conditions of installation in each case. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with work.

B. Extend insulation full thickness as shown over entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections which interfere with placement.

C. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF GENERAL BUILDING INSULATION:

A. Apply insulation units to substrate by method indicated, complying with manufacturer's recommendations. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

3.4 PROTECTION:

A. General: Protect installed insulation and vapor retarders from harmful weather exposures and from possible physical abuses, where possible by non-delayed installation of concealing work or, where that is not possible, by temporary covering or enclosure.

END OF SECTION

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM**Error! Bookmark not defined.**

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. This Section includes sheet metal flashing and trim in the following categories:

1. Roof Drainage Systems
    a. Exposed trim, Roof Edge Trim, and fascia.
    b. Copings.
    c. Metal flashing.
    d. Reglets.
    e. Roof expansion-joint covers.
    f. Metal Splash Pans.
    g. Precast Concrete Splash Blocks

B. Related Sections: The following Sections contain requirements that relate to this Section:

C. Division 4 Sections for through-wall flashing and other integral masonry flashings specified as part of masonry work.

D. Division 7 Section “Roof Accessories” for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.

E. Division 7 Section “Joint Sealants” for elastomeric sealants.

F. Division 7 Roofing Sections for flashing and roofing accessories installed integral with roofing membrane as part of roofing-system work.

1.3 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing.

B. Fabricate and install flashings at roof edges to comply with recommendations of FM Loss Prevention Data Sheet 1-49 for the following wind zone:

1. Wind Zone 2: Wind pressures of 31 to 45 psf.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data including manufacturer's material and finish data, installation instructions, and general recommendations for each specified flashing material and fabricated product.

C. Shop Drawings of each item specified showing layout, profiles, methods of joining, and anchorage details.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed sheet metal flashing and trim work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Mockups: Prior to installing sheet metal flashing and trim, construct mockups indicated to verity selections made under Sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of Work.

1. Locate mockups on-site in the location and of the size indicated or, if not indicated, as directed by Architect.

2. Construct mockups for the following type of sheet metal flashing and trim:
   a. Gutters and downspouts.
   b. Exposed trim, Roof Edge Trim, and fascia.
   c. Copings.

3. Obtain Architect's approval of mockups before start of final unit of Work.

4. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

5. When directed, demolish and remove mockups from Project site.

6. Approved mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

1.6 PROJECT CONDITIONS

A. Coordinate Work of this Section with interfacing and adjoining Work for proper sequencing of each installation. Ensure best possible weather resistance, durability of Work, and protection of materials and finishes.

PART 2 - PRODUCTS

2.1 METALS

A. Note: All metals provided shall be supplied by roofing manufacturer and/or approved by roofing manufacturer for incorporation into the roofing system which allows metal flashing to be included in the roofing membrane guarantee and carry the same guarantee as the roof. Adjustment of material and material thickness listed as follows may require adjustment to obtain requirements for inclusion in the roofing system guarantee. These adjustments shall be made at no additional cost to the owner.

B. Copper: ASTM B 370; temper H00, cold rolled except where temper 060 is required for forming; not less than 16 oz./sq. ft. (0.55 mm thick), unless otherwise indicated.

C. Stainless-Steel Sheet: ASTM A 167, Type 304, soft annealed, with No. 2D finish, except where harder temper is required for forming or performance; minimum 0.0187 inch thick, unless otherwise indicated.

D. Coil-Coated Galvanized Steel Sheet: Zinc-coated, commercial-quality steel sheet conforming to ASTM A 755, G 90 (ASTM A 755M, Z 275) coating designation, coil coated with high-performance fluoropolymer coating as specified in “Coil-Coated Galvanized Steel Sheet Finish” Article; not less than 0.0336 inch (0.85 mm) thick, unless otherwise indicated.

E. Lead Sheet: ASTM B 749, Type L51121, copper-bearing lead sheet, with minimum thickness of 0.0625 inch (1.6 mm) except not less than 0.0937 inch (2.4 mm) thick for applications where burning (welding) is involved.

2.2 CONCEALED THROUGH -WALL SHEET METAL FLASHING

A. Material: Fabricate from the following metal:

1. Stainless Steel: 0.0156 inch (0.4 mm) thick.

B. Fabricate through-wall metal flashing: embedded in masonry as follows:

1. With ribs formed in dovetail pattern at 3-inch (75-mm) intervals along length of flashing to provide a 3-way integral mortar bond and weep-hole drainage.

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. Cheney Flashing (Dovetail); Cheney Flashing Company, Inc.

2. Keystone Three-Way Interlocking Thru-wall Flashing; Keystone Flashing Co.

2.3 REGLETS

A. General: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces and compatible with flashing indicated.

B. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.

C. Stucco Type: Provide with upturned fastening flange and extension leg of length to match thickness of applied finish materials.

D. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.

E. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.

F. Flexible Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.

G. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of the counterflashing lower edge.

1. Material: Stainless steel, 0.0187 inch thick.

H. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Fry Reglet Corporation.

2. Hickman: W. P. Hickman Co.

3. Keystone Flashing Company.

4. Imetco

2.4 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Burning Rod for Lead: Same composition as lead sheet.

B. Solder: ASTM B 32, Grade Sn50, used with rosin flux.

C. Solder for Stainless Steel: ASTM B 32, Grade Sn60, used with an acid flux of type recommended by stainless-steel sheet manufacturer; use a noncorrosive rosin flux over tinned surfaces.

D. Stainless-Steel Welding Rods: Type recommended by stainless-steel sheet manufacturer for type of metal sheets furnished.

E. Fasteners: Same metal as sheet metal flashing or other noncorrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened.

F. Asphalt Mastic: SSPC-Paint 12, solvent-type asphalt mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil dry film thickness per coat.

G. Mastic Sealant: Polyisobutylene; non-hardening, non-skinning, nondrying, non-migrating sealant.

H. Elastomeric Sealant: Generic type with requirements for joint sealants as specified in Division 7 Section “Joint Sealants.”

I. Epoxy Seam Sealer: 2-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior and interior nonmoving joints, including riveted joints.

J. Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather- resistant seaming and adhesive application of flashing sheet metal.

K. Paper Slip Sheet: 5-lb./square (0.244 kg/sq. m) red rosin, sized building paper conforming to FS UU-B-790, Type I, Style 1b.

L. Polyethylene Underlayment: ASTM D 4397, minimum 6-mil- (0.15- mm-) thick black polyethylene film, resistant to decay when tested according to ASTM E 154.

M. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work, matching or compatible with material being installed; noncorrosive; size and thickness required for performance.

N. Roofing Cement: ASTM D 4586, Type I, asbestos free, asphalt based.

2.5 FABRICATION, GENERAL

A. Sheet Metal Fabrication Standard: Fabricate sheet metal flashing and trim to comply with recommendations of SMACNA’s “Architectural Sheet Metal Manual” that apply to the design, dimensions, metal, and other characteristics of the item indicated.

B. Comply with details shown to fabricate sheet metal flashing and trim that fit substrates and result in waterproof and weather-resistant performance once installed. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Form exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems.

D. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder.

1. Copings: Prefabricate internal and exterior corners

E. Seams: Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

1. Copings: Prefabricate internal and exterior corners.

F. Expansion Provisions: Space movement joints at maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where Lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25mm) deep, filled with mastic sealant (concealed within joints).

G. Sealed Joints: Form non-expansion, but moveable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.

H. Separate metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations of contact with asphalt mastic or other permanent separation as recommended by manufacturer.

I. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.

J. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.

1. Size: As recommended by SMACNA manual or sheet metal manufacturer for application but never less than thickness of metal being secured.

2.6 SHEET METAL FABRICATIONS

A. General: Fabricate sheet metal items in thickness or weight needed to comply with performance requirements but not less than that listed below for each application and metal.

B. Gutters with Girth up to 20 Inches: Fabricate from the following material:

1. Coil-Coated Galvanized Steel: 0.0276 inch (0.7 mm) thick. 24 g.

C. Gutters with Girth 21 to 25 Inches: Fabricate from the following material:

1. Coil-Coated Galvanized Steel: 0.0336 inch (0.85 mm) thick. 22 g.

D. Downspouts: Fabricate from the following material:

1. Coil-Coated Galvanized Steel: 0.0217 inch (0.55 mm) thick. 26 g.

E. Splash Pans: Fabricate from the following material:

1. Stainless Steel: 0.0187 inch (0.5 mm) thick. 26 g.

F. Roof-Drain Flashing: Fabricate from the following material:

1. Lead: 4.0lb/sq. ft., hard tempered.

G. Exposed Trim, Roof Edge Trim, and Fasciae: Fabricate from the following material:

1. Coil Coated Galvanized Steel: 0.0276 inch (0.7mm) thick. 24 g.

H. Copings: Fabricate from the following material

1. Coil-Coated Galvanized Steel: 0.0396 inch (1.0 mm) thick. 22 g.

I. Base Flashing: Fabricate from the following material

1. Coil-Coated Galvanized Steel: 0.276 inch (0.7 mm) thick. 24 g.

J. Counter Flashing, Reglets, and Wind-Restraint Clips: Fabricate from the following material:

1. Coil-Coated Galvanized Steel: 0.0217 inch (0.55 mm) thick. 26 g.

K. Flashing Receivers: Fabricate from the following material:

1. Coil-Coated Galvanized Steel: 0.0217 inch (0.55 mm) thick. 26 g.

L. Valley Flashing: Fabricate from the following material:

1. Stainless Steel: 0.187 inch (0.5 mm) thick. 26 g.

M. Drip Edges: Fabricate from the following material:

1. Coil-Coated Galvanized Steel: 0.0217 inch (0.55 mm) thick. 26 g.

N. Eave Flashing: Fabricate from the following material:

1. Coil-Coated Galvanized Steel: 0.0217 inch (0.55 mm) thick. 26 g.

O. Equipment Support Flashing: Fabricate from the following material:

1. Coil-Coated Galvanized Steel: 0.0276 inch (0.7 mm) thick. 26 g.

P. Roof-Penetration Flashing: Fabricate from the following material:

1. Stainless Steel: 0.0187 inch (0.5 mm) thick. 26 g.

Q. Roof Expansion-Joint Cover: Fabricate from the following material:

1. Coil-Coated Galvanized Steel: 0.0276 inch (0.7 mm) thick. 26 g.

R. Roof-to-Wall Expansion-Joint Cover: Fabricate from the following material:

1. Coil-Coated Galvanized Steel: 0.0336 inch (0.85 mm) thick. 22 g.

2.7 COIL-COATED GALVANIZED STEEL SHEET FINISH

A. High-Performance Organic Coating Finish: Apply the following system by coil-coating process on galvanized steel sheet as recommended by coating manufacturers and applicator.

1. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 605.2.
   a. Color and Gloss: As selected by Architect from manufacturer's full range of choices for color and gloss.

2. Resin Manufacturers: Subject to compliance with requirements, provide fluoropolymer coating systems containing resins produced by one of the following manufacturers:
   a. Ausimont USA, Inc. (Hylar 5000)
   b. Elf Atochem North America, Inc. (Kynar 500)

3. Coil-Coated Steel Sheet Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

4. Coil-Coated Steel Sheet Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Atas Aluminum Corporation.
   b. Copper Sales, Inc.
   c. MM Systems Corporation.
   d. Petersen Aluminum Corporation.
   e. Vincent Metals.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions under which sheet metal flashing and trim are to be installed and verify that Work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Unless otherwise indicated, install sheet metal flashing and trim to comply with performance requirements, manufacture's installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Anchor units of Work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible., and set units true to line and level as indicated. Install Work with laps, joints, and seams that will be permanently watertight and weatherproof.

B. Install exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Roof-Edge Flashings: Secure metal flashings at roof edges according to FM Loss Prevention Data Sheet 1-49 for specified wind zone.

D. Expansion Provisions: Provide for thermal expansion of exposed sheet metal Work. Space movement joints at maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed with joints).

E. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches (38 mm), except where pre-tinned surface would show in finished Work.

1. Do not solder the following metals:
   a. Aluminum.
   b. Coil-coated galvanized steel sheet.

2. Pre-tinning is not required for the following metals:
   a. Lead.

3. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

F. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards. Fill joint with sealant and form metal to completely conceal sealant.

1. Use joint adhesive for nonmoving joints specified not to be soldered.

G. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder.

H. Separations: Separate metal from non-compatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.

1. Underlayment: Where installing stainless steel or aluminum directly on cementitious or wood substrates, install a slip sheet of red-rosin paper and a course of polyethylene underlayment.

2. Bed flanges of Work in a thick coat of roofing cement where required for waterproof performance.

I. Install reglets to receive counterflashing according to the following requirements:

1. Where reglets are shown in concrete, furnish reglets for installation under Division 3 Section “Cast-in-Place Concrete.”

2. Where reglets are shown in masonry, furnish reglets for installation under Division 4 Section “Unit Masonry.”

J. Counter flashings: Coordinate installation of counter flashings with installation of assemblies to be protected by counterflashing. Install counter flashings in reglets or receivers. Secure in a waterproof manner by means of snap-in installation and sealant, lead wedges and sealant, interlocking folded seam, or blind rivets and sealant. Lap counterflashing joints a minimum of 2 inches (50 mm) and bed with sealant.

K. Roof-Drainage System: Install drainage items fabricated from sheet metal, with straps, adhesives, and anchors recommended by SMACNA's Manual or the item manufacturer, to drain roof in the most efficient manner. Coordinate roof-drain flashing installation with roof-drainage system installation. Coordinate flashing and sheet metal items for steep-sloped roofs with roofing installation.

L. Splash Blocks: Provide Splash block at each downspout discharging on unpaved surface.

M. Equipment Support Flashing: Coordinate equipment support flashing installation with roofing and equipment installation. Weld or seal flashing to equipment support member.

N. Roof-Penetration Flashing: Coordinate roof-penetration flashing installation with roofing and installation of items penetrating roof. Install flashing as follows:

1. Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.

2. Seal and clamp flashing to pipes penetrating roof, other than lead flashing on vent piping.

O. Splash Pans: Provide metal splash pan at each downspout discharging on flat roof surface. Set on a roof protection pad per roof manufacturer.

3.3 CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

B. Provide final protection and maintain conditions that ensure sheet metal flashing and trim Work during construction is without damage or deterioration other than natural weathering at the time of Substantial Completion.

END OF SECTION

SECTION 08 71 00 - DOOR HARDWARE

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 the work of this section.

1.2 DESCRIPTION OF WORK:

A. Definition: "Builders Hardware" includes items known commercially as builders hardware which are required for swing, sliding and folding doors. Types of items in this section include (but are not necessarily limited to):

1. Hinges
2. Lock cylinders and keys
3. Lock and latch sets
4. Exit devices
5. Push/pull units
6. Closers
7. Miscellaneous door control devices
8. Door trim units
9. Protection plates

1.3 QUALITY ASSURANCE:

A. Manufacturer: Obtain each kind of hardware (latch and lock sets, hinges, closers, etc.) from only one manufacturer, although several may be indicated as offering products complying with requirements.

B. Supplier: A recognized builders’ hardware supplier who has been furnishing hardware in the project's vicinity for a period of not less than two years, and who is, or employs an experienced hardware consultant who is available at reasonable times during the course of the work for consultation about project's hardware requirements to Owner, Architect and Contractor.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturers' technical information for each item of hardware, include whatever information may be necessary to show compliance with requirements, and include instructions for installation and for maintenance of operating parts and finish.

B. Hardware Schedule: Submit final hardware in the manner indicated below. Hardware schedules are intended for the coordination of work.

C. Final Hardware Schedule Content: Based on builders' hardware indicated, organize hardware schedule into "hardware sets" indicating complete designations of every item required for each door or opening, include the following information:

1. Type, style, function, size, and finish of each hardware item.

2. Name and manufacturer of each item.

3. Fastenings and other pertinent information.

4. Location of hardware set cross-referenced to indications on drawings, both on floor plans and in the door and frame schedule.

5. Explanation of all abbreviations, symbols, codes, etc., contained in the schedule.

6. Mounting locations for hardware.

7. Door and frame sizes and materials.

8. Keying information.

D. Keying Schedule: Submit a separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks have been fulfilled.

1.5 PRODUCT HANDLING:

A. Packaging of hardware on a set by set basis is the responsibility of the supplier. Identify all hardware items by heading or item number to correspond with schedule.

B. Inventory hardware jointly with representatives of the hardware supplier and the hardware installer until each is satisfied that the count is correct.

C. Provide secure lock-up for hardware delivered to the project, but not yet installed. Control, handling and installation of hardware items which are not immediately replaceable, so that the completion of the work will not be delayed by hardware losses, both before and after installation.

1.6 JOB CONDITIONS:

A. Coordination: Coordinate hardware with other work. Tag each item or package separately with identification related to the final hardware schedule, and include basic installation instructions in the package. Furnish hardware items of proper design for use on doors and frames of the

thicknesses, profile, swing, security and similar requirements indicated, as necessary for proper installation and function. Deliver individually packaged hardware items at the proper times to the proper locations (shop or project site) for installation.

PART 2 - PRODUCTS

2.1 SCHEDULED HARDWARE:

A. Requirements for design, grade, function, finish, size and other distinctive qualities of each type of builders' hardware is indicated in the Hardware Schedule at the end of this section. Products are identified by using hardware designation numbers of the following:

1. Manufacturer's Product Designations: One or more manufacturers are listed for each hardware type required. Provide either the product designated or the comparable product of one of another manufacturer which comply with requirements including those specified elsewhere in this section.

2.2 HARDWARE ALLOWANCE:

A. Contractor shall allow the sum of Eighty Thousand Dollars and No Cents ($80,000) for the purchase of the hardware and excludes the installation. The cost of installation shall be included as a separate item in the contractor's proposal. Shop drawings and door hardware schedule shall be included in submittal for final approval by Architect.

2.3 MATERIALS AND FABRICATION:

A. General:

B. Hand of door: The drawings show the direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of the door movement as shown.

C. Fasteners: Manufacture hardware to conform to published templates generally prepared for machine screw installation. Do not provide hardware which has been prepared for self-tapping sheet metal screws, except as specifically indicated.

D. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match the hardware finish or, if exposed in surfaces of other work, to match the finish of such other work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.

E. Provide concealed fasteners for hardware units which are exposed when the door is closed, except to the extent no standard units of the type specified are available with concealed fasteners. Do not use through bolts for installation where the bolt head or the nut on the opposite face is exposed in other work, except where it is not feasible to adequately reinforce the work.

F. Tools for Maintenance: Furnish a complete set of specialized tools as needed for Owner's continued adjustment, maintenance, and removal and replacement of builders' hardware.

2.4 HINGES, BUTTS AND PIVOTS:

A. Templates: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

2.5 LOCK CYLINDERS AND KEYING:

A. General: Supplier will meet with Owner to finalize keying requirements and obtain final instructions in writing.

B. Review the keying system with the Owner and provide the type required (master, grandmaster or great-grandmaster), or integrated with Owner's existing system.

C. Equip locks with manufacturer's special six-pin tumbler cylinder with construction master key feature which permits voiding of construction keys without cylinder removal.

D. Metals: Construct lock cylinder parts from brass/bronze, stainless steel or nickel silver.

E. Comply with Owner's instructions for master keying and, except as otherwise indicated, provide individual change key for each lock which is not designated to be keyed alike with a group of related locks.

F. Key Material: Provide keys of nickel silver only.

G. Key Quantity: Furnish three change keys for each lock; five master keys for each master system; and five grandmaster keys for each grandmaster system.

1. Deliver keys to Owner.

2.6 LOCKS, LATCHES AND BOLTS:

A. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt with curved lip extended to protect frame; finished to match hardware set.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by Architect.

B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate removal, storage and reinstallation or application of surface protections with finishing work specified in the Division 9

sections. Do not install surface-mounted items until finishes have been completed on the substrate.

C. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

D. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

3.2 ADJUST AND CLEAN:

A. Adjust and clean each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.

B. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

C. Instruct Owner's personnel in proper adjustment and maintenance of hardware and hardware finishes during the final adjustment of hardware.

3.3 FINISH:

A. Generally shall be as indicated below unless otherwise noted in the schedule.

BHMA	FINISH	DESCRIPTION
600	UPS	Primed for Painting
605	US3	Bright Brass
605E		Polished Brass
606	US4	Satin Bright Brass
606E		Satin Brass
609	US5	Satin Brass, blackened, satin relieved
611	US9	Bright Bronze
612	US10	Satin Bronze
613	US10B	Dark Oxidized Satin Bronze, Oil Rubbed
613E		Light Oxidized Satin Bronze, Oil Rubbed
	US20D	Satin Black
	US10BL	Brushed Black
616	US11	Satin Bronze, blackened, satin relieved
618	US14	Bright Nickel Plated
619	US15	Satin Nickel Plated
620	US15A	Satin Nickel Plated, blackened, satin relieved
622	US19	Flat Black Coated
625	US26	Bright Chromium
626	US26D	Satin Chromium Plated
629	US32	Bright Stainless Steel

630	US32D	Satin Stainless Steel
689	SBL	Silver Aluminum Painted
690	LBL	Dark Bronze Painted
691	DBL	Light Bronze Painted
693	FBL	Black Painted
696	GBL	Satin Brass Painted

B. KEYING: Grandmaster key all locks to existing GMK system and key to existing on new master key systems under grandmaster as directed by the Architect and Owner. Allow for six (6) new master keys under GMK. Provide four (4) master keys for each new master key set. No additional grandmaster keys are required.

END OF SECTION

SECTION 09 65 00 - RESILIENT FLOORING AND BASE

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 DESCRIPTION OF WORK:

A. Extent of resilient flooring and accessories is shown on drawings and in schedules.

1.3 QUALITY ASSURANCE:

A. Manufacturer: Provide each type of resilient flooring and accessories as produced by a single manufacturer, including recommended primers, adhesives and sealants and leveling compounds.

B. Fire Test Performance: Unless otherwise indicated, provide resilient flooring having the following classifications or properties when test in accordance with the standard fire tests referenced below:

1. Flame Spread: Not more than 75 as per ASTM E 84.

2. Smoke Developed: Not more than 450 as per ASTM E 84.

3. Smoke Density: Not more than 450 as per NFPA 258.

1.4 SUBMITTALS:

A. Product Data: Submit two copies of manufacturer's technical data and installation instructions for each type of resilient flooring and accessory.

B. Samples: Submit, for verification purposes, samples of each type, color, and pattern of resilient flooring, including accessories, required, indicating full range of color and pattern variation. Provide full-size tile units, 6" x 9" samples of sheet flooring and 2-1/2" long sections of resilient flooring accessories.

1. For initial selection of colors and patterns submit, prior to above, samples in form of actual sections of resilient flooring including accessories showing full range of colors and patterns available for each type of resilient flooring required.

C. Certification for Fire Test Performance: Submit manufacturer's certification that resilient flooring furnished for areas indicated complies with required fire test performance and has been tested and meets indicated requirements.

D. Maintenance Instructions: Submit two copies of the manufacturer's recommended maintenance practices for each type of resilient flooring and accessory required.

E. Replacement Material: After completion of work, deliver to the project site replacement materials from the same manufactured lot as the materials installed, and as follows:

1. Tile flooring, not less than one box for each fifty boxes or fraction thereof, for each type, size, and color installed.

2. Sheet flooring, not less than one linear yard for each type, pattern, and color installed.

1.5 JOB CONDITIONS:

A. Maintain minimum temperature of 65 degrees F (18 degrees C) in spaces to receive resilient flooring for at least 40 hours prior to installation, during installation, and for not less than 48 hours after installation. Store resilient flooring materials in spaces where they will be installed for at least 48 hours before beginning installation. Subsequently, maintain minimum temperature of 55 degrees F (13 degrees C) in areas where work is completed.

B. Install resilient flooring and accessories after other finishing operations, including painting, have been completed. Do not install resilient flooring over concrete slabs until the latter have been cured and are sufficiently dry to achieve bond with adhesive as determined by manufacturer's recommended bond and moisture test.

C. Moisture Test - Concrete Floor:

1. Moisture emissions from concrete substrates at any grade shall not exceed 3.0 pounds per 1000 square feet per 24 hours. An anhydrous calcium chloride 72 hour test unit used properly and weighed within one hour of test will accurately determine the rate of emissions (in pounds per 1000 sq. ft.). Shot-blasted or scarified concrete will yield the most accurate results. When used properly a Delmhorst Moisture Detector (model // BD-8 // DP // with type 2-F 5/16” electrodes) will detect the presence of moisture. A 3% solution of phenolphthalein in alcohol on opened concrete will detect vapor emissions.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide products as listed on sheet ID1.1.

B. Other manufacturers will be considered, submit data and specifications showing compliance with the quality, serviceability, and warranty of the specified product.

2.2 MATERIALS:

A. Colors and Manufacturers: See Sheet ID1.1 in Drawings.

PART 3 - EXECUTION

3.1 PREPARATION: NEW CONSTRUCTION

A. Broom clean or vacuum surfaces to be covered and inspect subfloor. Start of flooring installation indicates acceptance of subfloor conditions and full responsibility for completed work.

1. Use leveling compound as recommended by flooring manufacturers for filling small cracks and depressions in subfloors.

2. Perform bond and moisture tests on concrete slabs to determine that concrete surfaces are sufficiently cured and ready to receive flooring.

3. Apply concrete slab primer, if recommended by flooring manufacturer, prior to application of adhesive. Apply in compliance with the manufacturer’s directions.

3.2 EXECUTION:

A. Install flooring using method indicated in strict compliance with manufacturer's recommendations. Extend flooring into toe spaces, door reveals, and into closets and similar openings.

B. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other non-permanent marking device.

C. Install flooring on covers for telephone and electrical ducts, and other such items as occur within finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on these covers. Tightly cement edges to perimeter of floor around covers and to covers.

D. Tightly cement flooring to subbase without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections. Hand roll flooring at perimeter of each covered area to assure adhesion.

3.3 TILE FLOORS:

A. Lay tile from center marks established with principal walls, discounting minor offsets, so that tile at opposite edges of room is of equal width. Adjust as necessary to avoid use of cut widths less than one-half tile at room perimeters. Lay tile square to room axis, unless otherwise shown.

B. Match tiles for color and patterns by using tiles from cartons in same sequence as manufactured and packages. Cut tile neatly around all fixtures. Broken, cracked, chipped, or deformed tiles are not acceptable.

C. Lay tile in "checkerboard" fashion with grain reversed in adjacent tiles.

D. Adhere tile flooring to substrates using full spread of adhesive applied in compliance with flooring manufacturer's directions.

3.4 SHEET VINYL FLOORING:

A. Install to provide as few seams as possible. Match seam edges for color, shading and pattern.

B. Use conventional full spread method of adhesive application.

C. Chemically bond seams using materials recommended by flooring manufacturers.

D. Install Patterns and grains in the same direction in adjoining rooms or areas not having door between. Provide manufacturer’s standard detail for integral coved base, to height of 4” with manufacturer’s recommended aluminum base cap.

3.5 WALLBASE:

A. Apply wall base to walls, columns, pilaster, casework and other permanent fixtures in rooms or areas where base is required. Install base in continuous lengths with no 4’ lengths, with preformed corner units, or fabricated from base materials with mitered or coped inside corners. Tightly bond base to substrate throughout length of each piece, with continuous contact at horizontal and vertical surfaces.

B. On masonry surfaces, or other similar irregular surfaces, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.

C. Transition Strips:

1. Place resilient strips tightly butted to flooring and secure with adhesive. Install edging strips at edges of flooring which would otherwise be exposed. Anchor into floor if necessary.

3.6 CLEANING AND PROTECTION:

A. Remove any excess adhesive or other surface blemishes, using neutral type cleaners as recommended by flooring manufacturers. Protect installed flooring with corrugated heavy Kraft paper or other covering.

B. Finishing: After completion of the project and just prior to final inspection of work, thoroughly clean floors and accessories.

END OF SECTION

SECTION 09 68 16 – CARPETING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specifications Sections, apply to work in this section.

1.2 SCOPE

A. The work required under this section consists of floor carpeting, accessories and related items to complete the work as indicated on the drawings and described in the specifications.

1.3 DELIVERY AND STORAGE

A. Do not deliver items specified in this section to the job site until the project is ready for the installation for the materials. Insure proper protection from weather and damage during transit and job site delivery of all materials.

1.4 CARPET CONTRACTOR QUALIFICATION

A. The carpet subcontractor shall be one who can offer proof of his ability to accept and complete an installation of other successful installations of this type.

1.5 FIRE HAZARD CLASSIFICATION

A. Interior floor finish in corridors and exit ways shall be Class I in accordance with Paragraph 12 3.3.2 and Section 6 5 of the Life Safety Code. Class I interior floor finishes shall have a critical radiant flux minimum of 0.45 watts per square centimeter as determined by NFPA Standard No. 253.

1.6 GUARANTEE

A. Any service required to correct either material or installation as outlined in the specifications shall be performed by the carpet subcontractor at no charge for a period of one year from the date of substantial completion.

1.7 GENERAL REQUIREMENTS

A. After notification from the Architect to proceed with the carpet laying, the carpet subcontractor shall inspect the floors and report any condition that would prevent him from making a

satisfactory installation. The condition shall be corrected and carpet laying shall proceed immediately after the floor is swept clean of all dust, etc., by the general contractor.

B. Install metal edge binder strips at the edge of all carpeting not against a wall, cabinet or other vertical surface.

1.8 JOB MEASUREMENTS

A. The carpet subcontractor shall be responsible for all carpet job measurements and see that all carpet fits properly.

B. All drawings and specifications shall be checked to determine whether or not carpet extends under cabinets, walls, etc.

1.9 WORKMANSHIP AND SUPERVISION

A. Workmanship in the carpet installation shall be first class. Tradesmen doing the installation shall be experienced in this type work.

B. The carpet subcontractor shall have on the job a competent foreman or other qualified person to see that all installation work is done in accordance with the specifications.

C. Supervision and/or inspection by carpet manufacturer's representative shall be when and if the manufacturer deems this necessary for their satisfaction regarding guarantees.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide products as listed on sheet ID1.1.

B. Other manufacturers will be considered, submit data and specifications showing compliance with the quality, serviceability, and warranty of the specified product.

2.2 MATERIALS:

A. Colors and Manufacturers: See Sheet ID1.1 in Drawings.

PART 3 – EXECUTION

3.1 PREPARATION OF SUBFLOORS FOR GLUED DIRECT INSTALLATION

A. Prior to installation of carpeting, it is the responsibility of the flooring subcontractor to test the slab for moisture content. The test required is according to recommended methods of the

flooring manufacturer. Flooring contractor is to provide a written report of the results to the General Contractor and the Architect for approval before beginning installation.

B. If flooring is to be installed over existing VCT, flooring contractor shall insure that substrate is free of all foreign matter and old waxes prior to installation. Test area shall be performed and approved by General Contractor and Architect before total installation proceeds to insure proper adhesion of flooring to existing substrate prepared properly.

C. If flooring is to be installed over aged existing concrete that has been sealed, flooring contractor shall insure that substrate is clean of all foreign matter and ready for acceptance of adhesive for proper installation and bonding. Test area to be performed over this areas as well.

D. All floors to which carpet is to be applied shall be thoroughly cleaned of all droppings, grease, oil, paint and any other foreign matter that would interfere with proper adhesion of the carpet backing.

E. All floors shall be smooth and true. All rough spots shall be smoothed prior to installation.

3.2 INSTALLATION

A. Direct glue-down installation: Carpeting glued with an attached rubber pad (or glued directly to the floor) shall be installed smooth and free from buckles and bubbles. All carpet requires rubber latex or seam sealer at all seams and carpet shall be installed with waterproof adhesive for a permanent installation.

B. DEFECTIVE WORK: All work shall be done to the satisfaction of the Architect. All carpeting not installed according to the drawings and specifications and considered defective shall be removed and replaced at no additional cost to the Owner.

3.3 CLEANING AND PROTECTION

A. Any carpet soiled during or after installation shall be cleaned thoroughly according to recommendations of the carpet manufacturer.

B. After laying the carpet tile, surfaces shall be protected by a layer of heavy building paper, taped at the seams.

C. All damaged carpeting that cannot be repaired properly shall be replaced before the project will be accepted.

D. Removal of rubbish: All rubbish, wrapping paper and salvages shall be removed from the job site.

3.4 EXTRA STOCK

A. As part of this subcontract, the carpet subcontractor shall turn over to the Owner packaged and labeled, approximately four square yards of each color of carpeting for future patching.

B. All excess pieces of usable carpet shall be left to the Owner's future repairs in addition to that specified above.

END OF SECTION

SECTION 09 72 00 - WALL COVERINGS

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. Vinyl wall covering.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include data on physical characteristics, durability, fade resistance, and fire-test-response characteristics.

B. Samples: For each type of wall covering and for each color, pattern, texture, and finish specified, full width by 36-inch long in size.

1. Wall-Covering Sample: From same production run to be used for the Work, with specified treatments applied. Show complete pattern repeat.

C. Samples for Initial Selection: For each type of wall covering.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Product Test Reports: For each wall covering, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For wall coverings to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Wall-Covering Materials: For each type, color, texture, and finish, full width by length to equal to 5 percent of amount installed.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install wall coverings until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at levels intended for occupants after Project completion during the remainder of the construction period.

B. Lighting: Do not install wall covering until lighting that matches conditions intended for occupants after Project completion is provided on the surfaces to receive wall covering.

C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide products as listed on sheet ID1.1.

B. Other manufacturers will be considered, submit data and specifications showing compliance with the quality, serviceability, and warranty of the specified product.

2.2 MATERIALS

A. Colors and Manufacturers: See Sheet ID1.1 in Drawings.

2.3 ACCESSORIES

A. Adhesive: Mildew-resistant, non-staining, strippable adhesive, for use with specific wall covering and substrate application indicated and as recommended in writing by the wall-covering manufacturer.

B. Primer/Sealer: Mildew-resistant, complying with requirements in Section 09 90 00 Painting and recommended in writing by primer/sealer and wall-covering manufacturers for intended substrate.

C. Seam Tape: As recommended in writing by the wall-covering manufacturer.

3 EXECUTION

3.2.1.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, installation of wall primer/sealer and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2.1.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew, and incompatible primers.

C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.

3.2.1.2.C.1 Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
3.2.1.2.C.2 Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
3.2.1.2.C.3 Painted Surfaces: Treat areas susceptible to pigment bleeding.

D. Check painted surfaces for pigment bleeding. Sand gloss, semigloss, and eggshell finish with fine sandpaper.

E. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

F. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.2.1.3 WALL-COVERING INSTALLATION

A. Assure that micro vented (perforated) wall covering material is installed on exterior walls.

B. Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated.

C. Cut wall-covering strips in roll number sequence. Change the roll numbers at partition breaks and corners.

D. Install strips in same order as cut from roll.

3.2.1.3.D.1 For solid-color, even-texture, or random-match wall coverings, reverse every other strip.

E. Install wall covering without lifted or curling edges and without visible shrinkage.

F. Match pattern 72 inches above the finish floor if material has patterns.

G. Install seams vertical and plumb at least 6 inches from outside corners and 6 inches from inside corners unless a change of pattern or color exists at corner. Horizontal seams are not permitted.

H. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without overlaps or gaps between strips.

I. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

3.2.1.4 CLEANING

A. Remove excess adhesive at seams, perimeter edges, and adjacent surfaces.

B. Use cleaning methods recommended in writing by wall-covering manufacturer.

C. Replace strips that cannot be cleaned.

D. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION

SECTION 10 44 16 – FIRE EXTINGUISHERS AND ACCESSORIES

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 DESCRIPTION OF WORK

A. Definition: "Fire extinguishers" in this section refer to units which can be hand carried as opposed to those which are equipped with wheels or to fixed fire extinguishing systems, unless otherwise indicated.

B. Type of products in this section include:

1. Fire extinguishers.

2. Fire extinguisher cabinets.

3. Mounting brackets.

1.3 QUALITY ASSURANCE

A. Provide portable fire extinguishers, cabinets and accessories by one manufacturer, unless otherwise acceptable to Architect.

B. UL Listed Products: Provide new portable fire extinguishers which are UL listed and bear UL "Listing Mark" for type, rating, and classification of extinguisher indicated.

C. FM Listed Products: Provide new portable fire extinguishers which are approved by Factory Mutual Research Corporation for type, rating, and classification of extinguisher indicated and carry appropriate FM marking.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for all portable fire extinguishers required. For fire extinguisher cabinets include roughing in dimensions, and details showing mounting methods, relationships to surrounding construction, door hardware, cabinet type and materials, trim style and door construction, style and materials. Where color selections by Architects required include color charts showing full range of manufacturer's standard colors and designs available.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

1. J.L. Industries

2. Larsen's Mfg. Co.

3. Muckle Manufacturing, Division of Technico, Inc.

2.2 FIRE EXTINGUISHERS

A. General: Provide fire extinguishers for each extinguisher cabinet and other locations indicated in colors and finishes selected by Architect from manufacturer's standard which comply with requirements of governing authorities.

B. Abbreviations indicated below to identify extinguisher types related to UL classification and rating system, and not necessarily to type and amount of extinguishing material contained in extinguisher.

C. Multi-Purpose Dry Chemical Type: All fire extinguishers in cabinets or bracket mounted shall be UL rated 4A-80B:C, 10 lb. nominal capacity, in enameled steel container for Class A, Class B and Class C fires.

2.3 MOUNTING BRACKETS

A. Provide manufacturer's standard bracket designed to prevent accidental dislodgment of extinguisher of proper size for type and capacity of extinguisher indicated in manufacturer's standard plated finish.

B. Provide brackets for extinguishers not located in cabinets. (FE-2)

C. Identify bracket mounted extinguishers with red letter decals spelling "FIRE EXTINGUISHER" applied to wall surface. Letter size, style and location as selected by Architect.

2.4 FIRE EXTINGUISHER CABINETS (for locations indicated as FE1).

A. General: Provide fire extinguisher cabinets where indicated of suitable size for housing fire extinguishers of types and capacities indicated.

B. Construction: Manufacturer's standard enameled steel box, with trim, frame, door and hardware to suit cabinet type, trim style, and door style indicated. Weld all joints and grind smooth. Miter and weld perimeter door frames.

C. Cabinet Type: Suitable for mounting conditions indicated of the following types:

1. Semi-Recessed: Cabinet box (tub) partially recessed in walls of shallow depth. Indicated on drawings as FE 1.
   a. Larsen 2409-6R Architectural Series (depth required 4" and 2 1/2" projection)
      1) Door Style: Full Glass With Larson Lock

D. Door Hardware: Provide manufacturer's standard door operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

2.5 FACTORY FINISHING OF FIRE EXTINGUISHING CABINETS

A. General: Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations except as otherwise indicated. Apply finishes in factory after products are assembled. Protect cabinets with plastic or paper covering, prior to shipment.

B. Baked Enamel Finish: Immediately after cleaning and pretreatment, apply manufacturer's standard baked enamel coating. Provide manufacturer's standard white color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install items included in this section in locations and at 54" to top of cabinet, but height of the fire extinguisher above the floor to be no more than 48” to comply with ADA and applicable regulations of governing authorities.

B. Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.

C. Securely fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer's instructions.

D. Where exact location of surface mounted, bracket mounted fire extinguishers is not indicated, locate as directed by Architect.

END OF SECTION

SECTION 10 95 00 - MISCELLANEOUS SPECIALTIES

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.

B. Extent of miscellaneous specialties are items specified herein and/or shown on drawings.

1.2 INSTALLATION:

A. Installation of each item shall be in accordance with approved shop drawings and with the manufacturer's current printed instructions, except as otherwise specified herein.

1.3 SUBMITTALS:

A. Submit shop drawings, manufacturer's brochures and color samples for each item to the Architect for approval.

B. Submit a copy of installation instructions for each item of work with the shop drawings.

1.4 FINISHES:

PART 2 - PRODUCTS

2.1 ACCESS DOORS:

A. Furnish access doors equal to Karp Model D SC-214P.

2.2 Bullet-resistant Hollow Metal transaction window

A. Bullet-resistant hollow metal transaction windows with transparent package receiver armortex sku: wi-tw-hm-pr

B. Bullet-resistant natural voice speak through armortex sku: sp-cs-nv-06

2.3 DRIVE-UP WINDOW UNIT:

A. Acceptable Manufacturers:

1. Mosler
2. Diebold
3. LeFebure

B. The following components are specified as Diebold components to establish a standard for bidding.

1. 156 SERIES LEVEL 1 DELUXE - SINGLE PANE Bullet Resistant glass.

2. Large capacity electric level 1 transaction drawer Finish-baked enamel

2.4 Blind includes 1" horizontal metal head rail, guardian tilter mechanism, tilt wand, and cord lock, valance, and color selection from standard colors. Provide blinds by one of the following only:

A Delmar, Style "Nouvelle"

B Hunter Douglas, Style "Celebrity"

C Levelour, Style "Monaco"

2.5 High-Strength Expanded Metal Mesh

A. Clark Dietrich Barrier Mesh BM50 16ga. - .48 inches thick

END OF SECTION

SECTION 21 01 00 - FIRE PROTECTION GENERAL PROVISIONS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide all labor, materials, tools, and services for a complete installation of equipment and systems contained in contract documents.

B. Principal features of work included are:

1. Fire Protection system.
2. Demolition of existing equipment, and piping.
3. Seismic bracing and anchorage for equipment and piping.

1.02 RELATED WORK

A. Electrical power and interlock and control wiring and conduit.

B. Field painting of exposed pipe.

1.03 GENERAL

A. The contract documents form a guide for a complete system. Provide all items necessary to provide a complete system but not specifically mentioned, such as hangers, transitions, offsets, and drains.

B. Layouts indicated on drawings are diagrammatical only. Coordinate exact location of equipment, ductwork, and piping to eliminate conflict with other divisions. Designer reserves right to make reasonable changes in location of equipment, and piping prior to construction.

C. Should Contractor find during progress of work that in his judgment existing conditions make desirable a modification, report such item promptly to Designer for instructions. Do not make deviations from contract documents without review of Designer.

D. Supervise all work with a competent mechanic specifically qualified in fire protection work.

E. The installing sprinkler contractor shall be licensed or permitted by the state and local authority having jurisdiction to perform fire protection installations. This shall be in compliance with all applicable state and local laws.

1.04 PERMITS

A. Secure and pay for permits, licenses, and inspections for work under this Division, including water connections.

1.05 CODES

A. Comply with all pertinent local, state, and national codes.

1.06 STANDARDS

A. Comply with all pertinent standards. This list is provided as a convenience to the contractor and is not to be considered all inclusive.

1. NFPA 13: Standard on automatic sprinkler systems.

1.07 SUBMITTALS

A. Submit for review complete brochures and shop drawings for materials and equipment proposed.

1. Brochures: Submit complete descriptions, illustrations and specification data for materials and equipment proposed. Clearly indicate proposed items when other items are shown on same sheet. Submit samples on request and/or set up for inspection. Samples will be returned to Contractor.

2. Shop Drawings: Complete equipment, and piping systems.

1.08 PROJECT MAINTENANCE MANUALS

A. Prior to final acceptance of project, provide Owner with bound maintenance manuals.

1.09 PROJECT TECHNICAL INSTRUCTION

A. Prior to final inspection of project, provide technical instruction to Owner as follows:

1. Field Instruction: Provide explanation of how systems and equipment are to operate.

2. Field Demonstration: Demonstrate operation and routine maintenance for systems and equipment.

1.10 CONSTRUCTION RECORD DOCUMENTS

A. Provide construction record documents. Keep at the project one set of drawings and daily record changes at the time they are made. Give drawings to Owner at project completion.

1.11 EXISTING SERVICES

A. Maintain existing services in operation during construction. Coordinate and schedule all service interruptions with Owner.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Provide materials and equipment of domestic manufacturer bearing the U.L. and F.M. label when such label is available.

PART 3 EXECUTION

3.01 COORDINATION

A. Coordinate location of fire protection piping with equipment, ductwork, and other piping to eliminate conflict with other divisions.

B. Provide proper chases and openings. Place sleeves and supports prior to pouring concrete or installation of masonry.

3.02 CUTTING AND PATCHING

A. Repair or replace routine damage caused by cutting in performance of contract.

B. Correct unnecessary damage caused due to installation of fire protection work.

C. Perform repairs with materials that match existing in accordance with the appropriate sections of these specifications.

3.03 TRENCHING, EXCAVATION AND BACKFILLING

A. Provide trenching, excavation and backfilling necessary for performance of fire protection work in accordance with the appropriate section of these specifications.

3.04 IDENTIFICATION

A. Identify exposed or accessible piping with stenciling contents indicating pipe contents and direction of flow on piping not more than 20 feet apart, at valves, at access panels, and at least once above each space.

B. Contractors option to identify exposed or accessible piping with snap-on or strap-on type markers. Color code markers in accordance with ANSI. Indicate pipe contents and direction of flow on marker. Install markers on piping not more than 20 feet apart, at valves, at access panels, and at least once above each space.

C. Color code piping exposed in equipment rooms. Paint to be Sherwin Williams Metalatex fire protection red.

D. Identify all mechanical equipment with engraved brass, aluminum, or stainless steel nameplates or tags. Use equipment names and numbers appearing in schedules on drawings. Fasten nameplates to equipment using screws. Glue or adhesive is not acceptable. Fasten tags to equipment using brass, aluminum or stainless steel chains.

E. Identify each valve with engraved brass, aluminum, or stainless steel identification tag indicating valve service and sequential identification number. Attach tag to valve handle with brass, aluminum or stainless steel chain. Provide two bound manuals to Owner listing each valve sequentially and indicating valve manufacturer, style, size, service, normal position, and specific location for each valve.

F. Frame and mount control diagrams and sequences in each equipment room. Use non-fading black and white prints encased in aluminum frame with plexiglass cover.

3.05 CLEANING

A. Repair damaged factory finishes covering all bare places and scratches.

3.06 FOUNDATIONS AND PADS

A. Provide foundations, pads, and bases required for equipment. Concrete to be in accordance with concrete division of specifications.

B. Coordinate proper sizes and locations of foundations, pads, bases, anchors, supports, and other items to be built into structure.

3.07 TESTING

A. Test all installed equipment and systems and demonstrate proper operation. Correct and retest work found defective when tested.

B. Thoroughly check piping system for leaks. Do not add any leak-stop compounds to the system. Make repairs to piping system with new materials. Peening, doping, or caulking of joints or holes is not acceptable.

END OF SECTION 210100

SECTION 21 11 19 - FIRE DEPARTMENT CONNECTION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish materials, accessories, equipment, tools, and transportation and performance of all services and labor required to completely execute the sprinkler and fire protection work for this project, as indicated on the drawings and as herein specified.

1.02 SCOPE OF WORK

A. Cutting of holes necessary for the installation of work specified under this Section. Coordinate cutting of material with other Divisions. Employ services of other trades for patching of concrete, masonry, and other material. Use same material for patching and finish neatly.

1.03 DESIGN REQUIREMENTS

A. Install in accordance with the drawings, specifications, and requirements of NFPA 13.

B. Furnish material and labor necessary to fully comply with the drawings and specifications and with the rules, regulations, and ordinances.

1. Provide a 3/4 inch ball drip for all types of fire department connections. Route discharge, to outside of building.

1.04 QUALITY ASSURANCE

A. Materials bearing UL and FM approval, where such approval is applicable or required by the agencies having jurisdiction over fire protection work.

B. Provide all hose threads, operating nuts, and accessories for Siamese connections, meeting local Fire Department Standard.

C. The installing sprinkler contractor shall be licensed or permitted by the state and local authority having jurisdiction to perform fire protection installations. This shall be in compliance with all applicable state and local laws.

1.05 SUBMITTALS

A. Equipment submittal drawings and data are required on all items named by manufacturer, including Siamese Connection - Type and Manufacturer.

1.06 APPLICABLE CODES

A. NFPA 13

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Acceptable Manufacturers: Croker-Standard, Potter Roemer, Elkhart.

B. Products listed indicate standard.

2.02 FIRE DEPARTMENT CONNECTION

A. Provide signage per NFPA 13 and requirements of local authority having jurisdiction for proper identification for fire department service.

1. Fire Department Connection (Siamese): Croker-Standard, Figure Number 6010-PB 4 inch by 2-1/2 inch two-way, flushed polished brass, with double clapper inlets siamese fire department connection. Hose threads shall be in accordance with local fire department requirements. Provide plugs with chains.

PART 3 EXECUTION

3.01 COORDINATION

A. Coordinate installation with other Divisions to ensure there are no conflicts.

END OF SECTION 211119

SECTION 21 13 13 - AUTOMATIC SPRINKLER SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish materials, accessories, equipment, tools, and transportation and performance of all services and labor required to completely execute the sprinkler and fire protection work for this project, as indicated on the drawings and as herein specified.

1.02 SCOPE OF WORK

A. Shop drawings.

B. Valves including check valves, system valves, backflow preventer, and indicator valves.

C. Pipe, fittings, interior.

D. Hangers, supports and sleeves.

E. Sprinkler heads, extra sprinkler cabinet.

F. Alarm check valves and accessories.

G. Testing and flushing.

H. Hydraulically calculate sprinkler system, wet and/or dry as required by drawings. Maximum water velocity shall be 25 feet per second for interior piping.

I. Cutting of holes necessary for the installation of work specified under this Section. Coordinate cutting of material with other Divisions. Employ services of other trades for patching of concrete, masonry, and other material. Use same material for patching and finish neatly.

J. Unless otherwise noted on the drawings or these specifications, the entire project shall be fully protected, excluding no spaces.

K. In an area of renovation and existing systems that are converted and/or extended to include the use of quick-response sprinklers, all existing sprinklers in a compartmented space shall be changed to quick response type. A compartmented space is defined as the entire smoke compartment.

1.03 DESIGN REQUIREMENTS

A. Install system(s) in accordance with the drawings, specifications, and requirements of NFPA 13 and NFPA 25.

B. Furnish material and labor necessary to fully comply with the drawings and specifications and with the rules, regulations, and ordinances.

C. Include in sprinkler system design the following requirements:

1. Light Hazard Occupancies (offices, patient rooms, corridors, lobbies, classrooms, hotel guest rooms, institutional, residential, libraries with 8 ft. high shelves max, unused attics) shall be 0.10 GPM/sq. ft. over 1500 sq. ft.

2. Ordinary Hazard Group 1 Occupancies (electrical rooms, mechanical rooms, storage rooms, kitchens, parking garages, laundries, restaurant service areas, and similar areas) shall be 0.15 GPM/sq. ft. over 1500 sq. ft.

3. Ordinary Hazard Group 2 Occupancies (medical record, boiler rooms, loading docks, machine shop, mercantile, libraries with large stack areas, trash rooms and similar areas) shall be 0.20 GPM/sq. ft. over 1500 sq. ft.

4. Extra Hazard Group 1 Occupancies (emergency generator room and similar areas) shall be 0.30 GPM/sq. ft. over 2500 sq. ft.
5. Canopies and overhangs utilizing Dry Pipe sprinkler systems shall be designed on an Ordinary Hazard Group 1 basis, utilizing 30 percent additional square footage for coverage (i.e., 0.15 GPM/sq. ft. over 1950 sq. ft.).
6. Provide 286 degree F. sprinkler heads in mechanical rooms, boiler rooms, elevator shafts and machine rooms, and other related high ambient temperature spaces.
7. Provide hose streams as required by NFPA 13.
8. Provide a minimum of 18 inches clearance between bottom of sprinkler deflector and top of storage.
9. Provide a 3/4 inch ball drip for all types of fire department connections. Route discharge to outside of building.
10. Provide the results of a Contractor independently performed flow test in accordance to NFPA 291 within 6 months to determine the adequacy of the water supply before construction begins. The Contractor shall use this data obtained to hydraulically design the system. Submit this with sprinkler system drawings and calculations.
11. Provide dry pendent type sprinkler heads located within cooler and/or freezer boxes with recess seat located within a conditioned space. Provide flexible boot connector at freezer dry sprinkler.
12. The hydraulic calculations shall be carried to the city water supply taking into account all fittings, valves, etc. The contractor shall be responsible for hydraulically sizing all new piping not sized on the drawings and shall take into consideration the existing piping to remain.
    a. Design calculations shall have a minimum of 5% difference of system demand including hose stream and the available water supply flow and pressure.

1.04 QUALITY ASSURANCE

A. Materials bearing UL and FM approval, where such approval is applicable or required by the agencies having jurisdiction over fire protection work.

B. The installing sprinkler contractor shall be licensed or permitted by the state and local authority having jurisdiction to perform fire protection installations. This shall be in compliance with all applicable state and local laws.

C. All sprinkler piping from “Point of Service” including underground used for sprinkler or standpipe system shall be installed by a Registered Sprinkler Contractor. Underground mains and hydrants must be installed and in service prior to starting construction.

D. All castings used for coupling housings, fittings and valve bodies shall be date stamped for quality assurance and traceability.

1.05 SUBMITTALS AND SHOP DRAWINGS

A. Prepare complete detailed working drawings for Fire Protection System. Submit drawings to Designer and to owner's insurance underwriter for approval. After receiving this approval, submit shop drawings to State Fire Marshal and local AHJ for his review and approval prior to starting installation. Prior approval by above listed authorities is required before sprinkler installation is begun.

B. The Sprinkler Contractor shop drawings and calculations shall be stamped and signed by a firm employee who has a minimum NICET III level certification and signed by a Responsible Managing Employee. Shop drawings and calculations shall be submitted by a licensed and registered fire protection contractor.

C. Equipment submittal drawings and data are required on all items named by manufacturer, including the following:

1. Sprinkler Heads - Type and Manufacturer. The mixing of sprinkler manufacturer shall not be permitted.

2. Valves - Type and Manufacturer, interior and exterior. Sprinkler devices (alarm check valves, dry pipe valves, etc. shall be listed and approved as component packages and no intermixing of valve manufacturers shall be allowed.

3. Water Flow, Pressure and Tamper Switches - Type and Manufacturer.

4. Piping and fittings.

D. The sprinkler system shall be hydraulically designed by industry standard computer software. The Contractor shall submit computer calculations and copy of original water flow test report with working plans. Include in calculations allowance for outside hose streams and domestic water as required.

E. Where seismic bracing is required by code, the Contractor will submit with the working plans copies of seismic bracing work sheets (ref. 2013 NFPA 13 - Fig. A.9.3.5(a)) or copies of computer generated seismic bracing calculations. Refer to specification section 21 05 47 for additional requirements.

F. Contractor will supply as-built drawings to the Owner, the Owner’s Insurer, the Architect, the Engineer and other entities as required by the Owner or the Authority Having Jurisdiction.

1.06 SPRINKLER SYSTEM COORDINATION

A. The contractor will be responsible for ensuring that the reflected ceiling plan shown on the working drawings is the latest revision from the Architect before commencing work.

B. The contractor shall be responsible for providing to the Architect notification for any drawing changes resulting from movement of sprinkler piping or heads during installation.

C. Failure to coordinate sprinkler system and building systems (including, but not limited to: ductwork, mechanical piping, and lighting fixtures) prior to fabrication or installation of sprinkler systems shall be corrected, modified, or changed as necessary at the expense of the contractor.

D. The contractor is to completely investigate, PRIOR TO BID, all requirements of local water utility and fire department. Devices such as ADT and/or local alarm systems, double check valve assemblies, detector checks, tamper switches shall be provided complete, wired, connected, and installed in accordance with local authorities by this Contractor. In the event the authorities have no installation details, the Contractor shall submit for approval proposed installation.

1.07 APPLICABLE CODES

A. NFPA 13

B. NFPA 25

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Products listed indicate standard.

2.02 VALVES

A. Acceptable Valve Manufacturers: Ames, Nibco, Anvil, Kennedy, Wilkins, Tyco or Victaulic.

B. Backflow Preventer

1. Double check detector valves: Ames C300 or Wilkins 350 ADA with 2" bronze by-pass meter or local water department standard. Size as indicated on drawings.

C. Interior Valves

1. Check valves

a. Iron body, Kennedy Valve 1126A swing check valve with resilent disc, flanged body.

b. Bronze body, Nibco KT-403-W threaded swing check valve with dielectric unions.

c. Ductile iron body, Tyco CV-1F swing check valve with grooved ends.

2. Gate valves

a. Iron body, OS&Y gate valve, Kennedy Valve FW-8068A, flanged.

b. Bronze body, OS&Y gate valve, Nibco T-104-0, threaded with dielectric unions.

c. Ductile iron body, OS&Y gate valve, Tyco with grooved ends.

D. Wall-Mounted Indicator Valves

1. Gate valve, Kennedy Valve 8701ASS, flanged NRS.

2. Wall indicator post, Kennedy Valve 641.

2.03 PIPE AND FITTINGS

A. Interior Pipe and Fittings

1. Piping for wet pipe systems shall be Schedule 40 black steel pipe 2” and smaller conforming to ASTM A135 or ASTM A53 and Schedule 10 black steel pipe 2-1/2” and larger conforming to ASTM A135.

2. Fittings for wet pipe systems

a. Fittings shall be threaded or grooved for 2 inch and smaller and flanged or grooved for pipe 2-1/2 inch and larger.

b. Ductile iron threaded fittings, ANSI B16.3 Class 300.

c. Cast iron threaded fittings, ANSI B16.4 Class 125 and 300 (extra heavy).

d. Cast iron flanged fittings, ANSI B16.1 Class 125 and 300.

e. Grooved couplings and fittings, as manufactured by Tyco, Anvil, Victaulic or equivalent. Couplings shall be rigid type, equivalent to Tyco 577 Rigid Coupling with pre-lubricated Grade “A” EPDM gasket. All groove couplings and fittings shall be furnished by a single manufacturer. Associated piping shall be roll-grooved.

f. Weldolet pipe outlets for branch connections shall be of approved manufacturer.

3. Piping for Dry Pipe systems and for drainage systems shall be Schedule 40 galvanized steel pipe, conforming to ASTM A795 with galvanized fittings, ANSI B16.4, galvanized coated, both interior and exterior of pipe and fittings.
4. Fittings for dry pipe systems
    a. Fittings shall be threaded or grooved for pipe 2 inch and smaller and flanged or grooved for pipe 2-1/2 inch and larger. Contractor has option of providing threaded piping for 6 inch and larger.
    b. Ductile iron threaded fittings, ANSI B16.3 Class 300 hot-dipped galvanized conforming to ASTM A153.
    c. Cast iron threaded fittings, ANSI B16.4 Class 125 and 300 (extra heavy) hot-dipped galvanized conforming to ASTM A153.
    d. Cast iron flanged fittings, ANSI B16.1 Class 125 and 300 hot-dipped galvanized conforming to ASTM A153.
    e. Grooved couplings and fittings, as manufactured by Tyco, Anvil, Victaulic or equivalent. Couplings shall be rigid type, equivalent to Tyco 577 Rigid Coupling with Tri-Seal Grade “E” EPDM gasket. All groove couplings and fittings shall be hot-dipped galvanized conforming to ASTM A153 and furnished by a single manufacturer. Associated piping shall be roll-grooved.
    f. Weldolet pipe outlets for branch connections shall be of approved manufacturer.
5. Flexible sprinkler drops shall be UL Listed and FM approved. The maximum length shall not exceed 4’-0” and the minimum bend radius shall not exceed the more stringent of the UL and FM guidelines. Flexible drops shall be installed per manufacturers printed instructions with mounting brackets supplied by the same manufacture. Hydraulic calculations shall allow for length of flexible drop used. Submit all product data including manufacturers mounting instructions with shop drawings submitted.
6. Mechanical tees are not allowed on this project. Where connection to existing sprinkler system, mechanical tees are acceptable for branch line and sprinkler main extension but should not include the addition of individual sprinklers where the pipe size is below 1-1/4 inch in size. Holes shall be cut in a manner which provides for disc retrieval. Disc shall be attached next to mechanical tee.
7. Piping in MRI rooms to be of non-metallic material.

B. Hangers, Supports, and Sleeves
1. Support piping with UL and FM approved hangers. Acceptable manufacturers: Anvil, B-Line, Fee & Mason.
2. Adjustable Clevis: Anvil Fig. 260.
3. Adjustable Swivel: Anvil Fig. 69. Beam Clamp with Anvil Fig. 92 or Anvil Fig. 218 with retaining strap. If Fig. 218 is used provided Fig. 157 rod attachment. Retaining strap shall be UL listed and FM approved for seismic applications.
4. Concrete Fasteners: Anvil steel shell and expander plug.
5. Concrete Insert: Anvil Fig. 152.
6. Riser Clamp: Anvil Fig. 261.
7. Powder-driven inserts shall not be accepted.

8. All pipes passing through rated floors or walls shall be sleeved and/or firestopped to an equivalent rating of the floor or wall assembly. Firestop materials shall meet ASTM E814 requirements.

9. All piping hangers and seismic braces shall be listed for use with sprinkler systems or shall be designed by a registered Structural Engineer, licensed to practice in the State. Refer to specifications 21 05 47 for additional requirements.

10. All hangers, bracing, etc., shall be designed to constrain the sprinkler discharge resulting from a system pressure of 175 psig at the base of the riser.

2.04 SPRINKLER HEADS, EXTRA SPRINKLER CABINET

A. Provide the following sprinkler heads of proper types, ratings, and spacings for areas involved. Provide appropriate finishes compatible with space finishes being served. Acceptable manufacturers: Tyco, Viking, Victaulic and Reliable.

1. Quick Response Type

a. Pendent and upright: Tyco TY-FRB (UL and F.M. approved). K-Factor = 5.6

b. Recessed, chrome: Tyco TY-FRB (UL and F.M. approved). K-Factor = 5.6

c. Fully concealed: Tyco-RF II, white or custom color coverplate as selected by Architect. Provide optional air and dust seal in all patient care areas, sterile work, sterile storage, patient procedure rooms, decontamination, compounding Pharmacy, and dietary. Coordinate with Architect for quantity of custom colors required and location of custom color coverplates (UL approved). K-Factor = 5.6

d. Horizontal sidewall: Tyco-FRB (UL and FM approved).

e. Dry: Tyco Model DS-1 (UL approved) standard coverage. K-Factor = 5.6.

f. Institutional: Tyco “Raven” (UL approved). K-Factor = 5.6.

B. Pendent heads in ceilings and horizontal sidewall heads shall have one-piece, non-adjustable escutcheons. Two-piece or slip type escutcheons shall not be accepted. This does not apply to recessed heads. Escutcheon shall be approved for use and supplied by the sprinkler manufacturer.

C. Sprinkler body shall be integrally cast with a hex-shaped wrench boss to reduce the risk of damage during installation. Wrenches shall be provided by the sprinkler manufacturer which directly engages the wrench boss.

D. Provide sprinkler cabinet equal to Tyco with spare sprinkler wrench.

E. Contractor shall coordinate dry barrel length as required for field conditions.

2.05 SWITCHES

A. Water Flow Switch: System Sensor Model WFD or Notifier Model No. WFD-60 vane type flow switch with pneumatic retard adjustable from 0 to 70 seconds, complete with two sets of single pole, double throw micro feature. Coordinate final voltage with Division 26.

B. Tamper Switches: System Sensor PIBV2(A) or Notifier Model No. PIBV2(A) for 4" and larger, Potter Model No. OSYSU-2 for pipe size less than 4", tamper switch double pole, double throw micro feature for ½-inch to 12-inch valves. Coordinate final voltage with Division 26.

2.06 WATER FLOW ALARMS

A. Electric Alarm: Electrically operated, 24 VDC, red enameled 10” round gong with pressure alarm switch. Coordinate final voltage with Division 26. Notifier MB-G10 or approved equal.

2.07 WET ALARM CHECK VALVES AND ACCESSORIES

A. Wet Alarm Check Valve and Accessories – Electric Bell

1. Alarm check valve shall be equal to Tyco CV-1FR with resilient elastomer seal facing on the spring-loaded clapper.
2. Provide trim package to control include as a minimum as follows:
    a. Main drain valve.
    b. Pressure gauges (system and supply).
    c. All installed components shall be replaceable without removing the valve from the installed position.
3. Provide waterflow switch connected to electric bell and fire alarm system.

2.08 DRY PIPE SYSTEM CHECK VALVE AND ACCESSORIES

A. Dry Pipe System Check Valve

1. Provide check type valve with divided seat ring, rubber faced clapper to automatically activate water motor alarm or electric alarm. Alarm check valve shall be equal to TYCO DPV-1, differential style valve with trim package.
2. Accelerator. Where an accelerator is used, provide an electronic accelerator.
3. Test and drain.
4. Air Maintenance device with low pressure alarm.
5. Alarm switch with supervisory capability.
6. Pressure gauges where required by NFPA 13.

B. Air Compressor

1. Coordinate with Division 26 for all wiring connection to approved air compressor.
2. Contractor to select air compressor to:
    a. Restore system pressure within 30 minutes or as required by NFPA 13.
    b. Maintain system pressure as required by approved dry pipe valve or shall be 20 psi in calculated trip pressure of dry pipe valve.

C. Calculations

1. Provide calculations for water delivery time by approved software.
2. Water delivery shall be:
    a. Light Hazard – 60 seconds.
    b. Ordinary Group 1 Hazard – 50 seconds.
    c. Ordinary Group 2 Hazard – 50 seconds.
3. Provide quick opening device as required.

D. Drainage

1. System branch lines shall be pitched at least ½ inch per 10 feet.
2. Mains shall be pitched at least ¼ inch per 10 feet.
3. Auxiliary Drains:
    a. Located in areas subject to freezing shall be readily accessible.

b. If capacity of trapped section is less than 5 gallon drain shall consist of valve not less than ½ inch and drain plug.

c. If capacity of trapped section more than 5 gallon drain shall consist of two 1 inch valves and one 2 inch by 12 inch condensate nipple and shall be accessibly located.

4. Test connection shall be located on end of most distant sprinkler pipe and equipped with readily accessible shut off valve and plug not less than 1 inch, at least one of which shall be brass.

5. Gridded systems are not acceptable.

2.09 INSPECTOR TEST AND DRAIN

A. Where indicated on drawings (riser or remote location), Inspector test and equal to AGF3011ASG. Inspector test and drain shall have:

1. Body Material: Bronze body, brass stem, steel handle, chrome-plated bronze ball, virgin Teflon valve seat. Sight Glass: Bronze housing with viewing window.

2. Components: A tamper resistant test orifice and a tapped port for system access.

3. Pressure Relief Valve and Drainage Piping: AGF Model 7000.

a. Pressure Rating: Factory rated at 175 psi.

b. Body Material: Bronze body and stainless steel spring.

c. Components: Nylobraid flexible tube, two 1/2” NPT by barbed 90 degree elbows, external identification plate and integral flushing handle to remove debris.

d. 1/2 inch MIPT inlet, 1/2 inch FIPT outlet.

e. Relief pressure shall be factory set to project specifications.

f. Relief valve shall operate to the OPEN position between 90% and 105% of the set pressure.

g. Relief valve shall reseat or CLOSE at a minimum of 80% of set pressure.

4. Test Orifice Size as required by NFPA 13, latest edition.

5. Size: F.I.P.T., same as connected piping.

6. Inlet and Outlet: Threaded.

PART 3 EXECUTION

3.01 COORDINATION

A. Coordinate installation with other Divisions to ensure there are no conflicts. Fire protection piping shall not take priority in routing over HVAC ductwork.

3.02 PIPE INSTALLATION

A. Connect to water main as shown on drawings.

B. Install underground piping to provide a minimum cover of 2.5 feet over the top of the pipe. Provide 3 feet of cover under roads and driveways.

C. Install underground service utility tape approximately 18 inches above pipe.

D. Attach hangers to structural steel work as specified above, except that structural work shall not be drilled and punched. Wherever necessary, furnish, install, and securely anchor to or between building members suitable angle iron or other steel members to support sprinkler work.

E. Provide support for grooved piping in conformance with requirements of MSS-SP-69, "Pipe Hangers and Supports - Selection and Application". In addition to these requirements, leave no horizontal pipe unsupported between any two couplings nor shall any pipe be left unsupported whenever a change in direction of flow takes place. Provide supports meeting the requirements stated above, but ensure that the distance between supports does not exceed the following:

PIPE SIZE	MAXIMUM SPAN BETWEEN HANGERS
1 Inch	8 Feet
1-1/4 through 2 Inch	10 Feet
2-1/2 through 4 Inch	12 Feet
5 through 8 Inch	14 Feet
10 through 12 Inch	15 Feet

F. Support vertical piping at every other floor or every other pipe length, whichever is most frequent. Set the base of the riser or base fitting on a pedestal or foundation.

G. Seismic Application: The use of single sided or friction type C-clamps with retention straps for hanging pipe shall be UL and FM approved for seismic application.

H. Where seismic bracing is indicated on plans, the Contractor will submit with the working plans copies of seismic bracing work sheets (ref. NFPA 13 - Fig. A.9.3.5(a)) or copies of seismic bracing calculations from industry standard computer software in accordance with seismic design category and ASCE07. Refer to specification section 21 05 47 for additional information.

I. Piping Above Grade:

1. In areas with no ceilings, run piping as high as possible. Minimum head room shall be 10’-0”.

2. Contractor is responsible for installation of seismic bracing required by code. The Contractor is responsible for coordinating with the Structural Engineer regarding proper seismic bracing. Refer to specification section 21 05 47 for additional information.

3. Grooved joint shall be installed in accordance with the manufacture’s written recommendations. Grooved ends shall be clean and free from indentations, projections or roll marks. The gasket shall be molded and produced by the coupling manufacturer of an elastomer suitable for the intended service. The coupling manufacturer’s factory trained representative shall provide on-site training for the Contractor’s field personnel in the use of grooving tools and installation of product. The representative shall periodically visit the job site to ensure the best practices in grooved product installation are being followed. (A distributor’s representative is not considered qualified to conduct the training.

J. Provide section valves where shown on drawings, complete with tamper switch, water flow alarm, and drain connections. Provide sight-glass where inspector’s test discharge cannot be readily seen when operating valve.

K. All control valves and indicating valves shall be chained into the open position and equipped with remote or central station signaling devices per 2013 NFPA 13 – 8.16.1.1.2.1.

L. All metallic sprinkler piping, including but not limited to, all risers, cross mains, drains, and branches are to be primed with at least one coat of rust inhibitive primer before installation. (Except where stainless steel or chrome plated piping is used.)

M. All sprinkler piping shall be hydrostatically tested at 200 psi and shall maintain that pressure with no loss for 2 hours or as required by NFPA 13 for normal pressure in excess of 150 psi.

N. Provide drain valves, pipes and test connections as required by NFPA 13. Pipe drain lines and test connections to outside building as shown on the drawings and details. Test lines must originate from the most hydraulically remote point of each sprinkler zone. All drain piping and fittings shall be galvanized coated, no exception.

O. Cross mains and feed mains shall not pass through electrical rooms or similar spaces. Only the branch line serving such spaces shall be permitted within the boundaries of these rooms.

P. Drain plugs shall be installed on trapped sections of piping between 5 and 50 gallons. Auxiliary drain valves, 1 inch or larger, shall be installed on trapped sections of pipe greater than 50 gallons, and piped to an accessible location.

Q. All dry pipe systems shall be tested in addition to hydrostatic test, an air pressure leakage test at 40 psi for 24 hours with a maximum pressure loss of 1-1/2 psi.

3.03 SPRINKLERS

A. Install sprinkler heads and required piping in areas such as concealed spaces, lab hoods, dietary freezer and chill boxes and other special areas and spaces as required by NFPA 13, NFPA 101, applicable state and local codes.

B. Install sprinkler heads centerline of corridors and locate in the center of the ceiling tiles. Install sprinkler heads in other designated spaces in the center of the ceiling tiles and symmetrically locate with other heads within the ceiling. (Refer to Architectural reflected ceiling plans.) Do not install sprinkler heads in other locations any closer than six (6) inches to any ceiling grid or wall.

C. Pendant sprinklers below ceiling shall be in alignment and parallel to ceiling features, walls, etc.

D. When the light fixtures extend below the ceiling, the sprinklers shall be spaced so that the sprinkler spray pattern is not obstructed. Refer to electrical plans for light fixture layout and types.

E. Provide guards on sprinkler heads where within 7’-6” of finished floor or wherever sprinklers may be subject to mechanical injury.

F. Do not install sprinklers which have been dropped, damaged or show a visible loss of fluid. Never install sprinklers with cracked bulb.

G. Furnish one sprinkler cabinet complete with 12 sprinklers of assorted temperature ratings of the type necessary and in use throughout the installation, including one sprinkler wrench. Locate and mount adjacent to riser.

3.04 MATERIAL AND TEST CERTIFICATE

A. Provide copy of Contractor’s Material and Test Certificate for above ground piping as required by NFPA 13 in Owners O&M Manual.

3.05 OWNER’S INFORMATION CERTIFICATE

A. Before commencing work, the sprinkler contractor shall obtain from the Owner, or his Agent, an Owner’s Information Certification containing the elements outlined in 2013 NFPA 13 – 4.3.

B. The Contractor shall provide a copy of the Owner’s Certificate to the Engineer.

3.06 GUARANTEE

A. The fire protection installation, as specified under this section of the specifications, shall be guaranteed for one year against defective equipment, materials, and workmanship.

B. Guarantee shall not be construed as requiring the sprinkler contractor to render service or maintenance required in the normal operation of the equipment or to make repairs that may be needed due to normal wear and tear or the Owner's negligence, abuse, or breakage.

3.07 INSPECTION SERVICE

A. After completion of the fire protection installation and at the start of the guarantee year, the Contractor shall execute the National Fire Sprinkler Association., Standard form of "Inspection Agreement," without charge to the Owner, calling for four inspections of the sprinkler system during the guarantee year. These inspections will, at a minimum, comply with the provisions and requirements of NFPA 25. During the guarantee year, the inspections shall be made as per the inspection agreement, plus the following maintenance to be performed during the course of the fourth inspection.

B. Operation of all control valves.

C. Lubrication of operating stems of all interior control valves.

D. Operation of water motor gong and/or electric alarms.

E. Cleaning of alarm valves.

F. Cleaning of dry pipe valves.

G. Lubrication of Fire Department Connection inlets.

H. The Standard Form of the National Fire Sprinkler Association., "Report of Inspection" shall be filled out in triplicate after each inspection and the copies sent to the Owner, Insurance Carriers, Fire Department, or other authorities that the Owner may designate.

END OF SECTION 211313

SECTION 22 11 16 - DOMESTIC WATER PIPING AND VALVES

PART 1 GENERAL

1.01 SYSTEM REQUIREMENTS

A. Submit pipe, valves, and fittings and have approved before starting installation. Pipe, valves, and fittings to be new, manufactured domestically, and marked clearly with manufacturers' name, weight, and classification or working pressure.

B. Piping to run approximately as shown on drawings or as structural and architectural conditions permit.

C. All products used for dispensing potable drinking water must be lead free and meet the requirements of NSF 61 and NSF 372 test standards via third party testing and certification.

PART 2 PRODUCTS

2.01 COPPER PIPES

A. Type "L" hard-drawn seamless copper tubing, ASTM B-88: Domestic hot and cold water 4" O.D. and smaller.

B. Type "K" hard-drawn seamless copper tubing:

1. Domestic water lines located under slab.

2. Exterior domestic water lines 2-1/2" and smaller underground.

C. Copper Pipe Fittings:

1. Provide sweat fittings, ASTM B-62, dimensions conforming to ANSI B16.22, wrought copper, with sweep patterns for copper tubing.

2. Dielectric connection: Provide Epco Sales, lead free dielectric couplers at junction of steel pipe and equipment with copper piping systems. Use of steel or cast iron fittings in copper piping systems prohibited. T-drill branch tee connections shall not be allowed for domestic water piping.

D. Unions to be brass ground joint, 250-pound working pressure.

E. Nipples used in conjunction with copper pipe to be brass.

2.02 VALVES

A. Valves are specified by Manufacturer and Model Numbers to establish quality levels unless otherwise noted. Crane, Milwaukee, Hammond, Nibco, Stockham, Centerline, Apollo, Kitz, or Watts are considered equal manufacturers. Provide clamp lock hand lever operators on valves less than 8 inches. Provide hand wheel and closed housing worm gear on valves 8 inches and larger unless indicated otherwise below. Provide chain operators for all equipment room and powerhouse valves 4 inch and larger which are located over 6 feet 6 inches above the finish floor. All valves shall meet NSF-61 requirements.

1. Gate Valves:

a. Gate valves for copper piping 2" and smaller systems to be Class 125, bronze body, solder ends, Nibco S-113 LF. Valve to have either solid or split wedge disc, inside screw, non-rising stem, and screwed bonnet.

2. Globe Valves:

   a. Globe valves 2" and smaller to be Class 150, bronze body, screwed ends, Apollo 121T-LF. Valve to be plug type with renewable seat and disc, rising stem, and union bonnet.

3. Ball Valves:

   a. Ball valves for copper water piping systems 2" O.D. and smaller to be equal to Apollo "3" S-585-66LF, solder ends, and for 2-5/8" thru 3-1/8" O.D. to be equal to Nibco T T-585-66LF, threaded ends. Valves to have bronze body, chromium plated bronze ball, PTFE seats, stuffing box ring and seals, and quarter turn on-off. Provide memory stops for valves used for balancing service. Valves to be rated for 400-psi WOG at 200 degrees F. Install threaded end valves with lead free brass adapters.

4. Check Valves:

   a. Check valves for copper water piping systems to be swing type, Class 125, bronze body, screwed ends, Nibco T-413-Y-LF.

5. Flow balancing valves for domestic hot water service shall be Bell & Gossett lead free Circuit Setter Plus or approved equal. Valve shall provide flow balancing, flow measuring, and positive shutoff service. Provide valve with memory stop, capped differential pressure readout ports with internal check valves and preformed insulation. Valve construction to be bronze body and brass ball rated for 200 psig at 250 degrees F.

2.03 STRAINERS

A. Provide cleanable "Y" type strainers in pump suction lines. Strainers to have iron body with screwed bronze or bolted iron cap. Strainer baskets to be brass. Water strainers to be Monel 20 mesh screen. Strainers to be line size complete with blow-down hose bibbs. When Suction Diffusers are specified for end suction pumps, strainers are not required. Strainers to be as follows:

   1. Solder joint 125# - Nibco S 413-Y-LF.

2.04 HANGERS

A. Insulated copper piping 1/2" O.D. thru 4" O.D., with no longitudinal movement to be Grinnell Figure 260, MSS SP-69 Type 1, adjustable clevis hanger with Figure 167, MSS SP-69 TYPE 40, galvanized steel insulation protection shield sized for maximum 10' span on 4 psi compressive strength insulation.

B. Non-insulated copper tubing 1/2" O.D. thru 4" O.D. with no longitudinal movement to be Grinnell Figure CT-99C, MSS SP-69 TYPE 9, plastic coated adjustable tubing ring hanger.

C. Insulated copper piping 1/2" O.D. thru 2-1/8" O.D. with longitudinal movement to be Grinnell Figure 171, MSS SP-69 TYPE 41, pipe roll complete with Figure 167, MSS SP-69 TYPE 40, galvanized steel insulation protection shield sized for maximum 10' span on 4 psi compressive strength insulation.

D. Support copper pipe risers by Grinnell Figure CT-121C, MSS SP-69 TYPE 8, plastic coated riser clamps at floor penetrations.

E. Support three or more parallel lines by trapeze hangers utilizing Unistrut channel or equal in bottom mounting arrangement with rod hanging support.

F. Adequately size hangers on insulated piping for insulation to pass continuously through hangers. Insulated piping to be supported outside insulation covering.

G. Provide concrete inserts, Grinnell Figure 282, MSS SP-69 TYPE 18, universal concrete insert, for attaching hangers to building structure. Inserts to be adequately sized and correctly positioned to support piping, valves, etc., when full of water and system is in operation.

H. Provide C-clamps with locknut, Grinnell Figure 86, MSS SP-69 TYPE 23, where piping is to be hung from steel beams. Welding hanger rods to steel members is not permitted. Provide malleable beam clamps, Grinnell Figure 218, MSS SP-69 TYPE 30, with extension piece, Grinnell Figure 157, where piping is hung from bar joist.

I. Support all piping by heavy steel, adjustable hangers, or brackets suitably fastened to structural portion of building. Place hangers in accordance with following tables.

COPPER TUBING SUPPORTS	
SIZE (IN.)	DISTANCE BETWEEN SUPPORTS (FT.)
5/8	6
7/8 - 1-1/8	8
1-3/8 - 2-1/8	10
2-5/8 - 5-1/8	12
6-1/8 - 8-1/8	14

J. Perforated metal, strap iron, or band iron hangers are not permitted. Offsets in hangers are not allowed. Pipe risers to be supported at regular intervals in pipe shafts within the limits of good practice.

K. See Insulation Section for requirements at pipe hangers.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install piping not to interfere with opening of doors or other moving parts. Do not install piping near or directly over any portion of electrical equipment.

3.02 FIRE-RATED PARTITIONS

A. Provide permanent firestop system at all piping penetrations of fire-rated walls and floors. Review details on drawing as well as this specification for permissible firestop systems. The firestop system shall have been tested and approved in accordance with ASTM E119 and U.L. 1479 (ASTM E814) and classified for up to 2 hours fire rating. Firestop system shall be type detailed on drawings or intumescent type capable of expanding up to 8 times its original volume. Firestop system to be 3M, Hilti, Nelson, Johns Manville, or Specified Technologies. Firestop system shall be installed in strict accordance with published U.L. approved installation instructions. Piping to pass through the fire-rated partition insulated or non-insulated as specified and detailed. Submit U.L. approved installation drawing for each type of penetration prior to construction.

3.03 NON-RATED PARTITIONS

A. Piping to pass through the walls insulated or non-insulated as specified. Wall should be finished to fit neatly around the piping. Firestopping is not required at non-rated partitions.

3.04 PIPE SLEEVES

A. Pipe sleeves shall be provided at non-rated partitions and floor penetrations. Pipe sleeves to be Schedule 40 or 18 gage steel. Sleeves to extend 1-1/2" in excess of partition depth on each side. Sleeves penetrating floors in wet areas, including all mechanical rooms, shall extend a minimum of 1 inch above the floor.

1. Piping requiring sleeves: Copper pipes thru masonry walls

B. Provide chromium-plated escutcheon plates for exposed uninsulated pipes projecting through floors or walls in finished spaces. Mechanical rooms and janitor closets are not considered "finished" spaces.

C. Hang piping so equipment, flanges, and connections do not bear weight of piping.

D. Adequately support vertical lines at their bases or by a suitable hanger placed in horizontal line near riser or by a base fitting set on pedestal.

E. Pipes not to be hung or supported by pumps. No torque to be applied to pumps by connecting pipes. After final pipe adjustments and initial operation of the pumps, this Contractor to recheck alignment of pumps and realign as required.

F. Run piping in straight lines; riser lines to be plumb with such offsets only as indicated or necessary. No sagging of lines permitted.

G. Unless otherwise shown on drawings, lines to be installed to drain to sumps or sewer.

H. Ream pipe after cutting to full bore. Remove foreign matter from inside of pipe before installing. Keep installed piping free from dirt and scale and protect open ends from foreign matter. Use temporary plugs or other approved methods of open end closure.

I. Threads to be right-hand, pipe standard, clean cut, full depth, and tapered. Joints to be made tight without caulking. Approved pipe joint lubricant to be used, applied in thin layer to the male thread only.

J. Install copper fittings with suitable flux and 95/5 lead free solder. Type K copper pipe to be joined by means of suitable flux and silver or phos-copper.

K. Piping to have sufficient number of flanges or unions for convenient installation and removal of piping and equipment.

L. Remake or replace defective, leaking, or otherwise unsatisfactory joints or material. Peening, caulking, or doping of piping is not permitted.

M. Install piping to prevent stresses and strains to piping and hangers from expansion or contraction. Provision for proper loops, offsets, or expansion joints to be responsibility of Contractor. Make provision for servicing and removal of equipment without dismantling piping.

3.05 PIPING IN TRANSFORMER, ELECTRICAL, AND ELEVATOR EQUIPMENT ROOMS

A. Refer to drawings. No water piping permitted in transformer, electrical, or elevator equipment rooms.

3.06 VALVE ACCESS

A. Locate all shutoff and control valves for easy access and operation. Where valves must necessarily be located in enclosed spaces, they shall be provided with access panels of sufficient size for operation. Furnish these access panels to proper trades for installation.

END OF SECTION 221116

SECTION 22 33 30 - RESIDENTIAL, STORAGE ELECTRIC DOMESTIC WATER HEATERS

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide a factory packaged, electric storage type domestic water heater.

PART 2 PRODUCTS

2.01 EQUIPMENT

A. Unit manufactured by PVI, Hesco, Ruud, State Industries, Lochinvar, A.O. Smith, HTP, or Bradford White. Model number, input capacity, electrical characteristics, accessories scheduled on drawings as basis of design.

B. Storage tank to be carbon steel, glass lined as a minimum.

C. Electrical elements shall be 80 watts per sq. inch density and thermostatically controlled, UL listed and rated.

D. ASME temperature and pressure relief valve.

E. Fiberglass insulation with steel jacket to meet latest ASHRAE Standards.

F. Operating instructions and written warranties.

PART 3 EXECUTION

3.01 INSTALLATION

A. Verify location and clearance requirements.

B. Installation in accordance with manufacturers’ recommendations and project drawings.

END OF SECTION 223330

SECTION 23 01 00 - GENERAL PROVISIONS OF HVAC SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide all labor, materials, tools, and services for a complete installation of equipment and systems contained in contract documents.

B. Principal features of work included are:

1. Heating, ventilating, and air-conditioning system.
2. Control system including line and low voltage control wiring and conduit.
3. Demolition of existing equipment, ductwork, and piping.

1.02 RELATED WORK

A. Electrical power and interlock and control wiring and conduit.

B. Laboratory equipment.

C. Field painting of equipment, ductwork, and piping.

1.03 GENERAL

A. The contract documents form a guide for a complete system. Provide all items necessary to provide a complete system but not specifically mentioned, such as hangers, transitions, offsets, and drains.

B. Layouts indicated on drawings are diagrammatical only. Coordinate exact location of equipment, ductwork, and piping to eliminate conflict with other divisions. Designer reserves right to make reasonable changes in location of equipment, ductwork, and piping prior to construction. Coordination drawings shall be submitted prior to any equipment/systems being installed to ensure that installation conflicts between trades are minimized.

C. Should Contractor find during progress of work that in his judgment existing conditions make desirable a modification, report such item promptly to Designer for instructions. Do not make deviations from contract documents without review of Designer.

D. Supervise all work with a competent mechanic specifically qualified in mechanical discipline.

1.04 PERMITS

A. Secure and pay for permits, licenses, and inspections for work under this division.

1.05 CODES

A. Comply with all pertinent local, state, and national codes. Refer to Division 01.

1.06 STANDARDS

A. Comply with all pertinent standards. This list is provided as a convenience to Contractor and is not to be considered all inclusive.

1. Sheet Metal and Air-Conditioning Contractors National Association (SMACNA).
2. American Gas Association (AGA).
3. Air Moving and Conditioning Association (AMCA).
4. Air-Conditioning, Heating and Refrigeration Institute (AHRI).
5. American Society of Mechanical Engineers (ASME).

1.07 SUBMITTALS

A. Submit for review complete brochures and shop drawings for materials and equipment proposed in accordance with Division 01.

1. Brochures: Submit complete descriptions, illustrations and specification data for materials and equipment proposed. Clearly indicate proposed items when other items are shown on same sheet. Submit samples on request and/or set up for inspection. Samples will be returned to Contractor.

2. Submittals shall be submitted in line by line format. Each submittal shall be provided with a cover letter and supporting documentation indicating how the submittal meets each line of the referenced specification section. All discrepancies between the construction documents and the submitted product shall be clearly identified for engineer evaluation.

3. If a product other than the basis of design is rejected by the engineer for any reason, the Contractor shall provide the basis of design product at no additional cost to the Owner.

4. Shop Drawings:

a. Control systems.
b. Complete equipment, ductwork, and piping systems in equipment rooms.
c. Complete equipment, ductwork, and piping systems in entire building.
d. Owner furnished equipment rough-in layouts.
e. Firestop systems.

1.08 PROJECT MAINTENANCE MANUALS

A. Prior to final acceptance of project, provide Owner with bound maintenance manuals in accordance with Division 01.

1.09 PROJECT TECHNICAL INSTRUCTION

A. Prior to final inspection of project, provide technical instruction to Owner as follows:

1. Field Instruction: Provide explanation of how systems and equipment are to operate during each season and during emergencies.

2. Field Demonstration: Demonstrate operation and routine maintenance for systems and equipment.

3. Video: Provide digital video of all field instruction and demonstration to Owner at completion.

1.10 PROTECTION

A. Protect all materials and equipment in accordance with Division 01.

B. The contractor must take appropriate precautions, during construction, to prevent unnecessary dust and debris from getting into air and water handling systems by covering equipment, controls and open-ended ducts and pipes as the installation progresses.

1.11 CONSTRUCTION RECORD DOCUMENT

A. Provide construction record documents in accordance with Division 01. Keep at the project one set of drawings and daily record changes at the time they are made. Give drawings to Owner at project completion.

1.12 EXISTING SERVICES

A. Maintain existing services in operation during construction. Coordinate and schedule all service interruptions with Owner.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Provide materials and equipment of domestic manufacture bearing the U.L. label when such label is available.

PART 3 EXECUTION

3.01 COORDINATION

A. Coordinate work in accordance with Division 01. Coordinate locations of equipment, ductwork, and piping to eliminate conflict with other divisions.

B. Carefully examine contract documents to be thoroughly familiar with items which require plumbing or mechanical connections and coordination.

C. Provide proper chases and openings. Place sleeves and supports prior to pouring concrete or installation of masonry.

3.02 CUTTING AND PATCHING

A. Repair or replace routine damage caused by cutting in performance of contract.

B. Correct unnecessary damage caused due to installation of mechanical work.

C. Perform repairs with materials that match existing in accordance with the appropriate section of these specifications.

3.03 FLASHING, COUNTERFLASHING, AND SEALING

A. Flash, counterflash, and seal ductwork and piping at penetrations of roofs and outside walls.

3.04 CONNECTION TO EQUIPMENT

A. Rough-in and connect to sterilizers, lab equipment, and Owner furnished equipment and provide a shutoff valve and union at each connection. Provide steam strainer and steam trap for steam equipment. Operating valves and/or controls for this equipment will be provided as an integral part of the equipment. Do not rough-in until shop drawings showing rough-in locations have been reviewed by Designer.

3.05 FOUNDATIONS AND PADS

A. Provide foundations, pads, and bases required for equipment. Concrete to be in accordance with concrete division of specifications.

B. Coordinate proper sizes and locations of foundations, pads, bases, anchors, supports, and other items to be built into structure.

3.06 IDENTIFICATION

A. Identify exposed or accessible piping with stenciling contents indicating pipe contents and direction of flow on piping not more than 20 feet apart, at valves, at access panels, and at least once above each space.

B. Contractors option to identify exposed or accessible piping with snap-on or strap-on type markers. Color code markers in accordance with ANSI. Indicate pipe contents and direction of flow on marker. Install markers on piping not more than 20 feet apart, at valves, at access panels, and at least once above each space.

C. Identify all mechanical equipment with engraved brass, aluminum, or stainless steel nameplates or tags. Use equipment names and numbers appearing in schedules on drawings. Fasten nameplates to equipment using screws. Glue or adhesive is not acceptable. Fasten tags to equipment using brass, aluminum or stainless steel chains.

D. Frame and mount control diagrams and sequences in each equipment room. Use non-fading black and white prints encased in aluminum frame with plexiglass cover.

3.07 CLEANING

A. Thoroughly clean ductwork and equipment casings before fans and filters are operated.

B. Repair damaged factory finishes covering all bare places and scratches.

3.08 TESTING

A. Test all installed equipment and systems and demonstrate proper operation. Correct and retest work found defective when tested.

B. Thoroughly check piping system for leaks. Do not add any leak-stop compounds to the system. Make repairs to piping system with new materials. Peening, doping, or caulking of joints or holes is not acceptable.

C. Conduct air or smoke test if in opinion of Designer reasonable cause exists to suspect leakage or low quality workmanship.

D. Test compressed air piping with Nitrogen at 100 psi for two hours without leaks.

E. Test HVAC systems water piping and steam supply and steam condensate return piping at a water pressure of 125 psig for two hours without leaks.

F. Vibration Tests:

1. Test vibration isolation system in accordance with methods and procedures described in the Testing, Adjusting, and Balancing Chapter in the latest edition of ASHRAE Applications Handbook.

2. Verify all vibration isolation systems are free floating and not short circuited by any connection between equipment and building structure.

3. Operate mechanical systems and verify visually and audibly that there is no excessive vibration or noise generated by the system.

END OF SECTION 230100

SECTION 23 05 49 - BASIC MATERIALS AND METHODS FOR HVAC

PART 1 GENERAL

1.01 WORK INCLUDED

A. Work required under this section of the specifications consists of basic materials and methods applicable to work under Division 23.

PART 2 PRODUCTS

2.01 VIBRATION ISOLATION

A. Isolate equipment as shown on drawings and as specified herein with factory-fabricated vibration isolators in accordance with recommendations in the latest edition of ASHRAE Applications Handbook. Isolators shall be manufactured by Kinetics, Mason Industries, or approved substitute. Provide isolators by a single manufacturer. Provide isolators of proper sizes and weight loading to meet the requirements. Provide isolators as follows:

1. Floor-mounted fiberglass or neoprene rubber pads, Kinetics Model KIP.
2. Spring and rubber hangers, Kinetics Model SFH or SRH.

2.02 V-BELT DRIVES

A. Provide all fan drives with V-belts rated for 150% of nameplate motor horsepower. Provide adjustable pitch motor sheaves for motor sizes through 20 hp. For motor sizes 25 hp and larger provide fixed pitch motor sheaves after balancing to within plus 5% of design air quantity. Select motor sheaves so centerline does not extend past end of motor shaft and such that motor bearing grease fitting and relief port is not obstructed.

B. Provide belt guards for all belt driven equipment. Provide expanded metal cover with access to driven shaft for tachometer.

2.03 FOUNDATIONS AND PADS

A. Provide foundations, pads, and bases required for equipment. Concrete to be in accordance with concrete division of specifications.

B. Coordinate proper sizes and locations of foundations, pads, bases, louvers, anchors, supports, and other items to be built into structure.

2.04 FASTENINGS TO STRUCTURES

A. Provide structural fastening devices for equipment, materials, piping and ductwork. Devices to be concrete inserts, expansion shields and lag bolts, and through bolts-washers-nuts. All bolted devices to use jamb nuts. Inserts to be continuous type as manufactured by Unistrut or approved substitute. Install per manufacturer's published installation instructions in lengths to suit specific application, complete with spring nuts, end caps, and plastic coated filler to prevent concrete seepage.

B. Use of power drive "shot-pins" is permitted only for ducts 20" in width and smaller and single pipes 1" and smaller.

2.05 ACCESS PANELS

A. Provide ceiling and wall access panels for installation by other Divisions. Coordinate locations so panels will provide proper access to equipment served. Notify Designer of proposed wall or ceiling access panel locations prior to installation of such panels. Minimum size: 24" x 24".

B. Panels shall be manufactured by Bilco or approved substitute. Provide panels with minimum 16 gauge steel construction with screwdriver operated locks and primer finish.

C. Provide fire-rated panels for installation in fire-rated partitions.

PART 3 EXECUTION - NOT APPLICABLE

END OF SECTION 230549

SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Perform test and balance work by a Test and Balance Agency which is engaged solely in full time test and balance work, is a member of the Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB) and is selected and employed by the contractor.

B. Perform test and balance in accordance with AABC or NEBB Standards.

C. Contract to the Test and Balance Agency shall be issued by the contractor. Coordination with the agency at the job site shall be the responsibility of the contractor in order to ensure proper scheduling and operation of the systems. All correspondence (reports, letters and communications) between any parties shall have copies sent directly to the designer and contractor.

D. The TAB agency shall review construction plans and specifications. If any discrepancies are noted which would hinder balancing, notify the designer with copy to the contractor. Make inspections of the job during construction for proper installation of the system(s) and of balancing aids in the system(s). Any discrepancies noted shall be brought to the attention of the contractor and designer. The number of inspections vary with the size and complexity of the job and shall be adequate for the purpose intended. Report ALL job visits in writing - MANDATORY.

1.02 RESPONSIBILITIES OF PROJECT CONTRACTOR

A. The contractor shall:

1. Provide approved Test and Balance Agency with copy of plans and specifications upon issue of construction documents.

2. Have the building and HVAC systems in operational readiness for TAB work to begin.

3. Correct prompt deficiencies of materials and workmanship identified as delaying completion of TAB work.

4. Be responsible for any added costs to the owner resulting from his failure to have the building and HVAC systems ready or from his failure to correct deficiencies promptly.

B. Complete operational readiness of the building requires that construction status of the building shall permit closing of doors, windows, ceilings installed, etc., to obtain projected operating conditions.

C. Complete operational readiness of the air conditioning systems requires that the following be accomplished:

1. Air Distribution Systems:

a. Verify installation conforms to design. All supply, return and exhaust ducts terminated and pressure tested for leakage as required by specifications.

b. All volume, control, fire and smoke dampers properly located and functional. All dampers shall be fully open. MVD gradients and spin damper handles should be exposed through insulation. Dampers serving requirements of minimum and maximum outside, return and relief air shall provide tight closure and full opening, smooth and free operation.

c. All supply, return, exhaust and transfer grilles, registers, diffusers, terminal boxes and filters installed.

d. Air handling systems, units and associated apparatus, such as heating and cooling coils, filter sections, access doors, etc., shall be sealed to eliminate bypass or leakage of air.

e. All fans operating at full load and verified for freedom from vibration, proper fan rotation and belt tension; heater elements in motor starters to be of proper size and rating. Check motor amperage and verify that it is under nameplate rating.

2. Water Circulating Systems:

a. Check and verify pump alignment and rotation. Verify location of thermometers, gages, and PT test plugs.

b. Open all valves to full open position. Close bypass stop valves. Set mixing valves to full flow through system components. Remove and clean all strainers. Verify specified pipe cleaning has taken place. Repeat operation until circulating water is clean.

c. Record pump motor amperage on each phase and voltage after reaching rated speed. Readings shall not exceed nameplate rating. Verify heater elements in motor starters to be of proper size and rating.

d. All water circulating systems shall be full and free of air; expansion tanks set for proper water level; all air vents installed at high points of systems and operating freely. System static pressure to be set minimum 5 psig above highest system elevation.

e. Check and set operating temperatures of heat exchangers to design requirements.

f. Verify that piping to coils is complete and set for counter flow. Verify location of thermometers, gauges, PT test plugs, and flow balancing/measuring valves.

3. Automatic Controls:

a. Verify that all control components are installed and functional in accordance with project requirements, including all electrical interlocks, damper sequences, temperature resets, and safeties.

b. Verify that pressure controllers are calibrated and control variable speed motor controllers as required to maintain a stable pressure.

c. All controlling instruments calibrated and set for designed operating conditions.

4. Notification of System Readiness: After completion of the work above, the contractor shall notify the TAB firm and designer certifying that the work has been accomplished and that the building and HVAC systems are in readiness for testing, adjusting, and balancing.

D. As part of this project contract, the contractor shall make any changes in the sheaves, belts and dampers required for correct balance as required by the TAB firm.

E. The contractor shall provide and coordinate services of qualified, responsible contractors, suppliers and personnel as required to correct, repair, or replace any and all deficient items or conditions found during the testing, adjusting and balancing period.

F. In order that all systems may be properly tested, balanced, and adjusted, the contractor shall operate systems at his expense for the length of time necessary to properly verify their completion and readiness for TAB.

G. Project schedules shall provide sufficient time to permit the completion of TAB services prior to owner occupancy.

H. The plans and specifications have indicated valves, dampers and miscellaneous adjustment devices for the purpose of adjustment to obtain optimum operating conditions, and it will be the responsibility of the contractor to install these devices in a manner that will leave them accessible and readily adjustable. Should any such device not be readily accessible, the contractor shall provide access as requested by the TAB firm. Also, any malfunction encountered by TAB personnel shall be reported to the contractor and designer and corrected by the contractor immediately so the balancing work can proceed.

1.03 QUALIFICATIONS OF THE TAB CONTRACTOR

A. The firm shall submit six (6) completed projects of like size and scope. Provide references for each project.

B. The test and balance firm shall submit a resume for the individual proposed to directly supervise the project. The supervisory personnel for the test and balance firm shall be certified test and balance engineers. All project managers and technicians shall be permanent, full-time employees of the agency.

C. The test and balance firm shall submit a list of its calibrated instrumentation to perform the work.

1.04 DOCUMENTS

A. The contractor shall furnish to the TAB firm electronic copied (PDF) of the following:

1. Mechanical specifications.
2. Mechanical drawings.
3. All pertinent addenda and change orders.
4. Control submittal drawings.
5. Approved submittal data on equipment installed, and related changes as required to accomplish the TAB test procedures outlined below.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION

3.01 RESPONSIBILITIES OF THE TAB FIRM

A. The TAB personnel shall check, adjust, and balance the components of the HVAC system which will result in minimum noise, specified temperature, and air flow conditions in the conditioned spaces of the building while the equipment of the system is operating economically. This is intended to be accomplished after the system components are installed and operating as provided for in the contract documents.

3.02 LIAISON AND EARLY INSPECTION

A. The personnel on the job shall act as liaison between the owner, designer and contractor. They shall inspect the installation of piping systems, ductwork systems, control systems, and other component parts of the HVAC systems during the construction stage to verify proper arrangement and adequate provisions for the testing and balancing.

B. During the balancing process, as abnormalities and malfunctions of equipment or components are discovered by the TAB personnel, the contractor shall be advised in writing so that the condition can be corrected by the contractor. The TAB firm shall suggest solutions to noted problems. Data from malfunctioning equipment shall not be recorded in the final TAB report.

3.03 THE TAB REPORT

A. TAB activities shall culminate in a report to be provided in an electronic copy (PDF) to the designer. The intent of the final report is to provide a reference of actual operating conditions for the owner's operating personnel.

B. All measurements and recorded readings (of air, water, electricity, sound, etc.) that appear in the reports must be done on-site by permanently employed technicians or engineers of the firm.

C. All comment sheets (punch lists) shall be signed by the contractor to acknowledge receipt. Any outstanding items at the time of completion shall be included in the report.

D. The report shall be certified and approved by the firm's test and balance engineer. The report shall be recorded on standard forms.

3.04 ACTUAL TESTING AND BALANCING PROCEDURES

A. Airside:

1. Supply Air:

a. Fans checked for rotation, amperage, static pressure, etc.

b. Terminal boxes set to maximum and minimum cfm and supply outlets balanced to within 5% of design cfm.

c. Main supply duct pitot tube traverse and adjustment of fan speed to produce design cfm while maintaining minimum system static pressure for proper terminal box operation.

2. Return Air:

a. Fans checked for rotation, amperage, static pressure, etc.

b. With supply system in the maximum mode, traverse and adjust return fan to design cfm.

c. With supply system in the maximum mode, proportion return inlets to within 5% of design cfm.

3. Outside Air:

a. Fans checked for rotation, amperage, static pressure, etc.

b. With supply system in the maximum mode, traverse and adjust minimum outside air damper and/or fan to design cfm.

4. Exhaust Air:

a. Fans checked for rotation, amperage, static pressure, etc.

b. With supply system in the maximum mode, traverse and adjust exhaust fan to design cfm.

c. Proportion exhaust inlets to within 5% of design cfm.

5. Diffusers, Registers, and Grilles:

a. Balance each supply, return and exhaust air outlet within 5% of design cfm.

b. Check and/or adjust pressure relationships so that each positive pressure and each negative pressure area is at least 10% positive or negative as appropriate.

6. After completion, take total air-handling system static profile and record all final statics, amperages, rpm, cfm, etc.

B. Waterside:

1. Domestic Hot Water Recirculation System:

a. Balance recirculation pumps ±5% of design gpm flow.

b. Set balancing valves to gpm settings as noted on plumbing drawings.

C. Controls:

1. AHU Controls:

a. Check temperature controls for proper calibration and setpoint.

b. Check economizer controls for proper damper operation and control calibration.

c. Check static pressure control under maximum and minimum conditions for proper operation.

2. Thermostats and Controllers:

a. Check for proper control of valves, dampers, terminal boxes, exhaust fans, etc.

b. Set at design set point.

D. Capacity and Performance Test:

1. Terminal Box Heating Coils: Test, set and record flow through terminal box heating coil.

2. Thermostat Calibration:

a. Measure and record dry and wet bulb temperatures at each thermostat.

b. Report any thermostat which is not controlling with +/-1-1/2 degree F.

3. Control Temperature Readouts:

a. Test actual temperature next to sensor (if possible) and compare to readout.

b. Report any sensor which is not within +/-1/1-2 degrees F.

3.05 REPORTS

A. Problems Encountered: Any items not installed, improperly installed or not functioning properly shall be reported to the contractor.

B. Final Report:

1. Any unresolved problems shall be reported in a general remarks section in front of the test and balance report.

2. Any unusual operations or pertinent remarks which may aid the maintenance personnel or ease the reading of the report shall be made in the general remarks section of the report.

3. All operating data and final tests shall be reported in the final report. This data shall include, but not necessarily be limited to the scope of work outlined above.

4. TAB contractor shall compile an Excel spreadsheet for all terminal boxes, listing each box by its unique identification number, the inlet flow area established by the box manufacturer, the manufacturer’s gain factor for the box, final TAB calibrated gain factor for the box if field calibrated, and the ratio of the calibrated gain factor to the manufacturer’s gain factor.

3.06 CALLBACK

A. Test and Balance Agency shall retest any unresolved problems noted in the final report. The revised results shall be forwarded after completion of test.

B. At the discretion of the designer before final acceptance of the TAB report, the report data shall be verified one time on the job site by selection of random check points in the presence of the designer. Representatives of the testing firm shall be present and provide the necessary equipment for test data verifications.

C. The firm shall be responsible for testing, adjusting, balancing, and reporting on the performance of all fans, dampers, air distribution devices, pumps and heat exchangers, the flow through all coils, pumps and heat exchangers, and the power consumption of all motors. The contractors and the suppliers of the equipment installed shall cooperate with the balancing agency to provide all necessary data on the design and proper application of the system components and shall furnish all labor and material required to eliminate any deficiency.

D. Make one (1) inspection within ninety (90) days after occupancy of the building to insure that satisfactory conditions are being maintained.

3.07 OPPOSED SEASON TESTING

A. This service allows for testing of equipment that, due to extreme weather conditions, cannot be accurately tested at the time of the initial balance. If a project is balanced during the summer, the opposed season testing is performed during the winter months and vice-versa.

B. During the opposed season testing, any necessary modifications to the initial adjustment required to produce optimum operation of the system components shall be made to produce the proper seasonal conditions in each conditioned space. At the time of opposite season testing, the designer and owner shall be given timely notification before any readings or adjustments are made so that he may participate.

END OF SECTION 230593

SECTION 23 09 23 - DIRECT DIGITAL CONTROL/BUILDING AUTOMATION SYSTEM (DDC/BAS)

PART 1 - GENERAL

1.01 DESCRIPTION

A. The work specified under this section of the specifications includes furnishing, installing, programming, and placing into operation the DDC/BAS systems. Systems shall be furnished, installed, and warranted by the manufacturer. Niagara Framework Supervisory Gateway for the building level is the "Java Application Control Engine", or JACE. Each JACE 9000 will be at the building level and will be utilized for the building level control (trending, alarming, scheduling, and reporting to the supervisory Niagara Utility Monitoring and control system front-end. All programs shall be turned over to the owner on a CD or USB flash drive.

B. Furnish (2) licenses enabling JACE 9000 with the necessary Niagara network connections for installation on laptop computers provided by owner. Include licenses to allow access to Niagara N4 devices. Include license enabling 5 additional years of software maintenance. For future expansion capabilities, licenses shall include capacity for 20% additional Niagara & BACnet connections.

C. The Contractor shall provide Niagara N4 compatible DDC controllers and HVAC equipment manufacturer provided BACnet communication devices.

D. Any device implementing the Niagara Framework is a Niagara Framework Supervisory Gateway and must meet these requirements. In addition to the general requirements for all DDC Hardware, Niagara Framework Supervisory Gateway Hardware must:

1. Have an unrestricted interoperability license and its Niagara Compatibility Statement (NiCS) must follow the Tridium Open NiCS Specification.
2. Manage communications between a field control network and the Niagara Framework Monitoring and Control Software, and between itself and other Niagara Framework Supervisory Gateways. Niagara Framework Supervisory Gateway Hardware must use Fox protocol for communication with other Niagara Framework Components, regardless of the manufacturer of the other components.
3. Be fully programmable using the Niagara Framework Engineering Tool.
4. Meet the following minimum hardware requirements:
    a. Unless otherwise specified, have one 1000 Mbps Ethernet Port & MS/TP port
    b. Central processing unit of 600 MHz or higher
    c. Embedded operating system

E. The DDC/BAS systems shall be furnished and installed under this section of the specifications and shall consist of microprocessor based digital system controllers. The systems shall have the ability for extension to other buildings by Ethernet or contractor provided fiber optic cabling. The systems shall have the ability for extension to other buildings by web addressable server. The systems shall be complete in every respect, including all auxiliary and accessory items as required, and shall be thoroughly coordinated so as to provide a compatible and completely workable system.

F. Provide a complete control system including electrical interlocks, wiring, conduit, relays, switches, control transformers, and other devices as required to accomplish automatic control of the mechanical systems. Refer to drawings for details.

G. All systems shall be guaranteed against defects of any nature and to operate properly for a period of not less than 12 months after final acceptance of the job by the Owner. During this period, the BAS manufacturer shall service and adjust the systems as required for proper operation, replacing components as required.

H. Submit complete shop drawings, equipment and component brochures, list of control valve CV and pressure drops, list of control dampers, written sequences of operations, diagrams indicating panels, gauges, components, spring ranges, and setpoints, and complete composite wiring diagrams indicating all equipment interlocks for entire control system.

PART 2 - PRODUCTS

2.01 GENERAL PRODUCT DESCRIPTION

A. The building automation system shall consist of the following:

1. Stand-alone DDC panels.
2. Stand-alone application specific controllers (ASCs).
3. Personal Computer operator workstation.
4. Web addressable server

B. The system shall be modular in nature and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, stand-alone DDC panels, and operator devices.

C. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution. Each DDC panel shall operate independently by performing its own specified control, alarm management, operator I/O, and historical data collection. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.

D. Stand-alone DDC panels shall be able to access any data from or send control commands and alarm reports directly to any other DDC panel or combination of panels on the network without dependence upon a central processing device. Stand-alone DDC panels shall also be able to send alarm reports to multiple operator workstations without dependence upon a central processing device.

2.02 NETWORKING/COMMUNICATIONS

A. The design of the BAS shall network operator workstations and stand-alone DDC panels.

B. Local Area Network:

1. Workstation/DDC Panel Support: Operator workstations and DDC panels shall directly reside on a local area network such that communications may be executed directly between controllers, directly between workstations, and between controllers and workstations on a peer-to-peer basis.
2. Dynamic Data Access: All operator devices shall have the ability to access all point status and application report data or execute control functions for any and all other devices via the local area network.
3. General Network Design: Network design shall include the following provisions:

a. High speed data transfer rates. The minimum transfer rate shall be 100 Mb (Mb/s).

b. Commonly available, multiple source, networking components and protocols shall be used to allow the BAS to coexist with other networking applications. MAP, ETHERNET, IBM Token Ring and ARCNET are acceptable technologies.

c. Use of an industry standard IEEE protocol.

d. Synchronization of the realtime clocks in all DDC panels shall be provided.

e. Permit at least four simultaneous users to access the system over the LAN, based on password level. Users shall have access to monitor parameters, change set points, set up trends, or start/stop controlled equipment. A remote user shall have this capability without having the system data base loaded on his/her remote computer.

f. Paging/Email feature shall be provided with capability to telephone/email selected facility maintenance personnel to notify them of critical BAS alarms.

g. Dial-Up Communications: The system shall allow interface into network through the use of auto-answer/auto-dial modems over telephone link as a secondary means of communication.

4. Dedicated BAS LAN: The BAS contractor shall design and install a LAN per the General Network Design requirements in 2.2 3. Provide one year cell modem\router service for remote monitoring and warranty support. Access for Owner & Engineer shall be provided.

2.03 STAND-ALONE DDC PANELS

A. General: Stand-alone DDC panels shall be microprocessor based, multi-tasking, multi-user, real-time digital control processors. Each stand-alone DDC panel shall consist of modular hardware with plug-in enclosed processors, communication controllers, power supplies, and input/output modules.

B. Memory: Each DDC panel shall have sufficient memory to support its own operating system and databases.

C. Point Types: Each DDC panel shall support the following types of point inputs and outputs:

1. Digital Inputs for status/alarm contacts
2. Digital Outputs for on/off equipment control
3. Analog Inputs for temperature, pressure, humidity, flow, and position measurements
4. Analog Outputs for valve and damper position control, and capacity control of primary equipment
5. Pulse Inputs for pulsed contact monitoring

D. Expandability: The system shall be modular in nature, and shall permit easy expansion through the addition of software applications, workstation hardware, field controllers, sensors, and actuators.

E. Serial Communication Ports: Stand-alone DDC panels shall provide at least two RS-232C serial data communication ports for simultaneous operation of multiple operator I/O devices such as industry standard printers, laptop workstations, PC workstations, and panel mounted or portable DDC panel operator's terminals. Stand-alone DDC panels shall allow temporary use of portable devices without interrupting the normal operation of permanently connected modems, printers, or network terminals.

F. Hardware Override Switches: The operator shall have the ability to manually override automatic or centrally executed commands at the DDC panel via local, point discrete, on-board hand/off/auto operator override switches for binary control points and gradual switches for analog control type points. These override switches shall be operable whether the panel is powered or not.

G. Hardware Override Monitoring: DDC panels shall monitor the status or position of all overrides and inform the operator that automatic control has been inhibited.

H. Local Status Indicator Lamps: The DDC panel shall provide local status indication for each binary input and output for constant, up-to-date verification of all point conditions without the need for an operator I/O device.

I. Integrated On-Line Diagnostics: Each DDC panel shall continuously perform self-diagnostics, communication diagnosis and diagnosis of all subsidiary equipment.

J. Surge and Transient Protection: Isolation shall be provided at all network terminations, as well as all field point terminations to suppress induced voltage transients consistent with IEEE Standard 587-1980. Isolation levels shall be sufficiently high as to allow all signal wiring to be run in the same conduit as high voltage wiring where acceptable by electrical code.

K. Powerfail Restart: In the event of the loss of normal power, there shall be an orderly shutdown of all stand-alone DDC panels to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data, and battery back-up shall be provided to support the real-time clock and all volatile memory for a minimum of 72 hours. Upon restoration of normal power, the DDC panel shall automatically resume full operation without manual intervention.

L. Provide a battery backup (UPS) system to support DDC panel functions for a minimum of 15 minutes upon loss of power. The UPS system shall be provided regardless of connection to facility emergency power system.

2.04 SYSTEM SOFTWARE FEATURES

A. General:

1. The Niagara Framework Engineering Tool must be Niagara Workbench or an Equivalent Niagara Framework engineering tool software and must:

a. Have an unrestricted interoperability license and its Niagara Compatibility Statement (NiCS) must follow the Tridium Open NiCS Specification.

b. Be capable of performing network configuration for Niagara Framework Supervisory Gateways and Niagara Framework Monitoring and Control Software.

c. Be capable of programming and configuring of Niagara Framework Supervisory Gateways and Niagara Framework Monitoring and Control Software.

d. Be capable of discovery of Niagara Framework Supervisory Gateways and all points mapped into each Niagara Framework Supervisory Gateway and making these points accessible to Niagara Framework Monitoring and Control Software.

e. Provide configuration of integrated field control system using the Niagara Framework Engineering Tool when supported by the field control system.

f. Provide time synchronization using Niagara scheduling objects.

g. Provide access to field control network data and supervisory functions via web interface and support a minimum of 4 simultaneous users.

2. All necessary software to form a complete operating system as described in this specification and on drawings shall be provided and compatible with the Niagara framework.

3. The software programs shall be provided as an integral part of the DDC panel and shall not be dependent upon any higher-level computer for execution.

B. Control Software Description:

1. Pre-Tested Control Algorithms:

a. Two Position Control

b. Proportional Control

c. Proportional plus Integral Control

d. Proportional, Integral, plus Derivative Control

e. Automatic Control Loop Tuning

2. Equipment Cycling Protection.
3. Heavy Equipment Time Delays.
4. Powerfail Motor Restart.

C. Energy Management Applications: DDC panel shall have the ability to perform any or all of the following energy management routines using Niagara Objects and\or Niagara Services:

1. Time of Day Scheduling
2. Calendar Based Scheduling
3. Holiday Scheduling
4. Temporary Schedule Overrides
5. Optimal Start/Stop
6. Night Setback/Setup Control
7. Economizer
8. Peak Demand Limiting
9. Temperature Reset

D. Custom Process Programming Capability: Using the Niagara Framework Engineering Tool, DDC panels shall be able to execute custom, job-specific processes defined by the user, to automatically perform calculations and special control routines.

E. Alarm Management: Using the Niagara Alarm Service, alarm management shall be provided to monitor, buffer, and direct alarm reports to operator devices and memory files. Each DDC panel shall perform distributed, independent alarm analysis and filtering to minimize operator interruptions due to noncritical alarms, minimize network traffic, and prevent alarms from being lost. At no time shall the DDC panel's ability to report alarms be affected by either operator activity at a PC workstation or local I/O device, or communications with other panels on the network.

F. Historical Data and Trend Analysis: Using the Niagara History Service and Niagara Trend Log Objects, provide a variety of historical data collection utilities to automatically sample, store, and display system data in all of the following ways:

1. Continuous Point Histories.
2. Control Loop Performance Trends.
3. Extended Sample Period Trends.
4. Data Storage and Archiving.

G. Runtime Totalization: Stand-alone DDC panels shall automatically accumulate and store runtime hours for binary input and output points using Niagara Objects and\or Niagara Services.

H. Analog/Pulse Totalization: Stand-alone DDC panels shall automatically sample, calculate and store consumption totals on a daily, weekly, or monthly basis for user-selected analog and binary pulse input-type points.

I. Event Totalization: Stand-alone DDC panels shall have the ability to count events such as the number of times a pump or fan system is cycled on and off.

2.05 APPLICATION SPECIFIC CONTROLLERS - HVAC APPLICATIONS

A. Each stand-alone DDC controller shall be able to extend its performance and capacity through the use of remote Application Specific Controllers (ASCs).

B. Each ASC shall operate as a stand-alone controller capable of performing its specified control responsibilities independently of other controllers in the network. Each ASC shall be a microprocessor-based, multi-tasking, real-time digital control processor.

C. Each ASC shall have sufficient memory to support its own operating system and data bases.

D. The operator interface to any ASC point data or programs shall be through any network-resident PC workstation or portable operator's terminal connected to any DDC panel in the network.

E. Application specific controllers shall directly support the temporary use of a portable service terminal.

F. Powerfail Protection: All system setpoints, proportional bands, control algorithms, and any other programmable parameters shall be stored such that a power failure of any duration does not necessitate reprogramming the controller.

G. Battery Backup (UPS): UPS shall be provided to support ASC functions for a minimum of 15 minutes upon loss of power. The UPS system shall be provided regardless of connection to facility emergency power system.

H. The modes of operation supported by each ASC shall minimally include, but not be limited to, the following:

1. Daily/Weekly Schedules
2. Occupancy Mode
3. Economy Mode
4. Temporary override Mode

I. Continuous Zone Temperature Histories: Each ASC shall automatically and continuously maintain a history of the associated zone temperature to allow users to quickly analyze space comfort and equipment performance for the past 24 hours. A minimum of two samples per hour shall be stored.

J. Alarm Management: Each ASC shall perform its own limit and status monitoring and analysis to maximize network performance by reducing unnecessary communications.

K. Application Descriptions:

1. Unitary Controllers:

a. Unitary controllers shall support, but not be limited to, the following types of systems to address specific applications indicated on the drawings:

1) Heat Pumps (Air-to-Air, Water-to-Air)

2) Packaged Rooftops

3) Fan Coils (Two-Pipe, Four-Pipe)

b. Unitary controllers shall support the following types of point inputs and outputs:

1) Economizer Switchover Inputs

2) Drybulb

3) Outdoor Air Enthalpy

4) Differential Temperature

5) Differential Enthalpy

6) Binary Input from a separate controller

7) Economizer Outputs

8) Integrated Analog with minimum position
9) Binary output to enable self-contained economizer actuator
10) Heating and Cooling Outputs
11) 1 to 3 Stages
12) Analog Output with two-pipe logic
13) Reversing valve logic for Heat Pumps
14) Fan Output
15) On/Off Logic Control

2. AHU Controllers:
   a. AHU controllers shall support all the necessary point inputs and outputs to perform the specified control sequences in a totally stand-alone fashion.
   b. AHU controllers shall have a library of control routines and program logic to perform the sequence of operation.

2.06 OPERATOR INTERFACE

A. Command Entry/Menu Selection Process: Operator workstation interface software shall minimize operator training through the use of English language prompting, English language point identification, and industry standard PC application software.

B. Graphical and Text-Based Displays: At the option of the user, operator workstations shall provide consistent graphical or text-based displays of all system point and application data described in this specification. Point identification, engineering units, status indication, and application naming conventions shall be the same at all workstations.

C. Password Protection: Multiple-level password access protection shall be provided to allow the user/manager to limit workstation control, display and data base manipulation capabilities as he deems appropriate for each user, based upon an assigned password.

D. Operator Commands: The operator interface shall allow the operator to perform commands including, but not limited to, the following:

1. Start-up or shutdown selected equipment.
2. Adjust setpoints.
3. Add/Modify/Delete time programming.
4. Enable/Disable process execution.
5. Lock/Unlock alarm reporting for each point.
6. Enable/Disable Totalization for each point.
7. Enable/Disable Trending for each point.
8. Override PID Loop setpoints.
9. Enter temporary override schedules.
10. Define Holiday Schedules.
11. Change time/date.
12. Enter/Modify analog alarm limits.
13. Enter/Modify analog warning limits.
14. View limits.
15. Enable/Disable Demand Limiting for each meter.
16. Enable/Disable Duty Cycle for each load.

E. Logs and Summaries: Reports shall be generated automatically or manually, and directed to either CRT displays, printers, or disk files. Summaries shall be provided for specific points, for a logical point group, for a user-selected group of groups, or for the entire facility without restriction due to the hardware configuration of the building automation system. Under no conditions shall the operator need to specify the address of hardware controller to obtain system information.

2.07 PERSONAL COMPUTER OPERATOR WORKSTATION

A. General: Provide an operator's workstation to access the BAS network.

B. Provide PC Compatible computer system, Dell Inc. or approved equal with the following features:

1. 3.2 GHz Intel Xeon CPU E5-2640 x64 (or better) compatible with dual- and quad-core processors, or equivalent processor.
2. 12 GB RAM memory minimum.
3. 500 GB hard drive.
4. Four USB ports built-in.
5. 48X CDRW/DVD combo drive.
6. 30" LCD color monitor
7. USB Optical mouse.

C. Provide Niagara 4 Supervisor software and ensure operator workstation has all necessary components required to operate the Supervisor software.

D. Network Connection: Graphical workstations shall allow for access to the BAS network through a pull-down menu approach using only a mouse. The keyboard shall be required only when entering text or for programming functions. The workstation shall be used as an interface to the BAS network and shall not be required to process any control or energy management algorithms nor manage any BAS network communications.

E. Multiple user security levels shall be provided to allow for various degrees of system access and control. The system shall automatically generate a report of log-on/log-off time and system activity for each user. Provide automatic log-off capability to prevent unauthorized system use.

F. The workstation shall be provided with a key element display that records log-ons, log- offs, overrides, alarms and alarm acknowledgments.

2.08 ELECTRONIC, ELECTRIC AND PNEUMATIC CONTROL COMPONENTS

A. Electric Thermostats: Thermostats to be manufacturer's best commercial grade thermostat with adjustable setpoint, dials calibrated in degrees F, and digital temperature indication. Select thermostats with suitable range for service intended. Temperature measurement accuracy shall be +/- 0.5 degrees F. Thermostats located in public areas such as corridors or elsewhere as indicated on drawings shall be provided with programming lockout to prevent unauthorized adjustment. Thermostats located where subject to physical damage and/or where identified on drawings shall be provided with tamper resistant cover. Warmer – Cooler setpoint adjustment will not be acceptable.

B. Electronic Sensors/Transmitters: Sensors/transmitters to be 1000 Ohm platinum RTD type with high resistance change vs. temperature or humidity change, accurate to +/- 0.3 degrees F for temperature and +/- 2.0% for humidity at applicable range, and provide 4 to 20 MA or 0 to 5 VDC output signal. Sensors/transmitters to be suitable for room, duct, or well mounting as required by application. Room type to have built-in setpoint potentiometer and digital room temperature or humidity indication. Select for temperature/humidity range of application. Provide appropriate mounting plate and hardware. Temperature sensors used as a part of Energy (BTU) Measurement System shall meet the applicable requirements of that section. Sensors shall have setpoint adjustment through BAS only. Sensors located where subject to physical damage and/or where identified on drawings shall be provided with protective cover.

C. Smoke Detectors: Install duct-mounted smoke detectors at locations indicated on drawings and in accordance with published smoke detector installation requirements. Smoke detectors to be furnished and installed by Division 23.

D. Averaging Temperature Sensors (Mixed Air, Preheat, Etc.): Provide single, custom length Freon-filled capillary tube type sensing element. Accuracy shall be +/- 0.3 degrees F. Sensor shall be single element with length of one linear foot for every one square foot of coil face area.

E. Control Panels: Control panels to be constructed of unitized steel or aluminum cabinets. Provide cabinets with hinged, locking door opening to the front. Multiple panels mounted side-by-side to be hinged to the left or on opposite sides to open in the middle. Start-stop switches, hand-off-automatic switches, pilot lights, and temperature indicating devices to be flush-mounted in panel door. All other devices to be internally mounted within panel. Local panels exposed to weather to be weatherproof construction. Panel locations to be approved by Designer and be accessible for operation and maintenance. All devices specified to be mounted on control panel that require electrical connections to be prewired to a dual, numbered terminal strip located inside panel. Pneumatic piping inside panel may be poly properly supported in laced bundles or in panduit trays. All lines in panel shall have number I.D. bands. Gauges shall be installed on all pneumatic lines entering or leaving the panel. All devices inside the panel or mounted on panel face shall have an engraved laminated plastic nameplate. Wiring within panel to conform to National Electrical Code, and shall be neatly bundled and laced or enclosed in panduit trough.

F. Control Valves: Two-inch and smaller water service valves to be screw connected chrome plated brass ball type with characterized port to allow equal percentage throttling. Two-and-one-half inch and larger to be flange connected, brass-body ball-type with ductile iron flanges and stainless steel trim. Valve pressure rating to be in accordance with piping and fitting specifications Section 23 21 13. (Minimum 125 psi operating pressure.) Provide pilot positioning relays for pneumatic operated valves requiring sequencing except at terminal units. Valve actuators to be selected to close valves against pump shutoff head or maximum steam inlet pressure. Provide stainless steel stem with removable composition disc and self adjusting spring-loaded Teflon packing. Two position water valves to be line size or one line size smaller than connecting piping with maximum 1 psi water pressure drop. Modulating water valves to have equal percentage flow characteristics and be sized for maximum 4 psi water pressure drop. Zone type, tri-state, pulse type, or similar non-proportional control valves/actuators are <u>not</u> acceptable.

G. Automatic Control Dampers: Ultra low-leak automatic control dampers to be Arrow Pin Lock opposed-blade dampers for modulating control and parallel blades for 2-position control or approved equal. Frames and blades to be minimum 16 gauge extruded aluminum or galvanized steel construction with 4" to 6" deep frame and 8" maximum width blades. Pivot rods to be 1/2" diameter, extruded aluminum or plated steel. Bearings to be corrosion resistant. Install blade linkage hardware in angle or channel frame section out of airstream. All hardware to be corrosion resistant. Seals to be replaceable extruded vinyl or silicone rubber blade seals and flexible metal compression type jamb seals. Dampers to have maximum 4 cfm per square foot leakage at 1" water gauge static pressure and 8 cfm per square foot leakage at 4" water gauge static pressure, verified by independent testing laboratory.

H. Electronic Actuators: Actuators shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator. End switches to deactivate the actuator at the end of rotation or magnetic clutch is not acceptable. For power-failure/safety applications, a mechanical, spring return mechanism shall be used. Non-mechanical forms of fail-safe are not acceptable. All spring return actuators shall be capable of both clockwise or counterclockwise spring return operation by changing mounting orientation. Proportional actuators shall accept a 2 to 10 VDC or 4 to 20 mA and provide a 2 to 10 VDC position feedback signal. 24 VAC/DC actuators shall not require more than 15 VA for AC or 8 watts for DC applications. All non-spring return actuators shall have an external manual gear release to aid in installation and allow manual positioning when the actuator is not powered. All actuators shall have an external direction of rotation switch to aid in installation and provide proper control response. Actuators shall be provided with a factory-mounted 3-foot electrical cable and conduit fitting to provide easy hook-up to an electrical junction box. Provide cover mounted control transformer for 120-VAC power supply. The actuators shall be U.L. listed.

I. Volumetric Devices: Fan Inlet Air Flow Sensors and Indicating Transmitters

1. Fan Inlet Piezometer Air Flow Sensors shall be factory mounted in the air handling units. They shall be piezometer type average velocity sensors designed for installation inside the inlet ring of centrifugal fans accurate to +/- 1.5% measurement accuracy. There shall be no portions of device protruding into inlet cone.
2. Air flow transmitters shall be field installed by the controls sub-contractor. The airflow transmitter shall be an industrial quality, electronic solid state, ultra low span, ½ percent accuracy transmitter with integral square root, scaling, and output filter with indication. Each transducer shall be provided with a microprocessor digital readout meter, operating independent of all other control devices. This unit to provide a direct digital readout of the air volume as derived from the total and static input signals received from the respective air flow measuring element. The meter shall have a digital readout and 3 way zeroing valve for zero verification and calibration. Readout to be flush mounted on the enclosure door. The meter shall be calibrated to an accuracy of +/- 2% of span. Area factor input for respective inlet probes to be adjustable via a keypad. Provide individual airflow transmitters, especially selected for the required spans of each of the above primary processor shall to be Paragon Controls Inc. Model MT-1.
3. For Air Handling Units with 2 or more supply fans AND 2 or more return fans, the transmitter shall be Paragon Controls, Inc. FAATS-1000 fan array airflow totaling system. Output signal shall be 4-20mA and shall measure airflow for each individual fan within a fan array system as well as the total airflow rate of each array.

J. Room Differential Pressure Alarm System: Room differential pressure devices identified on drawings, shall be TSI or equal by Anemostat or Tekair. Provide a unit outside of each patient isolation room, protective environment room, surgery room and elsewhere as indicated on drawings. Provide unit with audible and visual alarm, digital display of room pressure differential, through-the-wall pressure sensor and transformer. Provide BacNet interface for device monitoring through the BAS. System accuracy shall be +/- 10% of pressure reading ± 0.00001 in H2O with range of +/- 0.2000" w.c. The device shall be provided with a door switch and field adjustable timer to minimize nuisance alarm indication due to door opening. Where indicated on the drawings, provide a remote visual alarm and key switch by room pressure alarm manufacturer.

K. Static Pressure Devices: Static pressure measuring stations with +/- 2% accuracy equal to Paragon Controls PE-5000 shall be provided. Industrial quality, electronic solid state, 1/2 percent accuracy static pressure transmitters equal to Paragon Controls Model DPT-4001 shall be provided. Transmitter span shall be matched to application.

L. Transformers: Provide all 24-volt control transformers necessary to convert 120-volt line voltage power to control voltage at control devices.

M. Relays, Hand-Off-Auto Switches, Pilot Lights: Provide all relays, hand-off-auto switches, and pilot lights necessary to accomplish automatic control of the mechanical systems. See electrical drawings for starters provided integral with hand-off-autos, pilot lights, and auxiliary contacts.

N. Pressure Switches: Pressure switches shall have contact action and pole configuration as required by application, U.L. listing, and adjustable setpoint.

O. Current Sensing Relays:

1. Acceptable Manufacturer: Hawkeye Model 908 or approved equivalent.
2. Current sensor shall be induce powered from the monitored load and shall have an adjustable operating range from 2.5 - 135 A. Visual indicators (LEDs) shall indicate output status and sensor power. Adjustable trip setpoint to +/- 1%. Current sensor output shall be N.O., solid state, 0.1A @ 30 VAC/DC.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Components:

1. Provide sensors, transmitters, controllers, actuators, valves, dampers, and related items, necessary to accomplish control sequence shown on drawings. Install all such devices except as noted herein to the contrary.
2. Deliver control valves to the job site to be installed by Mechanical Tradesman under supervision of Control Tradesman.
3. Deliver automatic dampers to the job site to be installed by Mechanical Tradesman under supervision of Control Tradesman.
4. Mechanical Tradesmen to install flow switches, immersion wells, pressure tapping, and all associated shut-off cocks required for control systems.
5. The control equipment and connecting piping shall be installed in a neat and workmanlike manner by trained mechanics in the direct employ of the control manufacturer.
6. All exposed tubing and conduit shall be run parallel to or at right angles to the building structure, and shall be concealed in all finished spaces. Tubing and conduit may be run exposed in mechanical rooms or areas where other piping is exposed.

7. Prepare coordinated composite wiring diagram showing all interlock wiring associated with starters, control panels, and controls.
8. Drawings and Layouts: The controls contractor shall provide to the mechanical contractor complete schematic drawings for the entire control system for submittal to the Designer for approval before work shall begin. Brochures describing each item of control equipment or component shall be included.
9. Provide sequence of operation written so that building engineer can read and understand control scheme.
10. As-built drawings to be framed under plexiglass and placed in each respective equipment room area.

B. Electrical:

1. Division 23 Mechanical Tradesman shall furnish and install low-voltage control wiring, including conduit, conductors, and terminations for same. Division 23 shall also furnish and install control components associated with the low-voltage control systems and shall wire and connect components in accordance with approved wiring diagrams.
2. Division 26 Electrical Tradesman shall furnish and install power wiring including conduit, conductors, and terminations to motors, safety switches, starters, relays, valve and damper actuators, and other components requiring power as indicated on the electrical drawings, by the specifications, and in accordance with approved wiring diagrams. Division 26 shall also furnish and install starters as scheduled on the electrical drawings.
3. Division 23 to furnish and install all local area network wiring, including conduit, conductors, and terminations for same. The local area network (LAN) shall be configurable as either a bus or a star, or a combination of the two. The LAN shall use twisted pair, coax, or fiber optic cable, or any combination of the three to meet noise immunity and/or distance requirements. The network design shall provide a high speed data transfer rate for alarm and report generation of no less than 100 Mb (Mb/s).
4. Division 23 to furnish all input and output control wiring, including conduit, conductors, and terminations for same. All input and output control wiring shall be #18 twisted and shielded cable. No input or output point shall be more than 250 feet from its respective panel. All shields to be grounded at the control panel. All shields at the sensors or transducers to be folded back and taped. All cable splices shall have joints soldered and taped including the shield. No mechanical connections will be acceptable. All connections within the panels must be made with connectors of appropriate size and design for the terminals being applied. All cables must be labeled and identified on corresponding termination drawings. A copy of the termination drawing shall be adequately protected and left in its respective panel.
5. Install all control wiring associated with DDC/BAS in minimum 1/2" size EMT. Provide all associated couplings, connectors, and fittings. No electrical wiring and polyethylene tubing may occupy the same conduit. Separate carriers are required.
6. All wiring shall be in accordance with local regulations and the National Electrical Code.

C. Room Devices:

1. Room devices shall be mounted so that the top of the device is 48" above the floor and aligned with the top of the light switch plates and 8" from the light switch if shown on the drawings adjacent to the light switch.
2. Room device locations shall be coordinated with door swings, light switches, and other wall-mounted items.

3.02 QUALITY CONTROL

A. Control system to be set up and checked out by factory-trained competent technician skilled in the setting and adjustment of temperature controls used in this project. This mechanic to be experienced in type systems associated with this control system.

B. At time of final observation, Control Contractor to demonstrate the entire sequence of operation for the systems to the Engineer. At this time, Engineer to observe function of entire control system, observe temperature control operations, damper positions, necessary to assure that temperature control system is operating as intended by mechanical design.

C. Final acceptance of system not to occur until sequence of operation check has taken place and certified by Engineer's representative.

D. The Control Tradesman to be responsible for returning to job during the opposite season to verify operation of control system. Engineer to be given notice of this return and to accompany Control Tradesman to observe the sequence of operation.

E. Complete Niagara BACNET QC Checklist in APPENDIX A of this section.

3.03 BACKUP OF COMPUTER SOFTWARE

A. Provide a backup of all programs used in Application Specific Controllers.

B. Provide a backup of each Niagara Framework Supervisory Gateway. The backup must be sufficient to restore a Niagara Framework Supervisory Gateway to the final as-built condition such that new Niagara Framework Supervisory Gateway loaded with the backup is indistinguishable in functionality from the original.

3.04 INSTRUCTION AND ADJUSTMENT

A. On completion of the job, the controls contractor shall have completely adjusted the entire control system. He shall arrange to instruct the Owner's representative on operation of the control system and supply him with three (3) copies of the control operating and instruction manuals.

B. The Controls Contractor shall obtain from the Owner's representative a signed receipt that he has received the instruction manuals and complete instruction on the operation of the system.

C. Contractor Adjustment: At the completion of the job, the controls contractor must submit to the Architect a letter stating that he has made final calibrations and adjustments to the system and that the Owner's operating personnel have been instructed in its use.

3.05 WARRANTY SERVICE

A. Warranty servicing shall be for a period not less than 12 months after final acceptance of the job by the owner and include the following provisions:

1. Emergency maintenance service on regular working hour basis during warranty.
2. Replacing defective parts and components as required.
3. Servicing by factory trained and employed service representatives of system manufacturer.
4. Maintaining of system programming.

B. Provide one year cell modem\router service for remote monitoring and warranty support. Access for Owner & Engineer shall be provided.

APPENDIX A

QC CHECKLIST: Niagara BACNET

This checklist is not all-inclusive of the requirements of this specification and should not be interpreted as such.

This checklist is for (check one:)

Pre-Construction QC Checklist Submittal	(Items 1-3)	
Post-Construction QC Checklist Submittal	(Items 1-5)	
Close-out QC Checklist Submittal	(Items 1-15)	

Initial and date each item in the spaces provided verifying that each requirement has been met.

Items verified for Pre-Construction, Post-Construction and Closeout QC Checklists Submittal:			
	Item	Initial	Date
1	All DDC Hardware is numbered on Control System Schematic Drawings.		
2	Signal lines on Control System Schematic are labeled with the signal type.		
3	Local Display Panel (LDP) Locations are shown on Control System Schematic drawings.		

Items verified for Post-Construction and Closeout QC Checklist Submittal:			
	Item	Initial	Date
4	All sequences are performed as specified using DDC Hardware.		
5	Training schedule and course attendee list has been developed and coordinated with shops and submitted.		

Items verified for Closeout QC Checklists Submittal:			
	Item	Initial	Date
6	Final As-built Drawings, including all Points Schedule drawings, accurately represent the final installed system.		

Items verified for Closeout QC Checklists Submittal:			
	Item	Initial	Date
14	Scheduling, Alarming, and Trending have been implemented using Niagara Framework objects and services, and BACnet Instrinsic Alarming as indicated.		
15	All Properties indicated as required to be Writeable are Writeable and Overrides have been provided as indicated		

(QC Representative Signature) (Date)

END OF SECTION 230923

SECTION 23 29 23 - VARIABLE FREQUENCY MOTOR CONTROLLER

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish complete variable frequency motor controllers (VSMC) as specified herein for the fans and pumps designated. All standard and optional features shall be included within the VSMC enclosure unless otherwise specified.

B. Provide VSMCs in accordance with this section. All VSMCs provided to be of same manufacturer.

1.02 QUALITY ASSURANCE

A. To ensure quality and minimize infantile failures at the job site, the VSMC shall be burned in at an ambient of 40 degrees Celsius minimum for at least 120 hours. The VSMC shall be operating a dynamometer and the load and speed shall be cycled during the test. All optional and special features shall be functionally tested at the factory for proper operation.

1.03 WARRANTY

A. The VSMC shall be warranted by the manufacturer for a period of 36 months from date of start-up. The warranty shall include parts, labor, travel costs, and living expenses incurred by the manufacturer to provide factory authorized on-site service.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. VSMC to be as manufactured by ABB, Danfoss-Graham, York/Toshiba, or approved equal.

B. The VSMC shall convert 3-phase, 60-Hz utility power to adjustable voltage and frequency, 3-phase, AC power for stepless motor speed control from 5% to 100% of the motor's Hz speed. Input voltage shall be as indicated on the equipment schedules on drawings.

C. Convertor Section: Full wave diode bridge rectifier.

D. Invertor Section: Transistorized sine coded pulse width modulated (PWM) type for stepless motor speed control.

E. Silicon-controlled rectifiers (SCRS) or GTOs shall not be used in the circuitry.

F. The VSMC maximum output current rating shall be 110 percent of the motor nameplate full load current.

G. The VSMC and options shall be tested to ANSI/UL Standard 508. The complete drive including all options shall be listed by a nationally recognized testing agency such as U.L. or ETL.

H. The VSMC and options shall comply with the applicable requirements of the latest standards of ANSI, IEEE, and the National Electrical Code. The VSMCs full load amp rating shall meet or exceed NEC Table 430-150.

I. Power line noise shall be limited to a voltage distortion of 3 percent and line notch depth of 10 percent or 16,400 volt microseconds whichever is less as defined in IEEE Standard 519, Guide for Harmonic Control and Reactive Compensation of Static Power Converters. Provide line reactors sized to limit line notching to 10 percent or 16,400 volt microseconds whichever is less.

J. The VSMC shall not emit either conducted or radiated RFI in excess of the limitations set forth in the FCC Rules and Regulations, Part 15, Subpart J, for class A computing devices. The VFD shall have an FCC compliance label. Provide RFI filters if required.

K. The increase in audible motor noise with the VSMC operating shall not exceed 3 decibels.

2.02 BASIC FEATURES

A. The VSMC shall include the following basic features:

1. The VSMC shall be housed in a NEMA 1 wall-mounted enclosure for indoor installations and a NEMA 3R enclosure for outdoor installations.
2. The following operator controls shall be located on the front of the enclosure:
   a. Hand/Off/Auto selector switch to start and stop the motor. In the auto position, the drive will start/stop from a remote contact closure.
   b. Auto/Manual selector switch. In the auto position, motor speed is determined by the follower signal. In the manual position, motor speed is determined by the manual speed potentiometer.
   c. Manual speed potentiometer.
   d. Power on pilot light to indicate that the AFC is being supplied by the power line.
   e. Fault pilot light to indicate that the AFC has tripped on a fault condition.
   f. Digital meter to indicate percent speed and percent load.
3. Two sets of form C, dry contacts to indicate when the VSMC is in the run mode.
4. One set of form C, dry contacts to indicate when the VSMC is in the fault mode.
5. When input power returns to normal following a fault trip for under-voltage, over-voltage, or phase loss, the VSMC shall automatically restart. The VSMC shall not automatically restart following fault trips due to overload or over-current.
6. The VSMC shall include a door interlocked, padlockable, input power disconnect switch.
7. Speed Control: The output frequency may be adjusted in proportion to any one of the following:
   a. 0-10 VDC Analog Signal.
   b. 0-5 VDC Analog Signal.
   c. 4-20 MA DC Analog Signal.
   d. 3-15 psig Pneumatic Signal.
8. Coordinate with controls supplier for exact input signal and type to provide proper input follower (i.e., grounded or floating).
9. Provide open protocol BACnet MS-TP, LONtalk, Johnson N2, etc. interface card to connect to Building Automation System. Coordinate with controls system provider for preferred interface language.

2.03 PROTECTIVE FEATURES

A. The VSMC shall include the following protective features:

1. Current limiting semiconductor fuses for the power input.
2. Separate overload relay for each motor controlled.
3. Protection against input power under-voltage, over-voltage, and phase loss.
4. Protection against output current overload and over-current.
5. Protection against over-temperature within the VSMC enclosure.

6. Protection against over-voltage on the DC bus.
7. In the event of a power loss, shutdown without component failure. Upon return of power, automatically return drive to normal operation, if the start is in the "ON" condition, being able to restart into a rotating motor regaining positive speed control without shutdown or component failure.
8. In the event of a phase-to-phase short circuit, shutdown safely without component failure.
9. In the event that an input or output power contactor is opened or closed while the drive is activated, no damage to the VSMC shall result.
10. Any disconnect switches between the VSMC and the motor shall include an auxiliary contact interlocked to the VSMC fault trip circuit. In the event that a disconnect switch is opened while the drive is running, the drive shall shut down.
11. DC bus discharge circuit for protection of service personnel.
12. Insensitive to incoming power phase sequence.

2.04 ADJUSTMENTS

A. The VSMC shall include the following adjustments available via potentiometers inside the enclosure:
1. Maximum speed, adjustable 50-100% base speed.
2. Minimum speed, adjustable 0-50% base speed.
3. Acceleration time, adjustable 2-60 seconds.
4. Deceleration time, adjustable 2-60 seconds with override circuit to prevent nuisance trips if deceleration time is set too short.
5. Current limit, adjustable 0-110%.

2.05 SERVICE CONDITIONS

A. The VSMC shall be designed to operate within the following service conditions:
1. Ambient temperature, 0-40 degrees C.
2. 0-95% relative humidity, non-condensing.
3. Elevation to 3300 feet without derating.
4. AC line voltage variation, -5% to 10% of nominal.

2.06 SPECIAL FEATURES

A. The following special features shall be included in the VSMC enclosure. The unit shall maintain its U.L. or ETL listing.
1. A motor starter shall be included in the bypass circuitry for constant speed motor control when the VSMC is taken out of service. Manual bypass shall provide all the circuitry necessary to transfer the motor from the VSMC to the power line, or from the line to the controller while the motor is at zero speed. The bypass circuitry shall be mounted in a separate section of the VSMC enclosure. Two motor contactors, electrically interlocked, shall be utilized. One contactor is to be between the controller and the motor. The other contactor is to be between the bypass power line and the motor providing across-the-line starting for motors 50 hp and less, and part-winding or “soft start” starting for motors greater that 50 hp. Motor overload protection is to be provided in both the controller mode and the bypass mode. The bypass section door shall include a "drive/line" switch, "on/off-reset" switch, and a "load transferred to line" pilot light.

2. The VSMC shall include a main fused disconnect switch or circuit breaker to provide a means of disconnecting all power to both the bypass circuitry and the controller. The disconnect switch or circuit breaker shall be door interlocked and padlockable. The fuses or circuit breaker shall be sized to provide short circuit protection for the motor when in the bypass mode per the NEC.
3. A second disconnect switch, circuit breaker, or contactors shall be provided to disconnect input power to the controller but not the bypass circuitry. This disconnect will allow troubleshooting and testing of the VSMC, both energized and de-energized while operating in the bypass mode.
4. Plug-in test meter shall provide a quick means for monitoring the different signals within the VSMC for start-up and troubleshooting. Where the meter is capable of operating with different horsepower VSMCs, only one meter needs to be supplied.

PART 3 EXECUTION

3.01 INSTALLATION

A. The manufacturer of the VSMC equipment shall provide a competent, factory trained service technician to supervise the installation, start-up and testing of the VSMC.

B. Install VSMCs in locations shown on the drawings in strict accordance with the manufacturer's published installation instructions.

C. Contractor shall provide such materials and assistance as required by the manufacturer's representative.

D. Division 26 shall provide necessary electrical connections.

E. Contractor shall provide coordination of the necessary controls not provided by the VSMC manufacturer.

3.02 START-UP, TESTING, DEMONSTRATION

A. The manufacturer's factory-trained service technician, assisted by contractor, shall verify correct installation, start-up equipment, and test it as a unit and a part of the system it serves. Verify by adjustments, tests, etc., that the equipment is functioning as specified. Provide three copies of test data to the Owner. As a minimum, check the following items:

1. Motor voltage and frequency.
2. Control input and automatic start/stop.
3. Calibration and adjustment for minimum and maximum speed setpoints and acceleration and deceleration rates.
4. Wire terminations.

B. VSMC manufacturer shall provide a minimum of 4 hours instruction to Owner to demonstrate the operation of the system. Provide three copies of operation and maintenance manual to Owner at completion of instructions.

END OF SECTION 232923

SECTION 23 31 10 - SHEET METAL DUCTWORK - LOW PRESSURE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Low pressure ductwork refers to systems operating at 2.00" w.g. total static pressure with velocities up to 2000 FPM. It is the intent of this specification to provide an installed duct system which will supply the air quantities indicated by the plans and have the lowest possible friction loss with the least possible leakage loss. Friction loss for each system shall not exceed that which is indicated in the A.C. unit schedule as external static pressure or in the fan schedule as static pressure and shall include the losses of all accessories. Friction losses shall be minimized by reduction in the number of offsets and elbows by pre-planning the duct system installation and coordination with other trades to prevent interferences. Access to all accessories requiring maintenance, service and inspection shall be maintained. Radius elbows are preferred for all turns to minimize friction, noise and vibration; and, especially, for sections having large volume or higher velocities and sections which may have turbulences.

B. The contractor shall provide and/or construct all materials, ductwork, joints, transitions, splitters, dampers, access doors, etc., as set forth in these specifications necessary to install the Low Pressure Sheet Metal Ductwork required by the Mechanical Drawings.

C. Low pressure ductwork shall be constructed to meet the following pressure class:

1. Supply ductwork downstream of terminal units: 1.0" pressure class.
2. Supply and return duct connections to fan coil units or single zone air systems (ESP ≤1.0"): 1.0" pressure class.
3. Supply and return duct connections to fan coil units or single zone air systems (ESP >1.0", ≤2.0"): 2.0" pressure class.
4. Exhaust and return ductwork (Fan ESP ≤2.0"): 2.0" pressure class.

1.02 QUALITY CONTROL AND REGULATORY STANDARDS

A. SMACNA Manual: Sheet Metal Tradesman is to have access on the construction site to the Latest Edition of SMACNA "HVAC Duct Construction Standards”, (Metal and Flexible). The Manual is referred to in specifications for required construction methods and details. Contractor shall comply with provisions of the SMACNA Manual and more stringent requirements of this specification.

B. Quality control involves not only the general performance requirements for all air ducts, but also quality workmanship which includes layout preplanning so that offsets, rises, falls, elbows, fittings, etc., are minimized or eliminated. General performance requirements for all ducts include:

1. Dimensional stability (shape deformation and strength).
2. Containment of the air being conveyed (leakage control).
3. Vibration (fatigue and appearance).
4. Noise (generation, transmission or attenuation).
5. Exposure (to damage, weather, temperature extremes, flexure cycles, wind, corrosive atmospheres, biological contamination, flow interruption or reversal, underground or other encasement conditions, combustion, or other in-service conditions).
6. Support (alignment and position retention).
7. Thermal conductivity (heat gain or loss and condensation control).

C. Provide galvanized duct materials which meet applicable requirements of SMACNA manual and local and state codes, whichever is the most stringent.

D. Support ductwork in accordance with applicable requirements of SMACNA manual, local and state codes, and details on plans, whichever is the most stringent.

E. Emboss fittings with material gauge, manufacturer, and type material.

F. Materials used as sealers, pre-insulated jackets and flexible ducts shall comply with a flame spread rating of 25 or less and a smoke developed rating of not over 50.

G. Joint sealer shall meet the requirements of UL181A or UL181B as applicable.

H. Duct sealant classification: Seal all transverse joints, longitudinal joints and duct wall penetrations in accordance with SMACNA Class A.

1.03 SUBMITTALS AND SHOP DRAWINGS

A. Submit material/product data to designer for approval ONLY when it deviates from products specified in Part 2 herein.

B. Shop Drawings: Contractor to submit to owner for approval complete sheet metal shop drawings of all ductwork, including equipment rooms, shafts, and especially congested areas and areas with possible conflicts. No installation shall proceed without owner stamped approval of shop drawings. Submittal to reflect space requirements coordinated with other trades such as Electrical, Plumbing, Mechanical and Structural. Prior to submission to owner, shop drawings to have stamped approval of all major trades which occupy ceiling space (HVAC, plumbing, piping, sprinkler, and electrical), to substantiate adequate coordination as to space, accessibility and to ensure no conflict exists between contractors.

C. The General Contractor shall be responsible for coordination between trades and shall stamp and sign the duct drawings to substantiate that the coordination has been accomplished. Non-critical piping and conduit shall give way to ducts.

PART 2 PRODUCTS

2.01 MATERIAL

A. Sheet Metal, Angles, Bar Slips, Hangers, and Straps: Galvanized steel.

B. Screws: Cadmium plated.

C. Joint Sealer: Manufactured by Hardcast, Inc., Two-Stage Sealant Process.

1. Stage 1: Apply fiber DT tape.

2. Stage 2: Brush on RTA-50 sealant over fiber tape.

2.02 FABRICATION

A. Provide a rectangular or round duct where required on drawings of prime quality galvanized steel sheets, thickness and reinforcement as required by the following schedule, SMACNA, or local and state codes, whichever is more stringent. When fabricating low pressure ductwork, largest duct dimension governs the entire duct and complete joint.

DUCTWORK GAUGE AND REINFORCEMENT SCHEDULE				
MAXIMUM DUCT DIMENSION (IN.)	DUCT GAUGE	SLIP GAUGE	STANDINGS	REINFORCEMENT
Up thru 18	24	24	- -	- -
19 - 30	24	24	1 x 24 ga.	No
31 - 42	22	22	1 x 24 ga.	No
43 - 54	22	22	1-1/2 x 20 ga.	1-3/8 x 1/8 Band Iron
55 - 60	20	20	1-1/2 x 20 ga.	1-3/8 x 1/8 Band Iron
61 - 84	20	20	1-1/2 x 18 ga.	1-1/2 x 1-1/2 x 1/8 Angle
85 - 96	18	20	1-1/2 x 18 ga.	1-1/2 x 1-1/2 x 3/16 Angle
Over 96	18	20	2 x 18 ga.	2 x 2 x 1/4 Angle

B. Duct dimensions shown on drawings indicate inside clear dimensions. Make allowances in sheet metal size for duct requiring internal duct liner to provide "inside clear" dimensions.

C. In addition to the requirements above, add supplemental bracing as necessary to prevent sagging, drumming, and vibration.

D. Round prefabricated 26 gauge slip joint duct may be used on exhaust and return duct 12" and smaller and for runout duct to boxes, diffusers, registers, and grilles.

1. Secure duct sections and fittings with sheet metal screws.

2. Make connections of round duct to rectangular duct using "spin-in" collars with manual volume damper.

3. Transverse and longitudinal slip joints shall be sealed with approved sealer.

E. Provide transverse joints of "s" and drive construction at least every eight feet on duct whose larger side is less than 18". Seal all transverse joints with joint sealant material.

F. Provide transverse joints, or equivalent supplemental angle reinforcing on 4 foot centers on duct whose larger side is greater than 18". At the contractor's option, duct mate or equal joint system may be substituted for "s" and drive construction. Seal all transverse joints with joint sealant material.

G. Longitudinal seams shall be Pittsburg Lock or grooved seams closed tightly and evenly. Button punch snap lock longitudinal seam construction shall not be allowed. Seal longitudinal joints which prove to leak with joint sealant material.

H. Cross break ductwork over 10" dimension, either side.

I. Do not exceed 20 degree angle of slope for increase-in-area transitions.

J. Do not exceed 20 degree angle of slope for decrease-in-area transitions.

K. Do not exceed 30 degrees on the entering side or 45 degrees on the leaving side for angle of transitions at connections to equipment without the use of approved vanes. 20 degree angle is preferred and should be used space permitting.

L. Provide Ells fabricated to one of the following specifications in order of preference (SMACNA Figures 4-2 through 4-4 and Figure 4-9 and Chart 4-1):

1. Unvaned elbow with the throat radius equal to 3/4 of the width of the duct and with a full heel radius.

2. Six inch throat radius with full radius, single thickness vanes and full heel radius. Maximum unsupported length of vanes shall be 36". Vanes shall be securely fastened to runners. All vanes shall be secure and stable in installed operating position. Construct vane edges to project tangents parallel to duct sides.
3. Square elbows with single thickness turning vanes. Maximum unsupported length of vanes shall be 36". Vanes shall be securely fastened to runners. All vanes shall be secure and stable in installed operating position. Construct vane edges to project tangents parallel to duct sides.
4. Radius elbows are the preferred fitting. Square elbows are to be used only when available space prevents the use of radius elbows.

M. Provide offsets as necessary in accordance with SMACNA Figure 4-7.

N. Make branch connections and tees in one of the following manners:

1. Converging radius elbow with MVD. (SMACNA Figure 4-5).
2. 45-degree entry with MVD. (SMACNA Figure 4-6).
3. Round spin-in fitting with MVD.

O. Space duct joints to avoid cutting them for branch take offs and outlet collars.

PART 3 EXECUTION

3.01 INSTALLATION, APPLICATION, ERECTION

A. Support ductwork on each side of the duct with suitable sheared strips of galvanized metal or 1" x 1/8" galvanized steel band iron hangers.

B. Attach hangers to the ductwork using sheet metal screws.

C. Secure hangers to concrete structure with approved anchor shields and to steel structure by means of C-clamps.

D. Space hangers approximately eight feet along the duct except as noted below.

E. For ducts 60" and larger and heavy sections, such as welded duct and sound absorbers, space hangers at approximately four foot intervals.

F. Obstructions shall not be located within ducts.

G. Do not exceed 45 degrees for easement transition angle.

H. Seal all transverse joints with approved sealer in accordance with manufacturers' directions. Also, seal longitudinal joints which prove to leak.

I. Insulation: Where drawings and insulating specifications indicate that ducts are to be insulated make provisions for neat insulation finish around damper operating quadrants, splitter adjusting clamps, access doors, and similar operating devices. Metal collar equivalent in depth to insulation thickness and of suitable size to which insulation may be finished to be mounted on duct.

J. Counterflashing: Counterflash all ducts where they pierce the roof.

K. Pitot Ports: Pitot ports for measuring airflow to be located in each main duct at the downstream end of the straightest run of the main and before the first branch take-off. Pitot ports to be formed by drilling 7/16" holes in the duct, lined up perpendicular to airflow on maximum 8" centers and at least three to a duct, evenly spaced. Holes to be plugged with plastic plugs. Provide access to these for future rebalancing.

3.02 CLEANING

A. Clean ductwork thoroughly to assure all foreign matter, dirt, etc. is removed.

END OF SECTION 233110

SECTION 23 31 11 SHEET METAL DUCTWORK - MEDIUM PRESSURE

PART 1 GENERAL

1.01 WORK INCLUDED

A. The contractor shall provide and/or construct all materials, ductwork, joints, transformations, fittings, access doors, etc., as set forth in these specifications necessary to install the medium pressure sheet metal ductwork required by the drawings.

B. Medium pressure - sheet metal ductwork with air velocity greater than 2000 feet per minute and static pressure 6" or less, but greater than 2".

C. It is the intent of this specification to provide an installed duct system which will supply the air quantities indicated by the plans and have the lowest possible friction loss with the least possible leakage loss. Leakage shall not exceed one percent of the respective system capacity. Friction loss for each system shall not exceed that which is indicated in the A.C. unit schedule as external static pressure or in the fan schedule as static pressure and shall include the losses of all accessories. Friction losses shall be minimized by reduction in the number of offsets and elbows by pre-planning the duct system installation and coordination with other trades to prevent interferences. Access to all accessories requiring maintenance, service, and inspection shall be maintained. Radius elbows are preferred for all turns to minimize friction, noise and vibration; and, especially, for sections having large volume or higher velocities, and sections which may have turbulences.

D. Medium pressure ductwork is required from the outlet of AHU to each variable volume terminal box and shall be constructed to meet a 4.0" pressure class minimum or higher as required to meet air handling unit design external static pressure.

1.02 QUALITY CONTROL AND REGULATORY STANDARDS

A. SMACNA Manual: Sheet metal tradesman to have access, on the construction site, to "HVAC Duct Construction Standards, Metal and Flexible, Second Edition, 1995". The Manual is referred to in the specifications for required construction methods and details. The Contractor shall comply with applicable provisions of the SMACNA Manual and the more stringent requirements of this specification.

B. Quality control involves not only the general performance requirements for all air ducts; but also, quality workmanship, which includes layout preplanning so that offsets, rises, falls, elbows, fittings, etc., are minimized or eliminated. General performance requirements for all ducts include:

1. Dimensional stability (shape deformation and strength).
2. Containment of the air being conveyed (leakage control). (See Part 3 of this specification for leakage testing.)
3. Vibration (fatigue and appearance).
4. Noise (generation, transmission or attenuation).
5. Exposure (to damage, weather, temperature extremes, flexure cycles, wind, corrosive atmospheres, biological contamination, flow interruption or reversal, underground or other encasement conditions, combustion, or other in-service conditions).
6. Support (alignment and position retention).
7. Thermal conductivity (heat gain or loss and condensation control).

C. Provide galvanized duct materials which meet requirements of SMACNA manual and local and state codes, whichever is the most stringent.

D. Support duct in accordance with SMACNA manual, local and state codes, and details on plans, whichever is the most stringent.

E. Emboss fittings and duct sections with material gauge, manufacturer, and type material.

F. Materials used as sealers, liners, pre-insulated jackets and flexible ducts shall comply with a flame spread rating of 25 or less and a smoke developed rating of 50 or less.

G. Joint sealer shall meet the requirements of UL181A or UL181B as applicable.

H. Duct sealant classification: Seal all transverse joints, longitudinal joints and duct wall penetrations in accordance with SMACNA Class A.

1.03 SUBMITTALS AND SHOP DRAWINGS

A. Submit material/product data to owner for approval.

B. Shop Drawings: The Contractor is to submit to Owner for approval complete sheet metal shop drawings of all ductwork, including equipment rooms, shafts, and especially, congested areas and areas with possible conflicts. No installation shall proceed without owner stamped approval of shop drawings. Submittal to reflect space requirements coordinated with other trades such as Electrical, Plumbing, Mechanical, and Structural. Prior to submission to Owner, shop drawings to have stamped approval of major trades which occupy ceiling space (HVAC, plumbing, piping, sprinkler, and electrical), to substantiate adequate coordination as to space and accessibility and to ensure no conflict exists between contractors.

C. The General Contractor shall be responsible for coordination between trades and shall stamp and sign the duct drawings to substantiate that the coordination has been accomplished. Noncritical piping, low pressure ducts, and conduit shall give way to medium pressure ducts.

PART 2 PRODUCTS

2.01 MATERIAL

A. Sheet Metal, Angles, Bar Slips, Hangers and Straps: Galvanized steel.

B. Screws: Cadmium plated.

C. Joint Sealer: Manufactured by Hardcast, Inc., Two-Stage Sealant Process.

1. Stage 1: Apply fiber DT tape.

2. Stage 2: Brush on RTA-50 sealant over fiber tape.

2.02 GENERAL FABRICATION REQUIREMENTS

A. Medium-pressure duct and fittings to be manufactured by a company who has had as its principal business the manufacture of spiral duct and welded fittings for at least five years.

B. Medium-pressure fittings to be manufactured by same manufacturer of ductwork to assure tight fit of all ductwork and components.

C. Supplier of medium-pressure ductwork to provide to Designer certified copies of test data made by independent United States laboratory covering all duct and fittings as manufactured by supplier.

D. Duct test data to cover leakage rate, bursting strength, collapsing strength, seam strength, and friction loss. Friction loss test data to cover both duct and assembled coupling joints. Fitting test data to cover friction loss tests of all fittings shown on drawings.

E. Installation manuals to be included by the Contractor with submittals. Manuals to provide detailed instructions on assembly, joint sealing, erection, reinforcement of flat-oval duct, and system pressure testing for leaks.

2.03 SPECIFIC FABRICATION REQUIREMENTS

A. Round Duct and Fittings:

1. Round duct to be manufactured using galvanized steel meeting ASTM A-525. Construction shall be in accordance with SMACNA manual and manufacturer's standards.

2. Round duct is to have appropriate seams made to eliminate leakage based on pressures for which the system has been designed. Longitudinal seam duct to have fusion welded butt seam.

3. Fittings and couplings shall have the minimum gauges specified by SMACNA Manual. Fittings to have continuous welds along all seams.

4. Divided flow fittings (90 degree and 45 degree branches, wyes, crosses, etc.) to be manufactured as a separate fitting, not as a tap collar or saddle tap welded into spiral duct sections. Entrances to be free of weld buildup, burrs, or irregularities.

5. Elbows in diameters 3" thru 8" to be stamped elbows. Other elbows to be gored construction with all seams continuously welded. Elbows to be fabricated to center line radius of 1.5 times the cross-sectional diameter. Two-piece mitered elbows shall not be used unless specifically shown on plans.

6. Spun bellmouth connections to be used at each round take-off from medium pressure plenum.

7. Galvanized areas damaged by welding to be coated with corrosion resistant aluminum paint.

2.04 COUPLINGS FOR ROUND MEDIUM-PRESSURE DUCT

A. Diameters up to 60":

1. Duct-to-Duct joints to be sleeve couplings, reinforced by rolled beads.

2. Duct-to-fitting joints to be slip-fit of projecting collar fitting into duct.

3. Insertion length of sleeve coupling and fitting collar to be 2" minimum.

B. Flat-Oval Duct and Fittings:

1. Provide flat-oval duct and fittings where indicated on drawings by symbol accompanying minor and major axis dimensions.

2. Provide spiral-seam, flat-oval duct manufactured from galvanized steel in the following U.S. Standard gauges:

FLAT OVAL DUCT CONSTRUCTION, SPIRAL SEAM	
MAXIMUM WIDTH (IN.)	**GAUGE**
0 - 24	24
25 - 48	22
49 - 70	20
70 and up	18

3. Provide reinforcement and bracing in accordance with SMACNA manual and published details of spiral flat-oval duct manufacturer for size and pressure conditions applicable.

4. Matching flat-oval fittings to be manufactured from galvanized steel with continuous weld seams in the following U.S. Standard gauges:

FLAT OVAL FITTING CONSTRUCTION	
MAXIMUM WIDTH (IN.)	**GAUGE**
0 - 36	20
37 - 60	18
61 and up	16

5. Construct flat-oval duct for sizes not available in spiral construction to the following minimum gauges:

FLAT OVAL DUCT CONSTRUCTION, LONGITUDINAL SEAM	
MAXIMUM WIDTH (IN.)	**GAUGE**
0 - 36	20
37 - 60	18
61 and up	16

6. Flat-oval duct not of spiral construction to be adequately braced on 4' centers by reinforced couplings or angle ring flanges to limit amplitude of wall vibration to plus or minus 0.008" and maximum wall deflection to 0.52" at 6" static pressure. Provide angle flanges when maximum width exceeds 41" or when maximum height exceeds 26".

7. Spun bellmouth connection shall be used at each flat oval duct connection to medium pressure plenum.

C. Rectangular Ductwork:

1. Reinforce rectangular duct with angles, i.e., no internal tie rods will be allowed for reinforcing. Joints to be double "S" slip up to 60" in width and companion angle flanged joint above 60" in width. Sheet metal gauges for medium pressure duct shall be as required by SMACNA manual.

2. Fabricate elbows using one of the following methods:

   a. Six inch throat radius with full radius, single thickness vanes and full heel radius. Maximum unsupported length of vanes shall be 36". Vanes shall be secure and stable in installed operating position. Construct vane edges to project tangents parallel to duct sides.

   b. Unvaned elbow with the throat radius equal to 3/4 of the width of the duct and a full heel radius.

   c. Square elbows with H-E-P: High Efficiency Profile turning vanes as manufactured by Aero/Dyne Company. Turning vanes shall be double thickness airfoil design with smoothly-rounded entry nose and extended trailing edge. Turning vane assemblies shall be fabricated with side rails and installed on design centers across the full diagonal dimension of the elbow. Vanes are to be installed in strict accordance with manufacturers' recommendations.

   d. Radius elbows are the preferred fitting. Square elbows are to be used only when available space prevents the use of radius elbows.

3. Contractor may request round or oval duct be substituted for any rectangular duct shown. Size substitutions to be based on equivalent airflow resistance.

D. Internally Insulated Double Wall Duct and Fittings:

1. Construction to be comprised of airtight outer pressure shell, 1" insulation layer, and perforated metal inner liner completely covering insulation.

2. Provide outer pressure shell manufactured from galvanized steel meeting ASTM A-525. Duct and fitting construction to be as specified for single wall round and flat oval duct.

3. Provide inner liner manufactured from galvanized steel meeting ASTM A-525 in the following minimum gauges:

	Diameter or Minor Axis, Inches		
	0”-34	35”-59	60+
Duct, Perforated Inner Liner	28	26	22
Fitting, Perforated Inner Liner	22	22	22

4. Perforations not to exceed 3/32" diameters. Percentage of open area to equal 13 percent.

5. Support inner liners of both duct and fittings with metal spacers welded in position to maintain spacing and concentricity.

6. Provide inner couplings to align inner lining to maintain airflow conditions equivalent to standard single wall medium-pressure duct joints. Butt joints are not acceptable for inner liner. Accomplish alignment by extending liner of fitting for slip joint into duct or by use of double, concentric coupling with two couplings held by spacers for rigidity and wall spacing. Provide insulation end fitting where internally insulated duct connects to uninsulated duct or fitting, fire damper, or flex to bring outer pressure shell down to nominal size.

PART 3 EXECUTION

3.01 INSTALLATION

A. Support round ducts from building structure with galvanized steel hangers as recommended in SMACNA manual. Secure hangers to masonry portion of building by means of inserts or other acceptable anchors. Secure hangers to steel structure members by means of C-clamps. Vertical risers and other duct runs where methods of support specified above are not applicable, to be supported by angle brackets as shown in SMACNA manual.

B. Support rectangular and flat oval ducts by 1" x 1/8" galvanized band iron or 3/8" galvanized rod hangers attached to reinforcing angles and spaced same as reinforcing angles. Secure hangers to concrete beam or slab by inserts, anchor shield and bolt, toggle bolt, or expansion bolt.

C. Attach hangers to ductwork using sheet metal screws.

D. Space hangers approximately 8' along the duct for ducts under 60". For ducts 60" and larger and heavier sections, such as welded duct, space hangers at approximately 4' intervals.

E. Hangers and bracing used with ductwork to be galvanized.

F. Obstructions shall not be located within ducts.

G. Provide smooth insulation finish around dampers, access doors, and similar operating devices. Provide metal collar equivalent in depth to insulation thickness.

H. Provide pitot ports for measuring airflows in each main supply duct downstream of straightest run of main and before first branch takeoff. Form pitot ports by drilling 7/16" holes in the duct, lined up perpendicular to airflow on maximum of 8" centers. Provide minimum of 3 per duct evenly spaced. Plug holes with plastic plugs. Provide access to pitot ports for future re-balancing.

I. Seal duct joints as follows:

1. Apply sealer to male end of couplings and fittings. After joint is slipped together, place sheet metal screws 3" on center, 1/2" from joint bead. Apply sealer to the outside of the joint extending 1" on each side of the joint bead and covering screw heads. Apply tape immediately over wet sealer.

2. Duct sealer to be specifically formulated for the sealing of high-pressure duct systems. Sealer to be compatible with tape to ensure cure and bond. Submit samples of sealer and tape along with specifications of each for approval. Flame spread rating of sealer to be less than 25, smoke development rating of sealer to be less than 50. Sealer to be mineral impregnated woven fiber tape and plastic type activator/adhesive as manufactured by Hardcast Inc., or approved equal. Apply joint material in strict accordance with manufacturers' published installation instructions.

3. Flanged joints to be sealed with neoprene rubber gaskets.

3.02 LEAKAGE TESTING OF INSTALLED SYSTEMS

A. Test medium pressure ductwork as follows:

1. Follow procedure published by United Sheet Metal Division of United McGill Corporation entitled "System Pressure Testing for Leaks" using prescribed test kit containing test blower, two U-tube manometer, and calibrated orifice tube.

2. Installed medium-pressure duct system to be pressurized to 6" w.g. maximum. Air leakage at test pressure to be measured by a calibrated orifice type flow meter. Total allowable leakage of system shall not exceed 1/2 of 1% of system air handling capacity. If system is tested in sections, leakage rates to be added to give performance of whole system.

3. Leakage concentrated at one point may result in objectionable noise even if system passes leakage rate criteria; correct to satisfaction of Designer.

4. Orifice flow measurement device to be individually calibrated against a primary standard and calibrated curve permanently attached to orifice tube assembly.

END OF SECTION 233111

SECTION 23 34 50 - SQUARE CENTRIFUGAL IN-LINE FANS

PART 1 GENERAL

1.01 QUALITY ASSURANCE

A. Certify fan performance in accordance with AMCA Certified Air and Sound Rating Criteria.

B. Fans shall be UL or ETL listed.

1.02 REQUIREMENTS

A. Select fans such that fan BHP does not exceed motor nameplate horsepower at scheduled conditions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Greenheck, Acme, Cook, or approved substitute.

2.02 EQUIPMENT

A. Non-overloading, backward inclined, aluminum centrifugal fan wheel.

B. Variable pitch V-belt drive or direct drive as scheduled.

C. Heavy gauge aluminum or galvanized steel housing with duct connection at fan inlet and outlet and removable access panels to access all interior components without removing ductwork or wiring.

D. Permanently lubricated, ball bearing fan motor.

E. Electrical junction box.

2.03 ACCESSORIES

A. Gravity backdraft damper.

B. Disconnect switch on single-phase fans.

C. Belt guard/motor cover.

D. Solid state variable speed controller.

E. Rubber vibration isolators.

F. See fan schedule on drawings for other required accessories.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install fans in accordance with manufacturers' published instructions.

B. Connect ducts to fans to allow for straight and smooth airflow.

C. Provide flexible connections between fans and ducts.

D. Install fans level.

E. Check fan alignment and balance. Correct improperly aligned or vibrating fans.

F. Final installation to be free of leaks.

G. Ensure fans are interlocked with appropriate systems and/or controls.

END OF SECTION 233450

SECTION 23 63 13 - AIR-COOLED CONDENSING UNITS

PART 1 GENERAL

1.01 CERTIFICATION

A. Units to be AHRI certified and UL listed.

1.02 MANUFACTURERS

A. Acceptable Manufacturers: Trane, York, Daikin, Carrier, or approved equal.

B. Manufacturers to review the allowable space for the condensing units considering service access, airflow clearances, and refrigerant piping to ensure adequate clearance exists for their units prior to submitting bid. Contractor shall not be allowed an extra should the low bidder prove to have unacceptable clearance.

PART 2 PRODUCTS

2.01 CONDENSING UNITS TO INCLUDE THE FOLLOWING COMPONENTS

A. Copper tube, aluminum fin condenser coil.

B. Compressor.

C. Direct drive propeller type condenser fan with permanently lubricated motor.

D. Fully weatherproof galvanized steel casing with rust resistant baked enamel finish.

E. Indoor fan relay.

F. Compressor current and thermal overload protection.

G. High and low refrigerant pressure switches.

H. Internal spring vibration isolation.

I. Liquid line filter dryer.

J. Crankcase heater.

K. Solid brass service valves.

L. Screen or louvered coil guards.

M. Start capacitor and relay.

N. Condensing pressure control for operation down to 0 degrees F ambient.

O. Pre-insulated and pre-charged refrigerant piping set. (Contractor option in lieu of Section 23 23 00).

P. Five-year compressor warranty.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install condensing unit on 4" high concrete pad allowing recommended area for service, maintenance and airflow requirements.

END OF SECTION 236313

SECTION 23 73 13 AIR HANDLING UNIT - MEDIUM OR LOW PRESSURE

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide air-handling units of the single-zone draw-thru, double wall central station type and size as scheduled on drawings.

1.02 PERFORMANCE

A. Certify unit components in accordance with AHRI Standard 430 as applicable.

B. Certify coils in accordance with AHRI Standard 410. Substantiate performance by AHRI computer-generated output.

C. Furnish coils with minimum rows and fins as scheduled even though performance can be achieved with fewer rows or fins.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Trane, Daikin, York, Carrier, or approved equal.

B. Manufacturers both listed above and proposed alternates to review the allowable space for the units considering supply and return airflow, service and maintenance access, coil pull clearance, and piping connections to insure adequate clearance exists for their units prior to submitting bid. Contractor shall not be allowed extra payment should the low bidder prove to have unacceptable clearance.

2.02 UNIT CONSTRUCTION

A. Unit sections shall be double wall construction. Exterior wall shall be minimum 18-gage solid galvanized steel. Interior wall shall be minimum 20-gage solid galvanized steel. Unit to be completely insulated with 1" thick, 1-1/2 pound density fiberglass insulation. Insulation shall meet NFPA-90A standards. All connecting channels shall be insulated to prevent sweating.

2.03 FAN SECTION

A. Provide DWDI fan with galvanized or phosphatized painted steel scroll housing. RPM selection shall not exceed 90% of maximum RPM capacity of unit.

B. Provide direct drive plenum fan with centrifugal fan wheel. Dynamically balance fan before and after installation in the cabinet section.

C. Provide steel fan shaft keyed, set screwed or clamped to the wheel per the manufacturers standard design to meet the specified performance. Maximum fan rpm to be well below the first critical speed.

D. Provide units with internally or externally mounted fan motors. Mount motors on slide rail base complete with adjustment nuts. See Specification Section 23 05 13.

E. Provide fan section with full sized, hinged, latched, double wall access doors for access to fan, motor, and bearings. Fans with externally mounted motors and bearings may provide removable access panels.

F. Provide self-aligning, grease-lubricated fan bearings of the ball, roller, or pillow block type. Provide extended lubrication lines from fan bearing to unit casing. Connect lubrication lines to a Zerk fitting mounted on the casing. Select bearings for an average life of 200,000 hours at design operating conditions.

G. Mount fan and motor assembly on minimum 2" deflection spring isolators. Fan assembly to be completely isolated from unit bulkhead with flexible neoprene connections.

2.04 COIL SECTION

A. Coil Section:

1. Provide insulated, double wall, galvanized construction drain pan extending under the coil and fan sections. Pan shall be sloped to provide positive drainage of condensate. Drain connection(s) are to be provided on the water piping connection side of unit. Coil sections with stacked coils to have an intermediate drain pan with condensate drop tubes to main drain pan.

2. Completely enclose coil headers within the insulated casing with piping connections extended through cabinet. Piping connections to be on same end of unit.

3. Provide coil section with removable access panel or access door to remove coil.

B. Cooling Coils - Direct Expansion:

1. Provide coils suitable for working pressure of 300 psig. Use pressure type liquid distribution on coil headers. Coils to have gravity oil drainage. Provide solder type coil connections.

2. Design coils for use of refrigerant-32.

3. Dehydrate coils after factory testing and charge with dry air.

4. Design and test coils in accordance with American National Standards Code for Mechanical Refrigeration (ANSI B9.1.).

5. Coils for row or face split operation to have intertwined circuits for equal loading on each circuit.

6. Coils to be constructed of 5/8" outside diameter copper tubing with aluminum fins. Bond fins by mechanical expansion.

2.05 ADDITIONAL SECTIONS

A. Filter Section:

1. Provide factory-built filter section complete with filters as specified herein. Minimum filter area to be as specified on unit schedule but not to exceed 500 fpm filter face velocity. Filter sections to have full sized, hinged, latched, double wall access doors for filter service.

B. Provide 30% medium efficiency (ASHRAE Standard 52), 2" thick pleated disposable type panel filters equal to Farr 30/30.

C. Provide a factory mounted Dwyer Magnehelic gage across filter section and mark gage to indicate design clean and dirty loading conditions.

D. Provide one complete set of replacement filters to Owner at job completion.

E. Mixing box to have interconnected low-leak type outside and return air dampers with parallel blades. Arrange dampers so outside and return air merge when entering mixing box. Damper rods to rotate in nylon bushings.

PART 3 EXECUTION

3.01 COORDINATION

A. Prior to purchasing units, refer to drawings and coordinate the required side of unit for motor, access panels and doors, and duct and piping connections to provide proper access clearance.

3.02 INSTALLATION

A. Install each unit on a minimum 4" high, level, rigid, and heavy concrete base.

B. Provide proper clearance at each unit for routine service including the changing of filters, removal of coils, bearing greasing, opening of access doors, and pulling of fan shaft.

C. Ductwork: Duct connections at each unit to allow for straight and smooth airflow. No turns are to be installed at the fan discharge which are in the opposite direction to fan wheel rotation. Provide flexible connections at duct connections to unit.

D. Piping:

1. Support piping independently of coils and with adequate flexibility to prevent undue stress at coil header connections.

2. Install full size drain lines from the drain pan connection to nearest floor drain and include trap to permit condensate to drain freely. The cooling coil condensate drain piping should be suitably configured and trapped to allow the condensate to drain while the air handling unit is in operation.

3. Install service valves on both supply and return lines to coils and install so valves can be shut off, a small section of pipe removed, and coil allowed to slide out. This condition applies to water and steam coils only.

END OF SECTION 237313

SECTION 23 81 26 - SPLIT SYSTEM A/C UNITS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Air-cooled, split system air conditioning units to be by Carrier, Trane, York, or specifically approved equal.

B. Manufacturers both listed above and proposed alternates to review the allowable space for the indoor units considering service access, filters access and refrigerant and condensate piping to ensure adequate clearance exists for their units prior to submitting bid. Contractor shall not be allowed an extra should the low bidder prove to have unacceptable clearance.

C. Manufacturer to submit for approval all evaporator and condensing unit matches showing a balance diagram indicating refrigerant suction pressure and proposed refrigerant line sizes. Under no circumstances shall an evaporator/condensing unit match be selected less than 36 degrees F. Attention to be given to units where significant lengths (heights) exist between evaporator and condensing unit locations.

PART 2 PRODUCTS

2.01 CONDENSING UNITS

A. Units to have capacity scheduled on drawings and be complete with the following:

1. Capacitor start and relay.
2. Indoor fan relay.
3. Liquid line filter dryer.
4. Short cycling prevention (Solid State).
5. Solid brass service valves.
6. Crankcase heaters.
7. High and low refrigerant pressure switches.
8. Current and thermal compressor overloads.
9. Winter start and condensing pressure control to allow operation in ambient to 0 degrees F.
10. Fully weatherproof casing, galvanized steel, zinc phosphatized, and finished with enamel. Provide with screened or louvered coil guards.
11. Control transformer.
12. Five-year compressor warranty.
13. Automatic changeover thermostat.

2.02 EVAPORATOR UNIT

A. Units to be capacity matched with condensing units and complete with following:

1. Forward curved, double inlet supply fan mounted on motor shaft, dynamically and statically balanced. Fan motor to be multi-speed, factory lubricated, have internal overload protection, and be resiliently mounted.
2. Cooling coil of nonferrous tubing with mechanically bonded aluminum plate fins with all joints brazed. Coil to have factory installed refrigerant metering device, refrigerant mechanical joint line fittings, and condensate pan.

3. Factory installed electric heater. All heaters to be equipped with thermal overload device, current overload for heaters 10 kw and required heating and cooling system controls including 60-va control circuit 24-volt transformer. Low voltage connection to be point-to- point on terminal board.
4. Factory insulated unit enclosure constructed of cold-rolled steel, bonderized and finished with baked enamel. Front access panels to provide access to all components. Filter rack to accept 1 inch thick filters.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install evaporator and condensing unit to allow space for service, maintenance, and airflow requirements.

B. Provide flexible duct to evaporator connection.

C. Install in compliance with manufacturers' recommendations.

END OF SECTION 238126

SECTION 26 05 37 - OUTLET BOXES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide each fixture, switch, receptacle, communication devices, and other wiring devices with a galvanized outlet box of appropriate size and depth for its particular location and use unless indicated otherwise.

1.02 SUBMITTALS

A. Submittals are not required for items furnished under this section.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Outlets and junction boxes shall be Steel City or approved substitute.

B. Provide 4" square x 1-1/2" deep boxes for switches and receptacles in drywall partitions. Use square cut plaster rings of proper gauge and depth.

C. Provide 4" x 1-1/2" octagonal boxes for ceiling outlets. For increased cubic capacity provide 4" x 2-1/8" octagonal, 4" x 1-1/2" square or 4" x 2-1/8" square boxes for ceiling outlets.

D. Provide 4" x 3-1/2" octagonal concrete rings with removable back plates and fixture studs for ceiling outlets in prestressed or reinforced concrete slabs.

E. Provide 2-1/2" x 3-3/4" one gang masonry boxes for switches and receptacles installed in concrete block walls not plastered. For increased cubic capacity provide 3-1/2" x 3-3/4" one gang masonry boxes. Where more than two conduits enter the box from one direction, provide 4" square boxes with square cut device covers not less than 1" deep specifically designed for this purpose. Use round edge plaster rings only if the block walls are to be plastered. Use sectional or gangable type outlet boxes only in dry wall construction.

F. For all systems boxes, provide 4-11/16" square outlet boxes with square cut device corners for block walls or round edge plaster rings for plastered walls. Single gang device boxes are not acceptable.

G. Permanent barriers shall be furnished in multi-gang boxes if the voltage between adjacent wiring devices exceeds 300 volts.

H. Provide galvanized malleable iron fittings with threaded hubs for screw connections and with the proper type covers for switches and receptacles served by exposed conduit. Use pressed steel outlet only for ceiling fixture outlets.

I. Provide galvanized malleable iron condulets with threaded hubs and covers and with proper configurations for all changes of direction of exposed conduits. Standard conduit ells may be used if they do not interfere or damage or mar the appearance of the installation.

J. Provide rectangular boxes for floor outlets. Boxes to be 2-gang or 3-gang, fully adjustable before and after concrete pour, Steel City No. 642-643. Cover to be Steel City No. P64-D4/P6DS, aluminum, with duplex screw cover for duplex receptacle. Carpet flange to be lexan type. Fittings to be Steel City No. SFH50, satin aluminum for high tension and Steel City No. SFH50-TEL, satin aluminum for low tension. For boxes in elevated slabs less than four inches thick, use Steel City 642 and 643-SC.

PART 3 EXECUTION

3.01 INSTALLATION

A. Locate boxes to prevent moisture from entering or accumulating within them.

B. Use boxes of sufficient cubic capacity to accommodate the number of conductors to be installed. See Article #370 of the latest edition of the National Electrical Code.

C. Effectively close unused openings in boxes with metal plugs or plates.

D. Set recessed boxes so that front edges are flush with finished surfaces.

E. Secure boxes to surfaces upon which they are mounted or embed boxes in concrete or masonry. Support boxes from structural members with approved braces.

F. Install blank device plates on outlet boxes left for future use.

G. Provide bushings in holes through which cords or conductors pass.

H. Install boxes so that the covers will be accessible at all times.

I. Outlet boxes in walls shall not be mounted back to back. Where drawings show outlets on both sides of the same wall, the boxes shall be staggered sideways and connected with short nipples to prevent passage of sound. Where outlets are mounted on both sides of same fire wall they are to be staggered a minimum of 24 inches to maintain the ratings of the wall.

J. Where required to hang a specified fixture, provide a fixture stud of the no-bolt, self-locking type on ceiling outlets.

END OF SECTION 260537

SECTION 26 24 16 - PANELBOARDS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide circuit breaker type panelboards as indicated on drawings and as specified in this section.

B. Refer to drawings for numbers of branch circuits, their ratings, number of poles, arrangements, etc.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS/EQUIPMENT

A. Provide panelboards by Square D, ABB, Siemens, or Eaton. Square D type designations are used to indicate type and quality of panelboards.

B. Lighting panelboards for 120/208-volts, 3-phase, 4-wire service shall be Square D type NQ.

C. Power panelboards for 120/208-volt, and 480/277-volt, 3-phase, 4-wire service shall be Square D I-Line distribution type.

D. Lighting and power panelboards and their associated circuit breakers shall be furnished with a short-circuit current rating greater than the available fault current shown on the panel schedules.

E. Series rated panelboards are not acceptable.

F. Provide panelboards of circuit breaker, dead-front safety type, UL labeled and meeting all applicable requirements of the National Electrical Manufacturers Association.

G. Provide panelboards with lugs (both main lugs and branch circuit lugs) suitable and UL approved for aluminum and copper 75 degree C rated conductors.

H. Provide shunt trip and GFI breakers where indicated on panel schedule.

I. Provide electrically isolated neutral bars.

J. Provide separate ground bars complete with lugs or connectors on bar.

K. Provide panelboards with sequence phased bus bars or distributed phase bussing for: [3-phase, 4-wire, 277/480-volts wye and 120/208-volts wye].

L. Provide panel doors equipped with chrome-plated locks and catches, all keyed alike. Provide two keys for each lock. Provide fronts with adjustable indicating trim clamps.

M. Provide thermal magnetic circuit breakers which are fully rated and temperature rated for a 40 degree C ambient. Breakers shall be quick-make, quick-break type with trip indication shown by handle position other than ON or OFF and with a common trip on all multi-pole breakers.

N. Where specific panelboard types, breaker types, or adjustable breaker devices are shown on the drawings, and the contractor elects to use another manufacturer or type, contractor will be responsible for additional cost incurred by the designer for evaluation of breaker coordination.

PART 3 EXECUTION

3.01 INSTALLATION

A. Ground separate ground bars to panel boxes and to the main service entrance ground bus with a code-sized grounding conductor installed in the same conduit as the phase and neutral conductors.

B. Install all circuits which use a common neutral in accordance with the latest edition of the National Electrical Code, Article Nos. 210-4, 210-5, 215-4, and 220-4d. Balance all circuits to achieve not greater than 10% unbalanced neutral current in panel feeders.

C. Provide six circuit breaker handle lock-on devices for each lighting panelboard for installation by the contractor on circuits as directed by the Owner to prevent unauthorized personnel from turning off circuits to controls, unit heaters, clocks, night lights, etc. Turn the spare lock-on devices over to the Owner for his use.

D. Provide typed directory cards mounted under plastic on the doors of all panelboards. The directories shall indicate the type of devices being served, including the space number or space names in which the devices or fixtures are located.

E. Provide engraved Bakelite nameplates for all the circuit breakers in use on power panelboards. Indicate the device, panel, or motor being served with 1/4" high letters. Provide nameplates without engraving for the spare breakers and/or spaces. Secure all nameplates to the panelboard trim with two roundhead sheet metal screws.

F. Provide engraved Bakelite nameplates on the visible face of all lighting and power panels indicating the panel designation in 3/8" letters. Secure the nameplates with a minimum of two round-head sheet metal screws. Normal power nameplates shall be black and emergency power nameplates shall be red.

G. Provide 7 sets of final as-built drawings for the panels after delivery of the panels for distribution by the Owner.

END OF SECTION 262416

SECTION 26 27 26 - WIRING DEVICES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide switches, receptacles, device plates, and other wiring devices as indicated on drawings.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers include Leviton, Hubbell, Eagle, Arrowhart, Pass and Seymour, and Bryant. Leviton numbers are used for clarity.

2.02 SWITCHES

A. 20-Amp, 120/277 VAC:

1. Single pole: Leviton No. 1221-2W.
2. Three-way: Leviton No. 1223-2W
3. Single pole, weatherproof: Leviton No. 1221-2W with Steel City No. SW1-C weatherproof plate.
4. Single pole with pilot light (120 VAC): Leviton No. 1221-PLC.
5. Momentary contact switch: Leviton No. 1257.

B. Dimmers shall be universal (LED/CFL/MLV/Incandescent) slide dimmers equal to Leviton DSM10-1LZ.

2.03 RECEPTACLES

A. 20-Amp, 125-VAC, NEMA 5-20R:

1. Duplex type: Leviton No. 5362-W (white).
2. Ground fault circuit interrupter: Leviton No. MGFN2-W (white).
3. GFCI Duplex type, heavy-duty industrial grade, Weather and Tamper-Resistant: Leviton G5362-WTW (White).
4. Weatherproof “In Use”, extra-duty type cover: Leviton 5980-UCL.
5. Duplex type, heavy-duty industrial grade, Weather and Tamper-Resistant: Leviton TWR20-W (White).

2.04 MISCELLANEOUS DEVICES

A. Twist lock receptacle: Hubbell No. 23000-HG series or approved substitute.

B. Flush dryer receptacle, 30-amp, 125/250 VAC: Leviton No. 5207 with No. 84028 plate.

C. Flush range receptacle, 50-amp, 125/250 VAC: Leviton No. 5206 with No. 84028 plate.

D. Clock outlet: Leviton No. 5261CH.

2.05 DEVICE PLATES

A. Provide Leviton Series 84 stainless steel or approved substitute. Provide cast alloy or stamped metal plates on all exposed switches and receptacles.

PART 3 EXECUTION

3.01 INSTALLATION

A. Mounting:

1. Mount all switches 46" above the finished floor to centerline of switch unless noted otherwise.
2. Mount all receptacles 18" above the finished floor to centerline of receptacle unless noted otherwise.
3. Mount weatherproof receptacles vertically.
4. Work devices to nearest block course using proper type outlet boxes as specified under [**Section 26 05 37**]. Check architectural and furniture drawings for counter (desk, special booth etc.) locations. Mount devices above work counters. Verify other special mounting conditions and locate devices as required.

B. Polarity: Properly wire all convenience outlets so that the hot wire, the neutral wire and the ground wire connect to the proper terminal on all receptacles.

C. Grounding: Install all receptacles in boxes specified under [**Section 26 05 37**], and install a No. 12 green ground wire from device grounding terminal back to the grounding bus in the panelboard and bond to outlet box.

D. Receptacles shown on the drawings as "special mounting height" shall be installed at mounting height as indicated on drawings. Where no mounting height is given and receptacles are above counters (or casework), they shall be mounted with centers 4" above top of counter. If the counter has a backsplash, receptacles shall be mounted with centers 4" above top of backsplash. Where special mounting height receptacles are not above counters and no mounting height is indicated, receptacle mounting heights shall match adjacent light switches or above counter receptacles. The Contractor shall coordinate the installation of all special mounting height receptacles with architectural design.

E. Install device plates in full contact with wall surface. Plates shall not project out from the wall.

F. Install device plates in full contact with surface-mounted box. Plates shall not project out from the edge of the box.

END OF SECTION 262726

SECTION 26 28 18 - SAFETY SWITCHES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide horsepower-rated, quick-make, quick-break, safety switches provided with the number of poles and fuses as required.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS/EQUIPMENT

A. Safety switches shall be as manufactured by General Electric, Square D Company, Cutler-Hammer, or approved substitute.

B. For 208- and 240-volt circuits, use general-duty type switches with Class R fuse clips. For 480-volt circuits, use heavy-duty type switches with Class R fuse clips.

C. Switches shall have arc shields, shall be of enclosed construction and fusible or non-fusible as indicated. Switches shall be rated for either 250-volt AC or 600-volt AC service as required.

D. Safety switches for all part-winding or two-speed motors requiring remote disconnect to be similar to Square D Series HLL-660, six-pole.

E. Switches shall have Electrical Interlock Kit with one normally open and one normally closed contact.

F. All switches shall be capable of interrupting locked rotor current of motor which it serves.

G. Enclosures to be NEMA-1 for interior use and NEMA-3R for exterior use unless noted otherwise.

H. Provide dual-element Bussman type FRN (250 volt) or type FRS (600 volt) fuses for any fusible safety switch serving a motor circuit.

I. For non-motor loads, provide dual element Bussman type LPN (250 volt) or type LPS (600 volt).

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide non-fusible switches at remote motor locations (raintight where required) as indicated on drawings.

B. Provide fusible disconnects at package A/C units, fused as specified on unit nameplate.

C. Mount switches to walls or adjacent to equipment enclosures using unistruts with a minimum of four bolts using toggle anchors for masonry construction, Phillips "Red Head" anchors for poured concrete construction and bolts, jumbo washers, lock washers and nuts for equipment enclosure mounting.

D. All safety switches to be identified with Bakelite nameplates.

END OF SECTION 262818

SECTION 26 29 13 - INDIVIDUAL STARTERS AND CONTROLS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide conduit, wiring and electrical connections to motors, safety switches, starters, relays, electrical interlock circuits, valves, unit heaters, fan coil units, pumps, air handling units, etc., complete and ready for operation. The Division 26 contractor shall review the electrical requirements of other sections and divisions of these specifications and drawings and provide the required power and control wiring.

B. Provide starters as shown on mechanical drawings and as scheduled on Electrical Drawings except custom designed starter such as chiller machine, those physically mounted on the unit such as a deaerator, or any piece of equipment where starter is furnished as an integral part of the equipment.

C. Starters shall be installed by Division 26 but provided by Division 23 or other divisions.

D. Control Wiring:

1. Division 23 shall furnish and install line- and low-voltage control wiring, including conduit, conductors, and terminations for same. Division 23 shall also furnish and install control components associated with the line- and low-voltage control systems and shall wire and connect components in accordance with approved wiring diagrams.

2. Division 26 shall furnish and install power wiring including conduit, conductors, and terminations to motors, safety switches, starters, relays, valve and damper actuators, and other components requiring power as indicated on the electrical drawings, by the specifications, and in accordance with approved wiring diagrams. Division 26 shall also furnish and install starters as scheduled on the electrical drawings.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS/MATERIALS

A. Starters shall be as manufactured by Square D, G.E., Cutler-Hammer, or approved substitute.

B. Starters used on 208-volt systems shall have two cartridge fuses in the control circuit.

C. Starters used on 480-volt systems shall have an individual 480/120-volt control transformer with two cartridge fuses in the primary and one in the secondary.

D. All starters to be provided with melting alloy overloads.

E. Starters used inside shall have **NEMA 1** enclosures; starters used in damp locations or exposed to the weather to have NEMA 3R enclosures.

F. Manual Motor Starter with Heater Unit: Square D Class 2510.

PART 3 EXECUTION

3.01 INSTALLATION

A. Connect all pumps, fans, and heating and air-conditioning equipment and have equipment complete and ready for operation. Contractor shall be responsible for checking with equipment manufacturer to obtain exact requirements. Electrical drawings showing mechanical requirements are diagrammatic only to indicate size, type, number of control items, and approximate location.

B. A short section of flexible conduit shall be used at each motor. Watertight flexible conduit shall be used on any motors in damp or exterior locations.

C. Flexible metallic conduit for motor connections shall be 1/2" minimum size.

D. **Identify starters and controls as required by Section 26 01 00.**

END OF SECTION 262913

SECTION 26 33 25 - EMERGENCY BATTERY POWER STATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. **All work specified in this section shall comply with the provisions of Section 26 01 00.**

B. Provide emergency battery power stations for AC power in the event of generator failure. Power station to be designed to transfer its rated load from conventional power lines to built-in invertor upon failure of normal power source. Size, location/s, voltage, etc., as specified on the drawings.

C. Unit to be an emergency power supply intended for use with lighting loads. It shall provide line voltage and frequency to incandescent and/or fluorescent lighting loads during normal power-on conditions. Upon power failure conditions, unit to transfer load from line to self-contained batteries and thereafter provide **120**-volt AC current for a period of 90 minutes minimum. Upon restoration of normal power, load to be transferred back to AC line. Batteries to be recharged to their full capacity and unit to remain on standby.

D. Cabinet to be designed for recessed or surface mounting as shown on drawings. Surface cabinets to have legs a minimum of 4 inches. Provide a door hinged from left side. Flange supporting door is 4" wider and 4" taller than cabinet. Indicating lights, meter, and test switch to be mounted on door without opening. Door to be suitably marked to indicate functions of the various indicating lights, meter, etc.

1.02 RELATED WORK

A. [**Section 26 51 00: Interior Lighting and Lamps.**]

1.03 SUBMITTALS

A. Submit dimensioned drawing of room in which the unit will be installed.

B. Submit complete brochures indicating all accessories and components.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Battery power stations to be equal to Trystar, Iota or approved equal. Numbers shown on drawings are Trystar numbers.

B. Numbers shown are Trystar numbers. **ELC-1500** surface-mounted, battery system which provides **120**-volts AC power in the event of power failure. Power station to be designed to transfer its rated load from conventional power lines to a built-in invertor upon failure of normal power source.

C. Transfer Relay (Incandescent and Fluorescent load): A double-pole, double-throw relay to be provided to switch both sides of load from the AC input to the AC invertor contained within the equipment. Relay is activated by either an open circuit or short circuit on incoming line. An additional output to be provided so that a portion of the load may be energized only upon power failure. Relay to contain a time delay (minimum 5 seconds) on retransfer from emergency back to normal.

D. Battery Charger: Battery charger to be completely automatic maintaining batteries in fully charged condition. Battery charger to signal completion of charge by an indicating light. Battery charger to periodically sample battery and replace any loss as loss occurs. During period between samples, battery charger to apply no voltage or current to batteries and shall apply a slight load.

E. Visual Indicator: Provide three pilot lights each a different color. A green pilot light to indicate unit is receiving power; amber pilot light to indicate battery charger is charging batteries; red pilot light to indicate when load has been transferred to batteries.

F. Batteries: Batteries to be of Long-Life nickel cadmium lead calcium nickel cadmium type requiring no water for ten years with a warranted life of twenty years and an expected life of twenty years. Batteries to have sufficient reserve capacity for operation of system for 90 minutes after twenty years' service. Batteries to be mounted so that electrolyte level may be seen from the front of the cabinet.

G. Inverters: Inverters to produce total wattage required at **120**-volt, 60-cycle sine wave with maximum of 10% THD. Inverters to pick up full rated load of incandescent, fluorescent, and HID lamps without damage. Short circuit protection to be provided so that inverters can work into a direct short without damage. Peak to R.M.S. voltage ratio not to exceed 1.414. Output voltage to be regulated so that under light, or no loads, maximum output voltage shall not exceed **128** volts R.M.S. Switch that energizes inverters to be solid state with no moving parts in low voltage system. Inverter to have 2 outputs, one normally on and one normally off per schematic wiring on drawings. Provide branch circuit breakers on output of unit. See drawings for number of circuits required.

H. Test Switch: A test switch accessible through front cover to be provided which, upon activation, shall transfer load from line to inverters and cause inverters to be energized from batteries.

I. Internal Switch: A switch to be provided, not accessible from exterior of unit, which removes load from the power station.

J. Load Meter: A meter to be mounted on door so that complete system can be calibrated under load after installation. Once calibrated any changes in power station or load to be immediately detected by activation of test switch.

K. Electrolyte level detector: Provisions to be made to monitor electrolyte level of one cell of battery and to sound buzzer at the time electrolyte level drops below the add water mark. Buzzer to be located where indicated on drawings and to have a Bakelite nameplate indicating "check battery water".

PART 3 EXECUTION

3.01 INSTALLATION

A. Install battery stations in accordance with manufacturers' instructions.

B. Arrange stations so that there is adequate space to accommodate removal of parts and maintenance.

C. Submit complete brochures indicating all accessories and components.

D. Submit dimensioned drawing of room in which the unit will be installed.

END OF SECTION 263325

SECTION 26 56 00 - EXTERIOR LIGHTING AND LAMPS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide labor, materials, equipment and services necessary for installation of all exterior lighting fixtures, lamps, poles, pole bases etc. for:

1. Area lighting.
2. Decorative lighting.
3. Parking lot and access roads.
4. Walkways and exterior building lights.

B. Refer to details and arrangements shown on drawings.

C. **Provide concrete bases as required for type of arrangements indicated.**

D. Concrete bases as required for type of arrangements indicated shall be installed under **Division 03**. Coordinate with other divisions for proper size of bases, anchor bolt arrangements, conduit stub-ups to pole bases, etc.

E. Fixtures, poles, and appurtenances, shall be suitable for exterior use, shall be UL listed, and shall be of standard design for intended application.

1.02 SUBMITTALS

A. Submit for approval prior to purchasing fixtures complete shop drawings and brochures including photometrics for each type of exterior lighting system specified. Shop drawings and brochures shall be specific and shall include all pertinent data and accessories. If substitute fixtures are proposed, include cuts of both specified fixture and proposed equivalent fixtures including photometrics of both fixtures.

B. If requested by **Architect**, submit a sample fixture which will be returned after inspection by **Architect**.

C. **Architect** reserves right to accept any fixture as an approved equivalent.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Lighting fixtures as indicated on Lighting Fixture Schedule.

B. Contactors and selector switches shall be Square D or approved substitute.

C. Photocells: Tork.

D. **Lighting Contactors: Square D or approved substitute.**

2.02 MATERIALS

A. Provide luminaire and pole assemblies as scheduled.

B. Luminaires, including all components, shall be designed to meet extreme temperature (low), moisture, and wind conditions in area.

C. Poles: Steel round or square, designed for wind load in the area of installation.

D. All 150-1500 watt metal halide luminaires shall be equipped with a proper ballast that is in compliance with the minimum requirements of the Energy Independence and Security Act of 2007 (EISA of 2007). Luminaires shall be marked with the circle E symbol indicating compliance with EISA.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install parking lot/roadway luminaires and poles on concrete bases. Provide all anchor bolts and bolt hole circle templates. Adjust luminaires to correct tilt and lamp all fixtures.

B. Adjust or rotate area and roadway lighting at night to maximize light utilization in intended areas.

C. **Install large area luminaires and poles on concrete bases. Provide all anchor bolts and bolt hole circle templates. Adjust luminaires to correct tilt and lamp all fixtures.**

D. Contractor to adjust or rotate area and roadway lighting at night to maximize light utilization in intended areas.

E. Bond together ground connections of luminaires to equipment grounding conductor, pole, and if present, separate 3/4" diameter x 10' copperweld ground rod driven at base of each pole.

F. Ground all luminaires to poles and all poles to equipment grounding conductor or to separate 3/4" diameter x 10' copperweld ground rod driven at base of each pole.

G. Each pole mounted outside lighting luminaire shall have its conductors spliced to the branch circuit connectors in the pole base. Provide a Tron waterproof fuse holder with time delay fuse (1.5 X luminaire current) in the pole base for each ungrounded conductor for each luminaire.

END OF SECTION 265600

SECTION 27 00 00 - GENERAL PROVISIONS FOR COMMUNICATIONS WORK

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. Applicable requirements of General Requirements/Provisions shall be considered a part of this section and shall have the same force as if printed herein full. In addition, all information related to communications infrastructure that is documented in the architectural, structural, mechanical, and electrical drawings/documents shall be included as part of the Communications documents.

1.02 QUALITY ASSURANCE

A. Specifications, Standards and Codes: All work shall be in accordance with the following:

1. The National Electrical Code (NFPA 70) as adopted by the local AHJ
2. American National Standards Institute (ANSI)
3. National Electrical Manufacturers Association (NEMA)
4. Telecommunications Industries Association (TIA)
5. Electronic Industries Association (EIA)
6. Institute of Electrical & Electronics Engineers (IEEE)
7. Underwriters Laboratories (UL)
8. American Standards Association (ASA)
9. Federal Communications Commission (FCC)
10. Occupational Safety and Health Administration (OSHA)
11. American Society of Testing Material (ASTM)
12. Americans with Disabilities Act (ADA)
13. Local city and county ordinances governing electrical work
14. In the event of conflicts, the more stringent provisions shall apply.

1.03 SCOPE

A. The work to be done under this section of the Specifications shall include the furnishing of labor, material, equipment and tools required for the complete installation of the work indicated on the Drawings or as specified herein.

B. All materials, obviously a part of the Communications Infrastructure and necessary to its proper operation, but not specifically mentioned or shown on the Drawings, shall be furnished and installed without additional charge.

C. The Drawings and Specifications are complementary to each other and what is called for by one shall be as binding as if called for by both. If a discrepancy exists between the Drawing and Specifications, the higher cost shall be included, and the engineer shall be notified of the discrepancy.

1.04 WORK INCLUDED

A. The Communications Infrastructure installed and work performed under this Division of the Specifications shall include but not necessarily be limited to the following:

B. Voice/Data Cabling Infrastructure

C. CATV Cabling Infrastructure System

D. CATV Cabling Distribution System

E. Audio-Visual Systems

F. Satellite Distribution System

G. Overhead Paging System

H. Wireless Access System

I. Nurse Call System

J. Emergency Call System

K. Patient Wandering System

L. Emergency Phones / Call Boxes

M. Low Voltage & Communications conduits, raceways, cable tray, racks, cabinets and equipment mounting boards

N. Grounding and Bonding

O. Underground raceway excavation, backfill, and compaction

P. Concrete work for duct banks, maintenance holes, handholes, vaults and restoration (where applicable)

1.05 DEFINITIONS

A. Terms: The following definitions of terms supplement those of the General Requirements and are applicable to Division 27 - Communications:

B. Provide: As used herein shall mean “furnish, install and test (if applicable) complete.”

C. Infrastructure: As used herein shall mean cable, conduit, raceway, cable tray or j-hooks with all required boxes, fittings, connectors, and accessories; completely installed.

D. Work: As used herein shall be understood to mean the materials completely installed, including the labor involved.

1.06 DRAWINGS

A. Drawings are generally diagrammatic and show the arrangement and location of pathways, outlets, support structures and equipment. The Contractor shall carefully investigate the structural and finish conditions affecting his work and arrange his work accordingly. Should conditions on the job make it necessary to make adjustments to pathways or materials, the Contractor shall so advise the Engineer and secure approval before proceeding with such work.

B. Where exact locations are required by equipment for stubbing-up and terminating conduit concealed in floor slabs, the Contractor shall request shop drawings, equipment location drawings, foundation drawings, and any other data required by him to locate the concealed conduit before the floor slab is poured.

C. Materials, equipment or labor not indicated but which can be reasonably inferred to be necessary for a complete installation shall be provided. Drawings and Specifications do not undertake to indicate every item of material, equipment, or labor required to produce a complete and properly operating installation.

D. The right is reserved to make reasonable changes in locations of equipment indicated on Drawings prior to rough-in without increase in contract cost.

E. The Contractor shall not modify the size or number of conduit runs indicated on the Drawings without the written approval of the Engineer.

F. Any work installed contrary to Contract Drawings shall be subject to change as directed by the Engineer, and no extra compensation will be allowed for making these changes.

G. The location of equipment, support structures, outlets, and similar devices shown on the Drawings are approximate only. Do not scale Drawings. Obtain layout dimensions for equipment from Architectural plans unless indicated on Communications plans.

H. Schematic diagrams shown on the Drawings indicate the required functions only. The technology of a particular manufacturer may be used to accomplish the functions indicated without exact adherence to the schematic Drawings shown. Additional labor and materials required for such deviations shall be furnished at the Contractor's expense.

I. Verify the ceiling type, ceiling suspension systems, and clearance above hung ceilings prior to ordering cabling and associated hardware. Notify the Engineer of any discrepancies or potential conflicts which may inhibit the completion of the specified work.

J. Review all architectural drawings for modular furniture. The contractor is not relieved of his/her responsibilities due to improper coordination. If the contractor feels they do not have the proper construction drawings in order to properly coordinate their work, they must request them of the owner, architect, engineer, or General Contractor.

K. Portions of these Drawings and Specifications are abbreviated and may include incomplete sentences. Omissions of words or phrases such as “the Contractor shall,” “shall be,” “as indicated on the Drawings,” “In accordance with,” “a,” “the” and “all are intended” shall be supplied by inference.

1.07 SUBMITTALS

A. Submit for approval, details of all materials, equipment and systems to be furnished. Work shall not proceed without the Owner and/or the Designer’s approval of the submitted items. The contractor shall supply one (1) in electronic PDF format consisting of COMPLETE BROCHURES AND SHOP DRAWINGS OF ALL MATERIALS, HARDWARE, COMPONENTS AND EQUIPMENT:

1. Submittals for individual systems and equipment assemblies that consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be considered, reviewed or stored, and such submittals will not be returned except at the request and expense of the Contractor.

2. Materials, hardware or components to be used complete the work identified must be clearly identified with a bold arrow or circle on each individual cutsheet. The submittal will be rejected without the proper identification.

3. Contractor shall generate shop drawings. Modify reviewed and accepted shop drawings to include revisions based upon completion of work. Submit shop drawings with record drawings on hard copy.

4. Shop drawings shall include equipment racks, patch panels, termination blocks, connection details, rack mounting details and any other details not included in the construction drawings.

B. Any materials and equipment listed that are not in accordance with Specification requirements may be rejected.

C. The approval of material, equipment, systems and shop drawings is a general approval subject to the Drawings, Specifications and verification of all measurements at the job. Approval does not relieve the Contractor from the responsibility of shop drawing errors. The Contractor shall carefully check and correct all shop drawings prior to submission for approval.

1.08 QUALITY ASSURANCE

A. Equipment and materials required for installation under these Specifications shall be the current model and new (less than one [1] year from the date of manufacture), unused and without blemish or defect.

B. Equipment shall bear labels attesting to Underwriters Laboratories, where subject to label service. Manufacturers of equipment and materials pertinent to these items shall have been engaged in the manufacture of said equipment a minimum of three (3) years and, if so directed by the Owner, be able to furnish proof of their ability by submitting affidavits and descriptive data about their product including size and magnitude comparable to requirements specified herein.

1.09 CONTRACTOR QUALIFICATIONS

A. The Contractor shall have total responsibility for the coordination and installation of the work shown and described in the Drawings and Specifications. The Contractor shall be a company specializing in the design, fabrication and installation of integrated communications systems.

B. Communications Systems specified shall be installed under the direction of a qualified Contractor. Qualification requirements shall include submittal by the Contractor to the Architect of the following:

1. List of previous projects of this scope, size and nature; including names and sizes of projects, description of work, time of completion and names of contact persons for reference.

2. Shall certify that they are manufacturer-authorized for work to be performed.

C. Contractor must employ at least one (1) full-time Registered Communications Distribution Designer (RCDD). The RCDD shall be a W2 employee and not a subcontractor.

D. Contractor must employ at least one (1) full-time certified Crestron programmer. The Crestron programmer shall be a W2 employee and not a subcontractor.

1.10 COORDINATION WITH OTHER TRADES

A. The Contractor shall coordinate communications work with that of other sections as required to ensure that the entire communications work will be carried out in an orderly, complete and coordinated fashion.

1.11 SITE INVESTIGATION

A. Prior to submitting bids of the project, visit the site of the work to become aware of existing conditions that may affect the cost of the project. Where work under this project requires extension, relocation, reconnections or modifications to existing equipment or systems, the existing equipment or systems, shall be restored to their original condition before the completion of this project.

1.12 PERMITS

A. Obtain all permits and inspections for the installation of this work and pay all charges incident thereto. Deliver to the Owner all certificates of said inspection issued by authorities having jurisdiction.

1.13 RENOVATIONS AND ADDITIONS

A. All work that would adversely affect the normal operation of the other portions of the Owner's property shall be done at a time other than normal working hours. Normal working hours shall be considered 8 a.m. to 5 p.m. Monday through Friday.

B. Prior to submitting bids on the project, visit the site of the work to become aware of existing conditions that may affect the cost of the project.

C. Where work under this project requires extension, relocation, reconnections or modifications to existing equipment or systems, the existing equipment or systems shall be restored to their original and operating condition. Remove all equipment indicated to be demolished, including outlets, devices, raceways and support structures.

D. Care shall be exercised in the removal and storage of equipment indicated to be relocated or removed and reused. Prior to placing back into service, equipment shall be cleaned, and marred or chipped paint surfaces touched-up.

E. Provide all coring, cutting and patching to existing walls, floors, etc., required for the removal of existing work or the installation of new work.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS

A. Where equipment is identified by manufacturer and catalog number, it shall be as the base of requirements for quality and performance. Where manufacturers for equipment are identified by name, the Contractor may submit for approval, similar equipment of other manufacturers as substitution. The Engineer's decision as to whether the submitted equipment is acceptable shall be final and binding.

B. All changes necessary to accommodate the substituted equipment shall be made at the Contractor's expense, and shall be as approved by the Engineer. Detailed drawings indicating the required changes shall be submitted for approval at the time the substitution is requested.

C. If substitutions are made in lieu of device specified; form, dimension, design and profile shall be submitted to the Engineer for approval.

D. Submit request for approval of substitute materials in writing to the Architect at least ten days prior to bid opening.

2.02 MATERIALS

A. All materials used in this work shall be new and shall bear the inspection label of Underwriters' Laboratories Inc. or certification by other recognized laboratory.

B. The published standards and requirements of the Telecommunications Industries Association (TIA), National Electrical Manufacturers Association (NEMA), the American National Standard Institute (ANSI), the Institute of Electrical and Electronic Engineers (IEEE), and the American Society of Testing Materials (ASTM), are made a part of these Specifications and shall apply wherever applicable.

C. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, for which replacement parts are available.

D. When more than one unit of the same class of equipment or material is required, such units shall be the products of a single manufacturer or partner manufacturers that offer a certified solution.

E. Components of an assembled unit need not be products of the same manufacturer, but must offer a certified end-to-end solution.

F. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.

G. Components shall be compatible with each other and with the total assembly for the intended service.

PART 3 EXECUTION

3.01 EXAMINATION OF CONDITIONS

A. Prior to the start of work, the Contractor shall carefully inspect the installed work of other trades and verify that such work is complete to the point where installation may properly commence. Start of work indicates acceptance of conditions.

B. Install equipment in accordance with applicable codes and regulations, the original design and the referenced standards.

C. In the event of a discrepancy, immediately notify the Project Manager.

D. Do not proceed with installation until unsatisfactory conditions and discrepancies have been fully resolved.

3.02 PROTECTION OF SYSTEMS AND EQUIPMENT

A. Protect materials and equipment from damage during storage at the site and throughout the construction period. Equipment and materials shall be protected during shipment and storage against physical damage, dirt, theft, moisture, extreme temperature and rain.

B. Damage from rain, dirt, sun and ground water shall be prevented by storing the equipment on elevated supports and covering the sides with securely fastened protective rigid or flexible waterproof coverings.

C. During installation, equipment shall be protected against entry of foreign matter on the inside and be vacuum cleaned both inside and outside before testing, operating or painting.

D. As determined by the Project Manager, damaged equipment shall be fully repaired or shall be removed and replaced with new equipment to fully comply with requirements of the Contract Documents. Decision of the Project Manager shall be final.

E. Damaged paint on equipment and materials shall be repainted with painting equipment and finished with the same quality of paint and workmanship as used by the manufacturer.

3.03 ACCESS TO EQUIPMENT

A. Equipment shall be installed in location and manner that will allow convenient access for maintenance and inspection.

B. Working spaces shall be not less than specified in the National Electrical Code (NEC) for voltages specified.

C. Where the Project Manager determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled, one time only, as directed by the Project Manager, at no additional cost to the Owner. “Conveniently accessible” is defined as being capable of being reached without the use of ladders or without climbing or crawling under or over obstacles such as motors, pumps, belt guards, transformers, piping and duct work.

3.04 CLEANING

A. During construction, and prior to Owner acceptance of the building, remove from the premises and dispose of packing material and debris caused by communications work.

B. Remove dust and debris from interiors and exteriors of electrical equipment. Clean accessible current carrying elements prior to being energized.

3.05 COMPLETION

A. General: Upon completion of the work, remove excess debris, materials, equipment, apparatus, tools and similar items. Leave the premises clean, neat and orderly.

B. Results Expected: Systems shall be complete and operational and controls shall be set and calibrated. Testing, start-up and cleaning work shall be complete.

C. Maintenance Materials: Special tools for proper operation and maintenance of the equipment provided under this Specification shall be delivered to the Owner.

3.06 TESTING AND VERIFICATION

A. See specific Division 27 sections for testing parameters of sub-systems.

B. The Contractor shall verify that requirements of this Specification are met. Verification shall be through a combination of analyses, inspections, demonstrations and tests, as described below.

C. Verification by inspection includes examination of items and comparison of pertinent characteristics against the qualitative or quantitative standard set forth in the Specifications. Inspection may require moving or partially disassembling the item to accomplish the verification, included as part of the work at no additional cost to the Owner.

D. The Contractor shall verify by formal demonstrations or tests that the requirements of this Specification have been met. The Contractor shall demonstrate that the communications systems, components and subsystems meet Specification requirements in the “as-installed” operating environment during the “System Operation Test.” Even though no formal environmental testing is required, the Contractor shall measure and record temperature, humidity and other environmental parameters and the environmental conditions, which were encountered during the “System Operation Test.”

E. The Contractor shall carefully plan and coordinate the final acceptance tests so that tests can be satisfactorily completed. The Contractor shall provide necessary instruments, labor and materials required for tests, including the equipment manufacturer's technical representative and qualified technicians in sufficient numbers to perform the tests within a reasonable time period.

F. The Contractor shall satisfy all items detailed in the final acceptance check-off list (punch list). The list shall be a complete representation of specified installation requirements. At the time of final acceptance punch list items shall be corrected until the system is found to be acceptable to the Owner and the Project Manager.

G. After the Contractor systems have been installed and tested, the completed test plan shall be signed by the Communications Contractor Project Manager and submitted for approval.

END OF SECTION 270000

SECTION 28 31 00 - FIRE ALARM SYSTEM

PART 1 GENERAL

1.01 SCOPE AND RELATED DOCUMENTS

A. The work covered by this section of the specifications includes the furnishing of all labor, equipment, materials, and performance of all operations associated with the installation of the fire alarm system as shown on the drawings and as herein specified.

B. The requirements of the conditions of the Contract, Supplementary Conditions, and General Requirements apply to the work specified in this section.

C. The complete installation shall conform to the applicable sections of NFPA-72, local code requirements, and National Electrical Code with particular attention to Article 760.

D. The work covered by this section of the specifications shall be coordinated with the related work as specified elsewhere under the project specifications.

1.02 QUALITY ASSURANCE

A. Each and all items of the fire alarm system shall be listed as a product of a single fire alarm system manufacturer under the appropriate category by Underwriters' Laboratories, Inc. (UL), and shall bear the UL label. All control equipment shall be listed under UL category UOJZ as a single control unit. Partial listing shall not be acceptable.

B. All control equipment must have transient protection to comply with UL864 requirements.

C. Where fire alarm circuits leave the building, additional transient protection must be provided for each circuit. Devices must be UL listed under Standard 497B, Isolated Loop Circuit Protectors.

1.03 GENERAL

A. Furnish and install a complete fire alarm system as described herein and as shown on the plans, to be wired, connected, and left in first class operating condition. Include sufficient control panel(s), annunciator(s), manual stations, automatic fire detectors, smoke detectors, alarm indicating appliances, wiring, terminations, electrical boxes, and all other necessary material for a complete operating system.

1. The fire alarm system shall allow for loading and editing special instructions and operating sequences as required. The system shall be capable of on-site programming to accommodate system expansion and facilitate changes in operation. All software operations shall be stored in a non-volatile programmable memory within the fire alarm control panel. Loss of primary and secondary power shall not erase the instructions stored in memory.

2. Full flexibility for selective input/output control functions based on anding, oring, noting, timing, and special coded operations shall also be incorporated in the resident software programming of the system.

B. Resident software shall allow for full configuration of initiating circuits so that additional hardware shall not be necessary to accommodate changes in, for instance, sensing of normally open contact devices to sensing of normally closed contact devices, or from sensing of normally open contact devices to sensing a combination of current limited and non-current limited devices on the same circuit and being able to differentiate between the two, or changing from a non-verification circuit to a verification circuit or vice-versa.

C. Resident software shall also allow for configuration of indicating appliance and control circuits so that additional hardware shall not be necessary to accommodate changes in, for instance, changing a non-coded indicating appliance circuit to a coded circuit, or from a slow march time (20 BPM) to a fast march time (120 BPM).

D. The system shall have the capability of recalling alarms and trouble conditions in chronological order for the purpose of recreating an event history.

E. All panels and peripheral devices shall be the standard product of a single manufacturer and shall display the manufacturer's name on each component. The catalog numbers specified under this section are those of Simplex Time Recorder Company and constitute the type, product quality, material, and desired operating features.

F. If equipment of another manufacturer is submitted for approval, the contractor shall state how much is to be deducted from his base bid for the substitution, and also shall state what, if any, specific points of system operation differ from the specified points of the system operation. This differentiation report must reference every paragraph of this specification.

1.04 OPERATION

A. The system alarm operation subsequent to the alarm activation of any manual station, automatic detection device, or sprinkler flow switch shall be as follows:

1. All audible alarm indicating appliances shall:

a. Sound a continuous fire alarm signal until silenced by the alarm silence switch.

b. Sound a selective positive non-interfering successive zone code. Interference of this code shall not be permitted until a completed transmission of its assigned number of rounds. Should coding be completed, a continuous master code or march time pattern shall sound until silenced by the alarm silence switch at the **control panel**.

c. Sound a march time pattern until silenced by the alarm silence switch at the **control panel**.

d. Sound a master code until silenced by the alarm silence switch at the [**control panel**][**remote annunciator**]. The master code will consist of a common code, e.g., 4-4-4.

2. All visible alarm indicating appliances shall flash continuously until **the system is reset**.

3. Any subsequent zone alarm shall reactivate the alarm indicating appliances.

4. All doors normally held open by door control devices shall release after no time delay.

5. A supervised signal to notify **an approved central station** shall be activated.

6. The mechanical controls shall activate the air handling systems in accordance with NFPA 90.

B. Upon reset of the fire alarm control panel, air handling units shall sequentially start up to minimize power demand.

C. The alarm shall be displayed on an 80 character LCD display. The top line of 40 characters shall be the point label and the second line shall be the device type identifier. The system alarm LED shall flash on the control panel and the remote annunciator until the alarm has been acknowledged. Once acknowledged, this same LED shall latch on. A subsequent alarm received from another zone shall flash the system alarm LED on the control panel and remote annunciator. The LCD display shall show the new alarm information.

D. A pulsing alarm tone shall occur within the control panel and the remote annunciator until the event has been acknowledged.

E. The alarm activation of any elevator lobby smoke detector shall, in addition to the operations listed above, cause the elevator cabs to be recalled according to the following sequence:

1. If the alarmed detector is on any floor other than the main level of egress, the elevator cabs shall be recalled to the main level of egress.

2. If the alarmed detector is on the main egress level, the elevator cabs shall be recalled to the predetermined alternate recall level as determined by the local authority having jurisdiction.

F. The activation of any system smoke detector shall initiate an alarm verification operation whereby the panel will reset the activated detector and wait for a second alarm activation. If, within one (1) minute after resetting, a second alarm is reported from the same or any other smoke detector, the system shall process the alarm as described previously. If no second alarm occurs within one minute, the system shall resume normal operation. The alarm verification shall operate only on smoke detector alarms. Other activated initiating devices shall be processed immediately. The alarm verification operation shall be selectable by zone.

1. The control panel shall have the capability to display the number of times (tally) a zone has gone into a verification mode. Should this smoke verification tally reach a pre-programmed number, a trouble condition shall occur.

2. Alarm verification zones shall be able to be divided into eight separate groups whereby only verification zones from the same group will confirm the first activation and cause the alarm sequence to occur.

G. The control panel shall have a dedicated supervisory service LED and a dedicated supervisory service acknowledge switch.

1. The activation of any standpipe or sprinkler valve supervisory (tamper) switch shall activate the system supervisory service audible signal and illuminate the LED at the control panel **and the remote annunciator**. Differentiation between valve tamper activation and opens and/or grounds on the initiation circuit wiring shall be provided.

2. Pressing the supervisory service acknowledge key will silence the supervisory audible signal while maintaining the supervisory service LED "ON" indicating the off-normal condition.

3. Restoring the valve to the normal position shall cause the supervisory service LED to extinguish, indicating restoration to normal.

4. **Restoring the valve to the normal position shall cause the supervisory service audible signal to pulse indicating the restoration to normal position. The supervisory service acknowledge key shall silence the audible signal.**

H. The alarm activation by either a manual or an electrically-operated coded station shall pulse the alarm indicating appliance to follow that code. The coded input signal shall take priority over all other input signals. All other alarm inputs shall be processed accordingly after coding is completed. If PNIS code is interrupted, it must be restarted and completed in its entirety without missing any portion of the code. Activation of control circuits for door release and air handling system shall not be delayed.

I. A manual evacuation (drill) switch shall be provided to operate the alarm indicating appliances without causing other control circuits to be activated. However, should a true alarm occur, all alarm functions would occur as described previously.

J. The system shall have a single key that will allow the operator to display all alarms, troubles, and supervisory service conditions including the time of each occurrence.

K. All doors normally held open by door control devices shall release upon AC power failure.

L. The actuation of the "enable walk test" program at the control panel shall activate the "walk test" mode of the system which shall cause the following to occur:

1. The city circuit connection shall be bypassed.
2. Control relay functions shall be bypassed.
3. The control panel shall show a trouble condition.
4. The panel shall automatically reset itself after signaling is complete.
5. Any momentary opening of an initiating or indicating appliance circuit wiring shall cause the audible signals to sound for four seconds indicating a trouble condition.

1.05 SUPERVISION

A. The system shall contain **Class "B", Style "B"** independently supervised initiating device circuits. The alarm activation of any initiation circuit shall not prevent the subsequent alarm operation of any other initiation circuit.

B. There shall be supervisory service initiation device circuits for connection of all sprinkler valve supervisory (tamper). Device activation shall cause a supervisory alarm at the control panel.

C. There shall be 2 independently supervised and independently fused indicating appliance circuits for alarm **chimes**. Disarrangement conditions of any circuit shall not affect the operation of other circuits.

D. Auxiliary manual controls shall be supervised so that an "off normal" position of any switch shall cause an "off normal" system trouble.

E. Each independently supervised circuit shall include a discrete LCD readout to indicate disarrangement conditions per circuit.

F. The incoming power to the system shall be supervised so that any power failure must be audibly and visually indicated at the control panel **and the remote annunciator**. A green "power on" LED shall be displayed continuously while incoming power is present.

G. The system batteries shall be supervised so that a low battery condition or disconnection of the battery shall be audibly and visually indicated at the control panel **and the remote annunciator**.

H. The system modules shall be electrically supervised for module placement. Should a module become disconnected, the system trouble indicator shall illuminate and the audible trouble signal shall sound.

I. The system shall have provisions for disabling and enabling all circuits individually for maintenance or testing purposes.

J. **Wiring to a hardwired (non-serial) remote annunciator shall be supervised for open and ground conditions. A separate annunciator trouble LCD readout must be provided. It shall illuminate and an audible trouble signal shall sound at the control panel upon the detection of an open or ground condition.**

K. There shall be independent supervision for opens of the air handling on/off/auto switch control output wiring. A discrete trouble LCD readout per output circuit will be provided for indication. A ground condition of the air handling control output wiring shall indicate a common ground trouble on the control panel.

1.06 POWER REQUIREMENTS

A. The control panel shall receive 120 VAC power (as noted on the plans) via a dedicated fused disconnect circuit.

B. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal 120 VAC power in a normal supervisory mode for a period of **twenty-four (24)** hours with 15 minutes of alarm operation at the end of this period. The system shall automatically transfer to the standby batteries upon power failure. All battery charging and recharging operations shall be automatic.

C. All external circuits requiring system operating power shall be 24 VDC and shall be individually fused at the control panel.

PART 2 PRODUCTS

2.01 FIRE ALARM CONTROL PANEL - SIMPLEX TYPE 4100-8001

A. Control panel construction shall be modular with solid-state, microprocessor-based electronics. It shall display only those primary controls and displays essential to operation during a fire alarm condition. Keyboards or keypads shall not be required to operate the system during fire alarm conditions.

1. A local audible device shall sound during alarm, trouble, or supervisory conditions. This audible device shall sound differently during each condition to distinguish one condition from another without having to view the panel. This audible device shall also sound during each keypress to provide an audible feedback to ensure that the key has been pressed properly.

B. The following primary controls shall be visible through a front access panel:

1. Eighty character liquid crystal display.
2. Individual red system alarm LED.
3. Individual yellow supervisory service LED.
4. Individual yellow trouble LED.
5. Green "power on" LED.
6. Alarm Acknowledge key.
7. Supervisory Acknowledge key.
8. Trouble Acknowledge key.
9. Alarm Silence key.
10. System Reset key.

C. The following secondary control switches and LEDs shall be available behind an access door:

1. City disconnect/switch.
2. Manual evacuation (drill).
3. Elevator bypass.
4. Door holder release bypass.
5. Future.

D. The control panel shall provide the following:

1. Setting of time and date.

2. LED testing.
3. Alarm, Trouble, and Abnormal condition listing.
4. Enabling and disabling of each monitor point separately.
5. Activation and deactivation of each control point separately.
6. Changing operator access levels.
7. Walk Test enable.
8. Running diagnostic functions.
9. Displaying software revision level.
10. Displaying historical logs.
11. Displaying card status.
12. Point listing.

E. For maintenance purposes, the following lists shall be available from the point lists menu:
1. All points list by address.
2. Monitor point list.
3. Signal/speaker list.
4. Auxiliary control list.
5. Feedback point list.
6. Psuedo point list.
7. LED/switch status list.

F. Scrolling through menu options or lists shall be accomplished in a self-directing manner in which prompting messages shall direct the user. These controls shall be located behind an access door.

G. Primary Keys, LEDs, and LCD Display:
1. The control panel shall have a 2 line x 40 character liquid crystal display which shall be backlit for enhanced readability. So as to conserve battery standby power, it shall not be lit during an AC power failure unless an alarm condition occurs or there is keypad activity.
2. The display shall support both upper and lower case letters. Lowercase letters shall be used for softkey titles and prompting the user. Uppercase letters shall be used for system status information. A cursor shall be visible when entering information.

2.02 SYSTEM FRONT PANEL OPERATION AND CAPABILITIES

A. Under normal condition, the front panel shall display a "System is Normal" message and the current time and date.

B. Should an abnormal condition be detected, the appropriate LED (Alarm, Supervisory, or Trouble) shall flash. The panel audible signal shall pulse for alarm conditions and sound steady for trouble and supervisory conditions.

C. The LCD shall display the following information relative to the abnormal condition of a point in the system.
1. 40 character custom location label.
2. Type of device (i.e., smoke, pull station, water flow).

3. Point status (i.e., alarm, trouble).

D. Two methods of acknowledgment for each abnormal condition shall be provided. One may be chosen depending on the NFPA requirements.

1. For NFPA 72D requirements: Pressing the appropriate acknowledge button shall display the first unacknowledged condition in the appropriate list (either alarm, supervisory, or trouble), and require another acknowledge button. Press to acknowledge only the displayed point.

2. For NFPA 72A, B, or C requirements: Pressing the appropriate acknowledge button shall globally acknowledge every point in the list.

E. These acknowledge functions may be passcode protected if the user has insufficient privilege to acknowledge such conditions. A message shall indicate insufficient privilege but allow the user to view the points without acknowledging them. Should the user have sufficient privilege to acknowledge, a message will be displayed informing the user that the condition has been acknowledged.

F. After all points have been acknowledged, the LEDs shall glow steady and the Sonalert will be silenced. The total number of alarms, supervisory, and trouble conditions shall be displayed along with a prompt to review each list chronologically. The end of the list shall be indicated by an end-of-list message "END OF LIST."

G. Alarm Silencing:

1. Should the Alarm Silence button be pressed, all audible alarm signals shall cease to operate.

2. Signals shall not be silenced during alarm silence inhibit mode.

H. System Reset:

1. The System Reset button shall be used to return the system to its normal state after an alarm condition has been remedied. The LCD display shall step the user through the reset process with simple English Language messages. Messages "SYSTEM RESET IN PROGRESS" will first be displayed followed by the message "SYSTEM RESET COMPLETED" and finally "SYSTEM IS NORMAL" should all alarm conditions be cleared.

2. Should an alarm condition continue to exist the message "SYSTEM RESET IN PROGRESS" will be followed by the message "SYSTEM RESET ABORTED" and the system will remain in an abnormal state. System control relays shall not reset. The Sonalert and the alarm LED will be on. The display will indicate the total number of alarms and troubles present in the system along with a prompt to use the ACK keys to review the points. These points will not require acknowledgment, if they were previously acknowledged.

3. Should the Alarm Silence Inhibit function be active, the SYSTEM RESET key press will be ignored. The message "SYSTEM RESET INHIBITED" will be displayed for a short time to indicate the action was not taken. As feedback to the operator, the message "SYSTEM RESET NO LONGER INHIBITED" will be displayed when the inhibit function times out.

I. Function Keys:

1. Additional function keys shall be provided to access status data for the following points:

a. Initiating device circuits.

b. Indicating appliance circuits.

c. Auxiliary relays.

d. Feedback points.

e. All other input/output points.

2. The following status data shall be available.

a. Primary state of point.

b. Zone, PID and Card type information.

c. Class "A" status.

d. Current priority of outputs.

e. Disable/Enable status.

f. Verification tallies of initiating devices.

g. Automatic/Manual Control Status of output points.

h. Acknowledge status.

i. Relay status.

J. History Logging:

1. The system shall be capable of logging and storing 300 events in an alarm log and 300 events in a trouble log. These events shall be stored in a battery-protected random access memory. Each recorded event shall include the time and date of that event's occurrence.

2. The following Historical Alarm log events shall be stored:

a. Alarms.

b. Alarm Acknowledgment.

c. Alarm Silence.

d. System Reset.

e. Alarm Historical log cleared.

3. The following Historical Trouble log events shall be stored:

a. Trouble conditions.

b. Supervisory alarms.

c. Trouble acknowledgment.

d. Supervisory acknowledgment.

e. Alarm Verification tallies.

f. Walk Test results.

g. Trouble Historical log cleared.

4. Silent Walk Test with History Logging:

a. The system shall be capable of being tested by one person. While in testing mode, the alarm activation of an initiating device circuit shall be silently logged as an alarm condition in the historical data file. The panel shall automatically reset itself after logging of the alarm.

b. The momentary disconnection of an initiating or indicating device circuit shall be silently logged as a trouble condition in the historical data file. The panel shall automatically reset itself after logging of the trouble condition.

c. Should the walk test feature be on for an inappropriate amount of time, it shall revert to the normal mode automatically.

d. The control panel shall be capable of supporting up to 8 separate testing groups whereby one group of points may be in a testing mode and the other (non-testing) groups may be active and operate as programmed per normal system operation. After testing is considered complete, testing data may be retrieved from the system in chronological order to ensure device/circuit activation.

e. Should an alarm condition occur from an active point, not in walk test mode, it shall perform operations described in Section 1.4.

K. LED Supervision: All slave module LEDs shall be supervised for burnout or disarrangement. Should a problem occur, the LCD shall display the module and LED location numbers to facilitate location of that LED.

L. System Trouble Reminder: Should a trouble condition be present within the system and the audible trouble signal silenced, the trouble signal shall resound at preprogrammed time intervals to act as reminder that the fire alarm system is not 100% operational. Both the time interval and the trouble reminder signal shall be programmed to suit the owner's application.

M. Access Levels:

1. There shall be four (4) access levels with level 4 being the highest level. Level 1 actions shall not require a passcode. Passcodes shall consist of up to ten (10) digits. Changes to passcodes shall only be made by authorized personnel.

2. In order to maintain security when entering a passcode, the digits entered will not be displayed, but a cursor will move along filling the position with an X to indicate that the digit has been accepted. All key presses will be acknowledged by a local audible sound.

3. When a correct passcode is entered, the message "Access Granted" shall be displayed. The new access level shall be in effect until the operator manually logs out or the keypad has been inactive for ten (10) minutes.

4. Should an invalid code be inputted, the operator shall be notified with the message "ERROR...INCORRECT PASSCODE" and shall be allowed up to three chances to enter a valid code. After three unsuccessful tries, the message "ACCESS DENIED" shall be displayed. The level shall not be altered, and the operator shall no longer be in the menu option.

5. Access to a level will only allow the operator to perform all actions within that level plus all actions of lower levels, not higher levels.

6. The following keys/switches shall have access levels associated with them:

a. Alarm Silence

b. System Reset

c. Set Time/Date

d. Manual Control

e. On/Off/Auto Control

f. Disable/Enable

g. Clear Historical Alarm Log

h. Clear Historical Trouble Log

i. Walk Test

j. Change Alarm Verification

7. Acknowledge keys shall also require privileged access to acknowledge points. If the operator presses an (ACK) key with insufficient access, an error message will be displayed. The points will scroll with (ACK) key presses to view the points on the list, but the points will not get acknowledged in the database.

8. the aforementioned equipment. Cabinet shall be equipped with locks and transparent door panel providing freedom from tampering yet allowing full view of the various lights and controls.

2.03 REMOTE ANNUNCIATOR(S) - SIMPLEX TYPE 4603-9101

A. Where shown on the plans, provide and install an LCD annunciator. The annunciator(s) shall have a beige enamel finish and shall communicate to the control panel over one twisted shielded pair of wire and operating power shall be 24 VDC and be fused at the control panel. Point-wired annunciators will not be considered as equal. The LCD display shall mimic the LCD display on the control panel.

B. The serial annunciator shall provide a common alarm and trouble circuit consist of:

1. Control Push-Button Switches - for: alarm silence, trouble silence, system reset, and manual evacuation duplicating the control panel switches. A key "enable" switch shall be provided to activate or deactivate the control switches.

2. Tone Alert - Duplicates the control panel tone alert during alarm and trouble conditions.

3. System trouble English language display.

4. Power on LED.

5. To accommodate and facilitate job site changes, the control switches shall have the capability to be programmed on-site to provide for manual switch input operation other than their standard purpose.

2.04 MULTIPLE ADDRESSABLE PERIPHERAL NETWORK (MAPNET)

A. Communication with addressable devices. The system must provide communication with initiating and control devices individually. All of these devices will be individually annunciated at the control panel. Annunciation shall include the following conditions for each point:

1. Alarm.

2. Trouble.

3. Open.

4. Short.

5. Device missing/failed.

B. All addressable devices shall have the capability of being disabled or enabled individually.

C. Up to 127 addressable devices may be multi-dropped from a single pair of wires. Systems that require factory reprogramming to add or delete devices are unacceptable.

D. Format: The communication format must be a completely digital poll/response protocol to allow t-tapping of the circuit wiring. A high degree of communication reliability must be obtained by using parity data bit error checking routines for address codes and check sum routines for the data transmission portion of the protocol. Systems that do not utilize full digital transmission protocol are not acceptable.

E. Identification of Addressable Devices: Each addressable device must be uniquely identified by an address code entered on each device at time of installation. The use of jumpers to set address will not be acceptable due to the potential of vibration and poor contact. Device identification schemes that do not use uniquely set addresses, but rely on electrical position along the communication channel are unacceptable. These systems cannot accommodate t-tapping the addition of an addressable device between existing devices requires reprogramming all existing electrically further devices. The system must verify that proper type device is in place and matches the desired software configuration.

F. Wiring Type, Distances, Survivability, and Configurations: Wiring types will be approved by the equipment manufacturer. Existing wiring will be utilized in retrofit applications. The system shall allow a line distance of up to 2,500 feet to the furthest addressable device on a Class B circuit. (Class A communications will be provided where shown on the drawings. Wire will be so routed to maintain sufficient distance between the forward and return loop as called for by the authority having jurisdiction.) To minimize wire routing and to facilitate future additions, t-tapping of the communications channel will be supported except where Class A wiring is required.

G. Addressable Device Types:

1. General: The system control panel, must be capable of communicating with the types of addressable devices specified below.

2. TrueAlarm Addressable Detector Bases - Simplex Type 4098-9781: All addressable smoke and heat detector heads as specified below will be pluggable into their bases. The base will contain electronics that communicate the detector status (normal, alarm, trouble) to the control panel over two wires. The same two wires shall also provide power to the base and detector. Different detector heads (smoke or heat) must be interchangeable. Upon removal of the head, a trouble signal will be transmitted to the control panel.

3. Ionization Detector Heads - Simplex Type 4098-9716, TrueAlarm:

   a. The ionization type detector shall be a plug-in unit which mounts to a twist-lock base and shall be UL listed.

   b. In order to provide stability over wide changes in environmental conditions such as temperature, humidity and pressure, they will be of dual chamber type: one chamber for sampling, one chamber for reference. They will be sealed against rear airflow entry.

   c. There shall be no limit to the number of detectors, stations, or zone adapter modules, which may be activated or "in alarm" simultaneously.

   d. The detector shall fit into a base that is common with both the heat detector and photoelectric type detector and shall be compatible with other addressable detectors, addressable manual stations, and addressable zone adapter modules on the same circuit. The detector shall also fit into a non-addressable base that is capable of being monitored by an addressable zone adapter module.

e. Cover all smoke detection devices with plastic bags immediately after installation to maintain cleanliness, if field conditions so require.

4. Photoelectric TrueAlarm Sensor - Simplex Type 4098-9701:

a. The photoelectric type detector shall be a plug-in unit which mounts to a twist-lock base, and shall be UL approved.

b. The detectors shall be of the solid-state photoelectric type and shall contain no radioactive material. They will use a pulsed infrared LED light source and be sealed against rear airflow entry.

c. The detector shall fit into a base that is common with both the heat detector and ionization type detector and shall be compatible with other addressable detectors, addressable manual stations, and addressable zone adapter modules on the same circuit. There shall be no limit to the number of detectors or zone adapter modules which may be activated or "in alarm" simultaneously.

5. Addressable Thermal Detector Head - Simplex 4098-9731: Thermal detector heads must be UL listed. They will be a combination rate-of-rise and fixed temperature (135 F) type, automatically restorable.

6. Addressable Pull Stations - Simplex Type 2099-9784:

a. Addressable pull stations will contain electronics that communicate the station's status (alarm, normal) to the transponder over two wires which also provide power to the pull station. The address will be set on the station. They will be manufactured from high impact red Lexan. Station will mechanically latch upon operation and remain so until manually reset by opening with a key common to all system locks. Pull stations will be **single action**.

b. The front of the station is to be hinged to a backplate assembly and must be opened with a key to reset the station. The key shall be common with the control panels. Stations which use Allen wrenches or special tools to reset, will not be accepted. The station shall consist of high impact Lexan plastic, red in color.

c. The addressable manual station shall be capable of field programming of its "address" location on an addressable initiating circuit. The manual station shall be fitted with screw terminals for field wire attachment.

d. There shall be no limit to the number of stations, detectors or zone adapter modules, which may be activated or "in alarm" simultaneously.

e. The addressable manual station shall be UL listed.

7. Addressable Photoelectric Duct Detector TrueAlarm - Simplex Type 4098-9702 with 4098-9701 Smoke Sensor:

a. The detector shall be a non-polarized 24 VDC type which is compatible with the fire alarm panel and obtains its operating power from the supervisory current in the fire alarm detection loop.

b. Detectors shall be of the solid-state photoelectric type and shall operate on the light scattering, photodiode principle. To minimize nuisance alarms, detectors shall have an insect screen and be designed to ignore invisible airborne particles or smoke densities that are below the factory set alarm point. No radioactive material shall be used.

c. The detector head shall be directly interchangeable with an ionization detector type. The 24 VDC detector may be reset by actuating the control panel reset switch.

d. Detector construction shall have a mounting base with a twist-lock detecting head that is lockable. The locking feature must be field removable when not required. Contact between the base and head shall be of the bifurcated type utilizing spring type, self-wiping contacts. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control panel. Detector design shall provide compatibility with other normally open fire alarm detection loop devices (heat detectors, pull stations, etc.).

e. It shall be possible to alarm the duct housing by using a test switch. Simplex Type 2098-9786 test LED alarm indicator.

f. For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housings front cover.

g. To minimize false alarms, voltage and RF transient suppression techniques shall be employed as-well-as smoke signal verification circuit and an insect screen.

h. Auxiliary SPDT relays and or remote LED alarm indicators and key-operated test stations shall be installed where indicated.

8. Zone Adaptor Module - Simplex Type MAPNET II 2190-9155: Zone adapter modules shall be used for monitoring of water flow, valve tamper, Halon control panels, non-addressable detectors, and for control of evacuation indicating appliances and AHU systems:

a. An addressable interface module shall be provided for interfacing normally open direct contact devices to an addressable initiating circuit. The device shall be a Simplex Type Zone Adapter Module (ZAM).

b. ZAMs will be capable of mounting in a standard electric outlet box. ZAMs will include cover plates to allow surface or flush mounting. ZAMs will receive their 24 VDC power from a separate two-wire pair running from an appropriate power supply.

c. There shall be two types of devices:

d. For Type 1 above:

1) For conventional 2-wire smoke detector and/or contact device monitoring with class B or class A wiring supervision.

a) This type of addressable device module will provide power to and monitor the status of a zone consisting of conventional 2-wire smoke detectors and/or N/O contact devices as specified elsewhere . The supervision of the zone wiring will be. These ZAMs will communicate the zone's status (normal, alarm, trouble) to the transponder.

2) For conventional 4-wire smoke detector with Class B wiring supervision - 2190-9158.

a) This type of addressable device will provide power to and monitor the contact status of a zone consisting of conventional 4-wire smoke detectors as specified else. The ZAM will provide detector reset capability and a 2-amp fuse to provide over-current power protection for the 4-wire detector. These ZAMs will communicate the zone's status (normal, alarm, trouble) to the transponder.

e. For Type 2 above:

1) Zone Adaptor Module - Simplex Type 2190-9161.

a) For signals, speakers, fire fighter phone jacks and other device control with Class B or Class A wiring supervision.

b) This type of addressable device will provide double-pole, double-throw relay switching that can be used to connect through easily replaceable 2-amp fuses: a zone of signals to a power source, speakers to an audio source, fire fighter phone jacks to a communications channel, or activate a variety of controlled devices. The module will be available in either a Class B or Class A supervision version. In the Class B version, the wiring will be supervised by an end-of-line device. In the Class A version, the wiring will be looped back and connected to the module to allow continual operation of the controlled devices even if the wiring sustains a single break. **Class B** devices will be provided. These ZAMs will communicate the supervised wiring status (normal, trouble) to the fire alarm control panel and will receive a command to transfer the relay from the fire alarm control panel.

2) Zone Adaptor Module. For non-supervised control - Simplex Type 2190-9163. This type of addressable device will provide double-pole, double-throw relay switching for loads up to 120 VAC. It will contain easily replaceable 2-amp fuses, one on each common leg of the relay.

f. The ZAM shall be supervised and uniquely identified by the control panel. Device identification shall be transmitted to the control panel for processing according to the program instructions. Should the ZAM become non-operational, tampered with, or removed, a discrete trouble signal, unique to the device, shall be transmitted to, and annunciated at, the control panel.

g. The ZAM shall be capable of being programmed for its "address" location on the addressable device initiating circuit. The ZAM shall be compatible with addressable manual stations and addressable detectors on the same addressable initiating circuit.

9. Addressable Device Supervision:

a. All devices shall be supervised for trouble conditions. The system control panel will be capable of displaying the type of trouble condition (open, short, device missing/failed).

b. Should a device fail, it will not hinder the operation of other system devices.

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide and install the system in accordance with the plans and specifications, all applicable codes and the manufacturer's recommendations. All wiring shall be installed in strict compliance with all the provisions of NEC article 760 A and C, Power-Limited Fire Protective Signaling Circuits or if required may be reclassified as non-power limited and wired in accordance with NEC-Article 760 A and B. Upon completion, the contractor shall so certify in writing to the owner and general contractor.

1. All junction boxes shall be sprayed red and labeled "Fire Alarm." Wiring color code shall be maintained throughout the installation.

B. Installation of equipment and devices that pertain to other work in the contract shall be closely coordinated with the appropriate subcontractors.

C. The contractor shall clean all dirt and debris from the inside and the outside of the fire alarm equipment after completion of the installation.

D. The manufacturer's authorized representative shall provide on-site supervision of installation.

E. All wiring shall be installed in conduit.

3.02 TESTING

A. The completed fire alarm system shall be fully tested in accordance with NFPA-72 by the contractor in the presence of the owner's representative and the local Fire Marshal. Upon completion of a successful test, the contractor shall so certify in writing to the owner and general contractor.

3.03 WARRANTY

A. The contractor shall warrant the completed fire alarm system wiring and equipment to be free from inherent mechanical and electrical defects for a period of one (1) year from the date of the completed and certified test or from the date of first beneficial use.

B. The equipment manufacturer shall make available to the owner a maintenance contract proposal to provide required inspections and tests per year in compliance with NFPA-72, Chapter 14 guidelines.

END OF SECTION 283100

SECTION 31 0000 - EARTHWORK (SITE WORK)

PART 1 - GENERAL

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this section.

B. Earthwork included in this section is for site earthwork only (5' outside of building). See structural earthwork specification for earthwork within building footprint.

DESCRIPTION OF WORK:

A. Extent of earthwork is indicated on drawings and described herein.

1. Site grading to elevations indicated on drawings is included as part of this work.

2. Preparation of subgrade for walks, and pavements is included as part of this work.

3. Soil compaction and control is included as a part of this work.

B. Excavation of Mechanical/Electrical Work: Refer to applicable sections for excavation required in conjunction with underground mechanical and electrical utilities, backfilling of excavated trenches shall be in accordance with this section.

C. Definition: "Excavation" consists of removal of material encountered to subgrade elevations indicated and subsequent disposal or relocation of materials removed.

QUALITY ASSURANCE:

A. Codes and Standards: Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.

B. Testing and Inspection Service: ***The CONTRACTOR shall employ a testing laboratory to perform soil testing during earthwork operations. Copies of all test results shall be provided to the Engineer for approval.***

JOB CONDITIONS:

A. Existing Utilities: Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.

Contractor shall utilize the Mississippi 811 system for location of existing utilities prior to commencement of any earthwork operations. Utilities as shown on the plans are a result of the Mississippi 811 system. The design professional assumes no responsibility for the accuracy of the location of utilities as shown on the plans. The contractor shall have utilities located and marked to his satisfaction prior to commencing work.

Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shut-off of services if lines are active.

B. Use of Explosives: The use of explosives is not permitted.

C. Protection of Persons and Property: Barricade open excavations occurring as part of this work.

Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

PART 2 – PRODUCTS (Outside of Building Pad – See Structural for Interior of Building Pad)

SOIL MATERIALS:

A. Clean Free Sand Fill shall be "River Sand" or approved equal.

B. Select Fill (Borrow Excavation): All fill shall have a liquid limit less than 45 and not more than 25 and a plasticity index (P.I.) between 8 to 12.

C. Washed Gravel shall be graded clean, washed pea gravel.

D. Select on Site Material shall be non-organic material of the optimum moisture content that will allow the prescribed compaction and approved for use outside of building area by testing laboratory. No material removed as unsuitable bearing material shall be approved as select on-site material.

E. Backfill and Fill Materials: Satisfactory soil must be one of the above materials free of clay, rock or gravel larger than 2" in any dimension, debris, waste, frozen materials, vegetable and other deleterious matter.

PART 3 - EXECUTION

EXCAVATION:

A. Earth Excavation includes excavation of pavements and other obstructions visible on ground surface; underground structures, utilities and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as rock or unauthorized excavation.

B. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Engineer. ***Unauthorized excavation, as well as remedial work directed by Engineer, shall be at the contractor's expense.***

Under footings (site work), foundation bases (site work), or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom without altering required top elevation.

Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Engineer.

C. Additional Excavation: Where excavation has reached required subgrade elevations, notify Engineer who will make an inspection of conditions.

If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated material as directed by Engineer.

Removal of unsuitable material and its replacement as directed will be paid on basis of contract conditions relative to changes in work.

D. Stability of Excavations: Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.

Maintain sides and slopes of excavations in safe condition until completion of backfilling.

E. Shoring and Bracing: Provide materials for shoring and bracing in good serviceable condition.

Establish requirements for trench shoring and bracing to comply with local codes and authorities having jurisdiction. It will be the responsibility of the Contractor to ensure compliance with all regulatory agencies regarding trenching and shoring operations.

Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.

F. Dewatering: Prevent surface water from flowing into excavations and from flooding project site, surrounding area and existing building.

G. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or run-off areas. ***Do not use trench excavations as temporary drainage ditches.***

H. Material Storage: Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade and shape stockpiles for proper drainage.

Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.

Dispose of excess soil material and waste materials as herein specified.

I. Excavation for Structures: Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10', and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection. All structure excavation shall be as indicated on plan sheets.

In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate

by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.

J. Excavation for Pavements: Cut surface under pavements to comply with elevations and grades as shown on plans.

K. Excavation for Trenches: Dig trenches to the uniform width required for particular item to be installed, sufficiently wide to provide ample working room. Provide 6" to 9" clearance on both sides of pipe or conduit.

Excavate trenches to depth indicated or required. Carry depth of trenches for piping to establish indicated flow lines and invert elevations. Beyond building perimeter, keep bottoms of trenches sufficiently below finish grade to avoid freezing.

Except as otherwise indicated, excavate for exterior water-bearing piping (water, steam, condensate, drainage) so top of piping is not less than 3'0" below finished grade.

Grade bottoms of trenches as indicated, including notching under pipe bells to provide solid bearing for entire body of pipe.

Backfill trenches with concrete where trench excavations pass within 18" of column or wall footings and which are carried below bottom of such footings, or which pass under wall footings. Place concrete to level of bottom of adjacent footing. ***Density tests along trench are required along the entire length with frequency as indicated on project plans.***

Concrete is specified in Division 32.

Do not backfill trenches until tests and inspections have been made and backfilling authorized by Engineer. Use care in backfilling to avoid damage or displacement of pipe systems.

COMPACTION:

A. General: Control soil compaction during construction providing minimum percentage of density specified for each area classification indicated below.

B. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density.

1. Structures (site related), Steps, and Pavements: Compact 9” loose lifts for all layers of backfill or fill material at 98% standard proctor (ASTM D-698) within 3% of optimum moisture. Where hand-operated compaction is used 5” loose lifts shall be used.

2. Lawn or Unpaved Areas: Compact top 6" of subgrade and each layer of backfill or fill material (12” lift thickness max) at 90% maximum density.

3. Walkways: Compact top 6" of subgrade and each layer of backfill (9” lift thickness max) or fill material at 95% maximum density.

C. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, to prevent free water appearing on surface during or subsequent to compaction operations. ***Moisture control will be included in bid items. No separate payment will be established for moisture control.***

Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by disking, harrowing or pulverizing until moisture content is reduced to a satisfactory value.

D. Along Utility/Drainage Trenches: Contractor shall perform density testing at not less than one density test for each 100 feet of utility/drainage piping in areas beneath paving for each lift of earthwork/subgrade (including crushed stone). In the event that a section of utility main/drainage pipe is less than 100 feet in length, density testing shall be performed between bends/fittings and/or drainage structures. Density testing is not required in areas outside of paving unless specified otherwise on the construction plans.

BACKFILL AND FILL:

A. General: Place acceptable soil material in layers in required subgrade elevations, for each area classification listed below.

B. Outside Building Area: Use select on-site material or select fill (borrow excavation – contractor furnished) against foundation walls, under grassed areas, trenches, and piping areas not indicated to be paved shall have a minimum of 4" of topsoil.

C. Under Walks and Pavement: Use select on-site material to backfill except directly below paving (sidewalk or parking) which shall be as indicated on project plans. Cut existing grade as necessary to install subgrade as indicated on project plans.

D. Inside Building Area: For areas requiring fill within building boundaries, see Section 31 0000 (For Building Only) or Structural Plan sheets.

E. Backfill excavations as promptly as work permits, but not until completion of the following:

1. Acceptance of construction below finish grade including, where applicable, dampproofing and waterproofing.
2. Inspection, testing, approval, and recording locations of underground utilities.
3. Removal of concrete formwork.
4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials.
5. Removal of trash and debris.
6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

F. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, or break-up sloped surfaces steeper than one vertical to four horizontal so that fill material will bond with existing surface.

When existing ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.

G. Placement and Compaction: Place backfill and fill materials in layers not more than 12" outside building in loose depth for material compacted by heavy compaction equipment (sheeps foot or steel wheel vibratory roller) and not more than 6" in loose depth for material compacted by hand-operated tampers.

Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

Place backfill and fill materials evenly adjacent to structures, piping or conduit to required elevations. Take care to prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping or conduit to approximately same elevation in each lift.

GRADING:

A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated, or between such points and existing grades.

B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding.

Finish surfaces free from irregular surface changes, and as follows:

1. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10' above or below required subgrade elevations.

2. Walks: Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 0.10' above or below required sub-grade elevation.

3. Pavements: Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than 1/2" above or below required subgrade elevation.

C. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

If in opinion of Engineer based on testing service reports and inspection, subgrade or fills which have been placed are below specified density, provide additional compaction and testing at no additional expense.

FIELD QUALITY CONTROL:

A. Quality Control Testing During Construction: Allow testing service to inspect and approve subgrades and fill layers before further construction work is performed.

1. ***Paved Areas Subgrade: Make at least one field density test of subgrade for every 2000 sq. ft. of paved area but in no case less than three tests. In each compacted fill layer, make one field density test for every 2,000 sq. ft. of overlaying paved area, but in no case less than three tests.***

2. Foundation Wall Backfill: Take at least two field density tests at locations and elevations as directed.

MAINTENANCE:

A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

B. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

C. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

DISPOSAL OF EXCESS AND WASTE MATERIALS:

A. Removal from Owner's Property: Remove waste materials, including unacceptable and acceptable excavated material, trash and debris, and dispose of it off Owner's property.

END OF SECTION 31 0000

SECTION 31 31 16 - TERMITE CONTROL

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. This section includes the following for termite control:

1. Soil Treatment

2. Below slab and all foundation systems.

1.3 DEFINITIONS:

A. EPA: Environmental Protection Agency.

B. PCO: Pest Control Operator.

1.4 SUBMITTALS:

A. Product Data: Treatments and application instructions, including EPA-Registered Label.

B. Product Certificates: Signed by manufacturers of termite control products certifying that treatments furnished comply with requirements.

C. Qualifications Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

D. Soil Treatment Application Report: After application of termiticide is completed, submit report to Owner's record information, including the following as applicable:

1. Date and time of application.

2. Moisture content of soil before application.

3. Brand name and manufacturer of termiticide.

4. Quantity of undiluted termiticide used.

5. Dilutions, methods, volumes, and rates of application used.

6. Areas of application.

7. Water source for application.

E. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE:

A. Application Qualifications: A PCO who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment in jurisdiction where Project is located and who is experienced and has completed termite control treatment similar to that indicated for this Project and whose work has a record of successful in-service performance.

B. Regulatory Requirements: Formulate and apply termiticide, and label with a Federal registration number, to comply with EPA regulations and authorities having jurisdiction.

1.6 PROJECT CONDITIONS:

A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with EPA-Registered Label requirements and requirements of authorities have jurisdiction.

1.7 COORDINATION:

A. Coordinate soil treatment application with excavating, filling, and grading and concreting operations. Treat soil under footings, grade beams, and ground support slabs, before construction.

1.8 WARRANTY:

A. General Warranty: Special warranty 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. Special Warranty: Written warranty, signed by applicator and Contractor certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.

C. Warranty Period: **Five** years from date of Substantial Completion.

1.9 MAINTENANCE SERVICE:

A. Continuing Service: Provide a proposal for continuing service, including monitoring, inspection, and treatment for occurrences of termite activity, from applicator to Owner, in the form of a standard yearly (or other period) continuing service agreement, starting on the date of substantial

completion. State services, obligations, conditions, and terms for agreement period and for future renewal options.

PART 2 - PRODUCTS:

A. SOIL TREATMENT:

B. Termiticide: Provide an EPA-registered termiticide complying with requirements of authorities having jurisdiction, in a soluble or emulsible, concentrated formulation that dilutes with water or foaming agent, and formulated to prevent termite infestation. Use only soil treatment solutions that are not harmful to plants. Provide warranty required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to the product's EPA Registered Label.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Bayer Corp.; Garden & Professional Care

2. FMC Corp.; Pest Control Specialties

3. AgroEvo Environmental Health, Inc.; a company of Hoechst and Schering, Berlin.

4. American Cyanamid Co.; Agricultural Products Group; Specialty Products Dept.

5. DowElanco

PART 3 - EXECUTION:

3.1 EXAMINATION:

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of the soil, interfaces with earthwork, slab and foundation work, landscaping, and other conditions affecting performance of termite control. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION:

A. General: Comply with the most stringent requirements of authorities have jurisdiction and with manufacturer's written instructions for preparing substrate. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil and around foundations.

B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and footings. Termiticide may be applied before placing compacted full under slabs if recommended by termiticide manufacturer.

C. Fit filling hose connected to water source at the site with a backflow preventer complying with requirements of authorities having jurisdiction.

3.3 APPLICATION – GENERAL:

A. General: Comply with the most stringent requirements of authorities have jurisdiction and with manufacturer's EPA-Registered Label for products.

3.4 APPLYING SOIL TREATMENT:

A. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute the treatment evenly.

1. Slabs-on-Grade and Basement Slabs: Underground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slab are placed.

2. Foundations: Adjacent soil including soil along entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab, and around interior column footers, piers, and chimney bases; and along entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.

3. Crawlspaces: Soil under and adjacent to foundations as previously indicated. Treat adjacent areas including around entrance platform, porches, and equipment bases. Apply overall treatment only where attached concrete platform and porches are on fill or ground.

4. Masonry: Treat voids.

5. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.

B. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

C. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instruction.

D. Post warning signs in areas of application warning workers that soil poisoning has been applied. Remove signs when areas are covered by other construction.

E. Reapply soil treatment solution to areas disturbed by subsequent excavation or other construction activities following application including rain.

END OF SECTION

SECTION 32 1313.51 - CONCRETE REINFORCEMENT – PAVING

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections apply to work specified in this section.

DESCRIPTION OF WORK:

Reinforcing steel bars, welded steel wire fabric for cast-in-place concrete.

Support chairs, bolsters, bar supports, spacers, and other devices for supporting reinforcements.

QUALITY ASSURANCE:

Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified:

ACI 301 "Specifications for Structural Concrete for Buildings".

ACI 315 "Details and Detailing of Concrete for Reinforcing.

ANSI/ASTM A185 - "Welded Steel Wire Fabric for Concrete Reinforcement".

ASTM A615 - "Deformed and Plain Billet-Steel Bars for Concrete Reinforcement".

CRSI - "Manual of Practice".

CRSI 63 - "Recommended Practice for Placing Reinforcing Bars".

CRSI 65 - "Recommended Practice for Placing Bar Supports, Specifications and Nomenclature".

SUBMITTALS:

Shop Drawings; Reinforcement: Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, splicing, stirrup spacing, diagrams of bent bars, arrangement of concrete reinforcement include special reinforcement required and openings through concrete structures.

Submit an electronic (pdf) or five (5) copies of shop drawings to the Engineer that show approval of the Contractor (electronic is preferred method). The Contractor and/or steel fabricator is urged to contact the Structural Engineer to resolve any questions that might arise during preparation of the shop drawings. If it is apparent to the Engineer that the Contractor has not thoroughly checked the shop drawings prior to submittal, the Contractor will be notified to resubmit a set that has been properly checked and the previous submittal will be abandoned. Only complete sets of shop drawings will be reviewed unless an agreement to check partial submittals is obtained prior to the first submittal. Do not fabricate any material until approval of the Engineer has been obtained.

PRODUCT HANDLING: Deliver reinforcing to project site in bundles marked with metal gauges indicating contents of bundle keyed to fabrication schedule. Handle and store materials to prevent contamination and deterioration.

PART 2 - PRODUCTS

REINFORCING MATERIALS:

Reinforcing Steel: ASTM A615, Grade 60 billet-steel deformed bars, uncoated finish.

Steel Wire: ANSI/ASTM A 82, plain, cold-drawn, steel.

Welded Wire Fabric: ANSI/ASTM A 185, welded steel wire fabric.

Tie Wire: Minimum 18 gage annealed type.

Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI recommendations, unless otherwise acceptable. All bolsters, chairs, etc. to be plastic tipped.

Other Supports: Concrete bricks may be used in bottom of ground supported grade beams to support reinforcing steel.

FABRICATION:

Fabricate in accordance with ACI 315.

Locate reinforcing Splices not indicated on Drawings at points of minimum stress. Indicate location of splices on shop drawings.

PART 3 - EXECUTION

PLACING REINFORCEMENT: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces. Install vertical dowel steel before placing concrete. Provide template to assure proper location and alignment.

END OF SECTION 32 1313.51

SECTION 32 1600 – CONCRETE CURBS, GUTTERS, AND WALKS

PART 1 - GENERAL

RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work specified in this section.

DESCRIPTION OF WORK:

A. Extent of work is shown on drawings, including walks and ramps.

B. Prepared subbase is specified in "Section 31 0000 – Site Earthwork".

C. Concrete and related materials are specified in "Section 32 1300 – Cast in Place Concrete Paving and Exterior Slabs".

QUALITY ASSURANCE:

A. Codes and Standards: Comply with local governing regulations if more stringent than herein specified. Joint Sealers to be installed by approved applicator.

JOB CONDITIONS:

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required to maintain indicated parking areas during construction.

Utilize flagmen, barricades, warning signs and warning lights as required.

PART 2 - PRODUCTS

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 a non-staining form release agent that will not discolor or deface surface of concrete.

B. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric.

Sidewalks and Ramps----------6x6 10/10 W.W.M.

C. Reinforcing Bars: Deformed steel bars, ASTM A 615, Grade 40.

D. Moisture Barrier: 6 mil polyethylene.

E. Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 40. Cut bars to 2'0" length with ends

square and free of burrs.

F. Concrete Materials: Comply with requirements of applicable sections for concrete materials, admixtures, bonding materials, curing materials, and others as required.

G. Expansion Joint Material: to be asphalt impregnated 1/2" thick meeting ASTM-D-1751.

H. Expansion Joint Cap: Greenstreak #941 plastic cap for 1/2" joints.

I. Joint Sealant: Dow Corning 890 Silicone (Self Leveling) or Sonneborn Sonolastic SL-2 Sealant. Color shall be concrete. ***All joints including expansion, construction, and control shall be sealed using joint sealant.***

J. Curing and Sealing Compound: Conform to TT-C-800, with 30% solids content minimum.

K. Epoxy Resin Grout: FS MMM-G-650.

CONCRETE MIX, DESIGN AND TESTING:

A. Comply with requirements of applicable sections for concrete mix design, sampling and testing, and quality control, and as herein specified.

B. Design mix to product normal-weight concrete consisting of Portland cement, aggregate, water-reducing or high-range water-reducing admixture (super-plasticizer), air-entraining admixture and water to produce the following properties:

1. Compressive Strength: 3,000 psi, minimum at 28 days.

2. Slump Range: 8" for concrete containing HRWR admixture (super-plasticizer); 4" for other concrete.

3. Air Content: 5% to 8%.

PART 3 - EXECUTION

SURFACE PREPARATION:

A. Remove loose material from compacted subbase surface immediately before placing concrete.

FORM CONSTRUCTION:

A. Set forms to required grades and lines, rigidly braced and secured. Install sufficient quantity of forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.

B. Check completed formwork for grade and alignment to following tolerances:

1. Top of forms not more than 1/8" in 10'.

2. Vertical face on longitudinal axis, not more than1/4" in 10'.

C. Clean forms after each use, and coat with form release agent as often as required to ensure separation from concrete without damage.

REINFORCEMENT:

A. Locate, place and support reinforcement as specified in "Section 32 1313.51 – Concrete Formwork – Paving", unless otherwise indicated.

B. Moisture Barrier: Provide a 6 mil Polyethylene moisture barrier under all concrete walks.

CONCRETE PLACEMENT:

A. General: Comply with requirements of sections for mixing and placing concrete, and as herein specified. Place concrete using methods which 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. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices. Deposit and spread concrete in a continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2-hour, place a construction joint.

B. Curbs and Gutters: Automatic machine may be used for curb and gutter placement at contractor's option. If machine placement is to be used, submit revised mix design and laboratory test results which meet or exceed minimums specified. Machine placement must produce curbs and gutters to required cross-section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete.

JOINTS:

A. General: Construct expansion, weakened-plane (contraction), and construction joints true-to-line with face perpendicular to surface of concrete. Construct transverse joints at right angles to the centerline, unless otherwise indicated. When joining existing structures, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Tooled Joints: Form weakened-plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer.

C. Expansion Joints: Provide premolded joint filler for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structures, walks and other fixed objects, unless otherwise indicated. Locate expansion joints at 20' o.c., each direction for each pavement lane, unless otherwise indicated. Use load transfer-slip dowel devices 2'0" long, installed so that one end of each dowel bar is free to move. Extend joint fillers full-width and depth of joint, and not less than 1/2" or more than 1" below finished surface. Furnish joint fillers in one-piece lengths for full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together. Install expansion joint cap on premolded expansion joint material and protect until concrete has been placed on each side.
Protect top edge of joint filler cap during concrete placement. Remove protection after concrete has been placed on both sides of joint.

D. Joint Sealers: Remove plastic cap and provide joint sealant in all expansion joints and comply with manufacturers instructions.

CONCRETE FINISHING:

A. After striking-off and consolidating concrete, smooth surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.

B. After floating, test surface for trueness with a 10' straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous smooth finish.

C. Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool, and round to 1/2" radius, unless otherwise indicated. Eliminate tool marks on concrete surface.

D. After completion of floating and troweling when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:

1. Broom finish, on all sidewalks, and curb and gutters by drawing a fine-hair broom across concrete surface, perpendicular to line of traffic. Repeat operation if required to provide a fine line texture acceptable to Engineer.

2. Do not remove forms for twenty-four hours after concrete has been placed. After form removal, clean ends of joints and point-up any minor honeycombed areas. Remove and replace areas or sections with major defects as directed by Engineer.

CURING:

A. Protect and cure finished concrete walks, complying with applicable requirements of Division 32 sections. Use curing and sealing compound or approved moist-curing methods.

REPAIRS AND PROTECTIONS:

A. Repair or replace broken or defective concrete as directed by Engineer.

B. Drill test cores where directed by Engineer, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to pavement with epoxy resin grout.

C. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least fourteen days after placement. When construction traffic is permitted, maintain concrete work as clean as possible by removing surface stains and spillage of materials as they occur.

D. Sweep concrete and wash free of stains, discolorations, dirt and other foreign material just prior to final inspection.

E. ***If the Engineer determines that the installed concrete does not meet the specifications it will be the responsibility of the Contractor to drill test cores where directed by Engineer at the Contractor's expense. The Contractor will also be responsible for payment of testing by a certified testing laboratory to ensure all concrete is per the specifications. In the event that the concrete does not comply with the specifications after testing, the Contractor shall remove and replace all areas not complying with specifications and replace at no additional cost to the Owner.***

END OF SECTION 32 1600

SECTION 329300 – PLANTS, SOIL, & SOD

PART 1 GENERAL

1.1 SUMMARY

A. Extent of the planting is shown on the drawings and in the schedules.

B. Provide all labor, materials, and equipment required by or referenced from the drawings and specifications to complete the work of this section.

C. Verify plant count from plan and provide and install all plant material on plan unless site conditions prohibit.

D. All plants shall conform to or surpass minimum quality standards as defined by the American Association of Nurserymen, current edition of American Standards for Nursery Stock published by American Association of Nurserymen, Inc. and in addition shall conform to sizes and descriptions in the plant list.

E. Related work: Section 328400 – Planting Irrigation

1.2 SUBSTITUTION

A. Substitution from the specified plant list will be accepted only when satisfactory evidence in writing is submitted to the Landscape architect, showing that the plant material is not available.

B. Requests for approval of substitute plant material shall include common and botanical names and the size of substitute material.

C. Only those substitutions of at least equivalent size and having essential characteristics similar to the originally specified material will be approved. Acceptance or rejection of substitute plant material will be issued in writing by the Landscape Architect.

1.3 APPROVAL AND SELECTION OF MATERIALS AND WORK

A. The selection of all materials and the execution of all operations required under the Drawings and Specifications are subject to the approval of the Owner and Landscape Architect. They have the right to reject any and all materials and any and all work, which in their opinion, does not meet the requirements of the Contract Documents at any stage of the operations. Remove rejected Work and or materials from Project Site and replace promptly at no additional cost to the Owner.

1.4 QUALITY ASSURANCE

A. The landscape installer shall be qualified with work resulting in successful plant establishment.

B. The installer is required to maintain an experienced full-time supervisor on project site when planting is in progress.

C. Topsoil analysis shall be furnished by Mississippi State University Extension Center (Mailing Address P.O. Drawer "Z", Gulfport, MS 39502-0045) Contact Information Phone 228-865-4227, Fax: 228-868-1470 Email: harrison@ext.msstate.edu (or an equal), stating percentages of organic matter; gradation of sand, silt, and clay content; caution exchange capacity; (sodium absorption ration;) deleterious material; pH; and mineral and plant-nutrient content of topsoil.

D. A report of suitability of topsoil shall be furnished for lawn growth stating the recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory topsoil.

E. The following codes and standards shall be observed:

1. State and Federal laws, including for disease and insect control.

2. Requirements of authorities having jurisdiction.

F. A Pre-installation Conference shall be conducted 30 days prior to construction. The General contractor shall schedule this meeting to include the landscape contractor, irrigation contractor, Landscape Architect, and any other parties participating in this contract.

1.5 WORKMANSHIP

A. Install all plant materials neatly.

B. Make minor adjustments to layout as may be required and requested by Landscape Architect at no additional cost to the Owner.

C. Coordinate delivery of all plant material with time of installation to prevent any plant material from being stockpiled on site longer than 24 hours.

D. Deliver materials in such manner as to not damage or decrease the health and vigor of the plant materials. Store materials away from detrimental elements. Coordinate with General Contractor to secure a safe staging area.

E. Handle, load, unload, and transport materials carefully to avoid damage.

F. Maintain and protect plant materials as necessary to insure health and vigor.

1.6 GUARANTEE

A. Guarantee all plant materials and lawn areas for one year from the date of substantial completion. Contractor shall replace plants that fail to grow properly with plants as originally specified at the earliest practical date following plant failure, without additional charges to the Owner.

B. Replacement materials will be guaranteed for one year from the date of replacement.

C. The Contractor shall not be responsible for replacing plants which are damaged by abuse or improper maintenance by Owner as reported by Contractor outlined below or by acts of nature occurring after acceptance.

D. Acts of nature may include but may not be limited to high winds of hurricane or tornado force, sleet, hail, freezing rain and extreme cold (as determined by the Landscape Architect). Contractor agrees to replace losses due to Acts of Nature at twenty percent (20%) less than the original contract price for the damaged work.

1.7 CONTRACTOR'S PERIODIC INSPECTION

A. During guarantee period, Contractor shall make periodic inspections of the project to satisfy him that maintenance by the Owner is adequate.

B. Any methods or products which he deems not normal or detrimental to good plant growth shall be reported to the Owner in writing.

C. Failure to inspect and report shall be interpreted as approval and the Contractor shall be held responsible for any and all replacements.

1.8 SOIL TESTING

A. Contractor shall have soil tested by suitable laboratory chosen by the Contractor and subject to written approval of the Landscape Architect.

B. Soil test shall be completed in all planting areas to determine lime and fertilizer requirements. Submit test results to Landscape Architect for approval. Contractor shall adjust pH and fertility based upon results. No addition to or placement of soil is to be done prior to initial soil test report approval.

PART 2 PRODUCTS

2.1 TOPSOIL

A. Topsoil shall be fertile, friable, sandy loam and a natural surface soil obtained from well areas reviewed by Landscape Architect and possessing characteristics of representative soils in the project vicinity that produce heavy growths of crops, grass, or other vegetation.

B. Topsoil shall be free of subsoil, brush, organic litter, or objectionable weeds, clay, clots, stumps, stones, roots, or other material harmful to plant growths or hindrance to planting or maintenance operations. Should regenerative materials be present in the soil, Contractor shall eradicate and remove such growth, both surface and root, which may appear in the imported material within one year following acceptance of the work.

B. Topsoil shall not be handled in a frozen muddy condition. The acidity range shall be between 5.0 and 7.0 inclusive. The mechanical analysis of the soil shall be as follows:

Sieve Size	Percent Passing
1 inch mesh	99 - 100 percent
1/4-inch mesh	97 - 99 percent
No. 100 mesh	40 - 60 percent
No. 200 mesh	20 - 40 percent

C. Topsoil, regardless of the source, shall meet all requirements of the paragraph above.

D. Stockpile material that does not meet the requirements may, at the option of the contractor, be improved by screening and the addition of organic matter and chemical admixtures.

2.2 PLANTING SOIL MIXTURE

A. Provide soil mix amended as per laboratory recommendations. Some more specific descriptions may be given on the drawings for special planting of trees. Basic planting soil mix consists of:

40% topsoil (as described Above)
60% organic planting mix (submit sample for approval)

B. The components shall be thoroughly mixed to uniform consistency by hand or machine methods.

2.6 TREES

A. All large deciduous shade trees and ornamental trees are to be field grown from rooted cuttings true to variety and not grafted material. No grafted material will be accepted for the initial installation or as guarantee replacement material.

B. Orders for Plant Materials - Submit to Landscape Architect within 30 days from date contract is awarded to the Contractor.

C. Contractor will submit confirmed orders within ten days of tagging. Contractor is responsible for payment of deposits.

2.7 ORDERS FOR PLANT MATERIALS

A. Submit to Landscape Architect within 30 days from date of contract is awarded to General contractor confirmed orders for material from approved growers (listed on plant schedule). Contractor is responsible for payment of deposits required by approved growers.

2.8 FERTILIZER

A. Fertilizer for all trees, plants and ground covers shall be Milorganite delivered to the site in unopened containers.

B. Fertilize all areas according to the manufacturer's recommended rates in accordance with the monthly maintenance guideline herein.

C. Cultivate and water beds or pits thoroughly after application.

D. Adjust fertilizer in accordance with interim soil test reports.

2.9 FERTILIZER FOR SOD

A. Fertilizer for sod shall be Milorganite fertilizer as per manufacturer’s recommended rates.

B. Fertilizer shall be uniform in composition, dry and free flowing, and shall be delivered to the site in the original, unopened container, bearing the Manufacturer's guaranteed analysis. Fertilizer shall not have been exposed to weather prior to delivery to the site. After delivery until used, it shall be completely protected at all times. It shall not be stored in direct contact with the ground.

2.10 PLANTS

A. All plants shall conform to or surpass minimum quality standards as defined by the American Association of Nurserymen (AAN), current edition of American Standard for Nursery Stock, published by the AAN, Inc. and in addition, shall conform to sizes and descriptions in the plant list.

2.11 CERTIFICATES OF INSPECTION FOR PLANT MATERIAL

A. All necessary inspection certificates shall be supplied to the Landscape Architect's representative for each shipment of plant material, as required by law. Certificates showing source of origin shall be filed with Landscape Architect prior to acceptance of the material.

2.12 INSPECTION

A. All plant materials shall be subject to inspection and approval. The Landscape Architect reserves the right to reject any and all plants which fail to meet this specification at any point during the installation of the job. All rejected materials shall be promptly removed from the site by the Contractor at no additional cost to the owner.

2.13 QUALITY AND SIZE

A. All plant materials furnished shall be well branched, proportioned width to height, of normal habit, sound, healthy and vigorous in growth. The minimum acceptable sizes of plants shall be measured before pruning with branches in normal position and shall conform to measurements specified. Plants used where symmetry is required shall be

matched as closely as possible. Plants shall meet all requirements as listed in the plant list.

2.14 SOURCE OF PLANTS

A. Plants shall be field nursery, container grown or collected material subject to the requirements of the Specifications.

2.15 FIELD TAGGED PLANTS

A. All trees are to be located and tagged by the Contractor. The Landscape Architect retains the right to refuse all plant material that does not meet the specifications identified on the drawing.

2.16 INSECTS, PESTS AND PLANT DISEASES

A. All plants shall be of healthy stock, free from disease, insects, eggs, larvae, and parasites of an objectionable or damaging nature.

2.17 SUBSTITUTIONS

A. Substitution from the specified list will be accepted only when satisfactory evidence in writing is submitted to the Landscape Architect, showing that the plant specified is not available. Requests for approval of substitute material shall include common and botanical names and size of plant material. Only those substitutions of at least equivalent size and having the essential characteristics similar to the originally specified material will be approved. The Landscape Architect will issue acceptance or rejection of substitute plant material in writing.

B. Balled and burlapped plant materials are to be wrapped with organic wrapping burlap only. Synthetic material will not be accepted. Remove all nursery loading straps once plant material is placed in the pit.

C. Stakes for supporting trees shall be sound timber, straight, sized as shown in planting details and of sufficient length to adequately support the plant. All visible surfaces shall be painted flat black.

D. Deadmen or stakes for anchoring guy wires in the ground shall be of size, material, and strength adequate to hold guy taut and maintain tree firmly in an upright position (see plan sections).

E. Wire shall be as shown on plans applicable sections for guying.

2.18 MULCH

A. The approved mulch shall be clean, fresh, free of noxious weed, seed, fire ants, Japanese beetles and/or fringed beetles. On slopes pine straw mulch shall be used.

2.19 EROSION-CONTROL MATERIALS (PLANTING SLOPES GREATER THAN 3:1)

A. Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended 6" steel wire staples.

B. Fiber Mesh: Biodegradable twisted jute or spun-coir mesh, 0.92 lb/sq yd minimum, with 50 to 65% open area. Include manufacturer's recommended 6" steel wire staples.

2.20 SOD

A. Sod shall be 100% specified grass, free of weeds, freshly dug.

2.21 LIME

A. Ground dolomitic limestone not less than 85% total carbonates and magnesium, ground so that 50% passes 100-mesh sieve and 90% 20-mesh sieve.

PART 3 EXECUTION

3.1 LAYOUT OF MAJOR PLANTS

A. Before commencing planting operations, location of major plants and outlines of areas to be planted shall be marked out on the ground, by the Contractor for approval by the Landscape Architect. Contact the Landscape Architect a minimum of 48 hours in advance of the anticipated review of the layout.

3.2 TIME AND PLANTING

A. Planting operations shall be during favorable weather in which conditions are neither extremely cold or hot nor to the point that the risk of loss is too great. The Contractor shall inform the Landscape Architect of high risks due to weather.

3.3 PREPARATION OF PLANTING BEDS (See Planting Sections)

A. Any planting bed that has an existing tree in it shall not be tilled. Each hole is to be hand dug. No major roots are to be harmed during the planting. If the tree is harmed, the Contractor will be held responsible.

B. Grade will be brought to the level of the finished grade by the Contractor. This is to include debris removal and any grading required to bring the landscaping finished grade to the proper level for planting trees, shrubs, and ground covers. Contractor shall grade for proper drainage.

C. Circular plant pits with vertical sides shall be dug by hand or machine methods for planting and transplanting of trees and shrubs.

D. Shrub pit diameter shall be a minimum of one foot greater than the spread of the root mass.

E. All transplanted material is to be replanted the same day it is dug or properly healed in and watered regularly to insure life.

F. Test excavated plant pits to determine if sufficient drainage is present for proper plant survival.

G. Fill the area between the pits, if the individual pits are arranged in a group, to the required grade with pine bark mulch 3" deep. Plant beds shall be neatly edged and kept free of weeds until the work is accepted.

3.4 EXCAVATION FOR PLANTING GROUND COVERS

A. Ground cover beds shall be scarified by hand or machine method to a minimum depth of 18". Four inches of pine bark additive and 20 pounds per 1000 square feet of Trident Rootzone Humus (or approved equal organic fertilizer) shall be uniformly incorporated into the soil to the full 18" of minimum depth.

3.5 DRAINAGE TEST FOR TREES

A. Tree pits shall be filled with water. If percolation is less than 100% within a period of twelve hours, drill an 8" auger to a depth of 2' below the bottom of the pit. Retest the pit. In case drainage is still unsatisfactory, notify the Landscape Architect in writing of the condition before planting the trees. Contractor is fully responsible for the warranty of the trees. If the tree is on a slope, provide a trench filled with stone and a 4" drainpipe to the point of nearest relief.

B. Drainage Test for Plants and Ground Covers shall be spot tested to insure proper percolation.

C. Balled and container plants shall be placed firmly upon scarified subgrade and backfilled with planting soil mixture. Remove all wire, cords, and burlap from the top of root ball. Hand tamp carefully around and under ball to fill all voids. Water during back filling. Form saucer from planting soil mixture in order to retain water.

D. Gently loosen outer roots of container grown plants to encourage outward growth.

E. Fertilizer shall be thoroughly mixed and soaked into the top 2" of soil for all plant pits.

3.6 TREE TRANSPORTATION

A. The Contractor shall be responsible not only for the safe transportation of the plants to the site but also their condition upon arrival. Trees with abrasions of the bark, sun scalds, fresh cuts, or breaks of limbs which have not completely callused will be rejected. Trees which have been damaged during transit will be replaced by the Contractor at no additional cost. All plant unit costs will reflect all above listed specifications.

3.7 TREE TAGS

A. All plants accepted at the nursery by the Landscape Architect shall be tagged with serialized self-locking tags. Trees delivered to the site without these tags or with broken tags will be rejected. The tags shall remain on the trees until the Contractor has been given instructions by the Landscape Architect for removal.

3.8 PRUNING DECIDUOUS TREES

A. Deciduous trees and shrubs shall be pruned only to thin out heavy growth.

B. Do not top or remove terminal growing point or leader of any plant.

3.9 TREE STAKING

A. Stake or support trees as illustrated and described in the planting details on the drawings.

3.10 PREPARATION OF LAWN AREAS

A. Grade will be brought to a level of 4" below finished grade by the General Contractor. The landscape contractor will spread 2-3" of topsoil, fine grading all lawn areas to finish grade. All areas shall have smooth and continual grade between the existing and fixed controls such as walks and curbs. Roll, scarify, rake and level as necessary to obtain true, even, and firm lawn surfaces. All finished grades shall meet approval of the Project Engineer before sodden or seeding operations begin.

3.11 AREAS TO RECEIVE SOD

A. Grade will be brought to the level of the finished grade by the Landscape Contractor. The Landscape Contractor will be responsible for fine grading. This is to include debris removal and any grading required to bring the finished topsoil grade to the proper level for laying sod. Contractor shall fine grade as necessary for uniformity and drainage.

C. On this grade spread specified fertilizer as per Manufacturer's recommendations and lime at a rate of 50 lbs. per 1000 square feet evenly over all areas to receive grass. A soil test shall be made prior to the beginning of fertilizing and liming, and the quantities of the lime and fertilizer shall be adjusted, if necessary, to achieve a pH of 6.0 to 7.0.

D. Scarify prepared grade to depth of 6 inches, thoroughly incorporating fertilizer and lime into the top 6" of existing soil in all areas to be grassed. Caution shall be exercised to avoid damage to underground utilities. All building debris, vegetation, sticks and stones over 1 inch in any dimension shall be removed and the surface leveled and smoothed.

3.12 SODDING OPERATIONS

A. Delivery of sod shall be scheduled so as to allow laying of sod without delay. No sod shall remain stacked longer than 24 hours. In the event that sod cannot be laid immediately upon delivery, Contractor shall lay sod on as designated site, to be approved by the Landscape Architect. No sod shall overlap, and it shall be lightly watered as necessary to keep moist.

B. Lay sod when bed is not excessively wet or frozen, but when soil is moist for a depth of 4".

C. Lay sod so that no voids occur. Sod shall be tamped and rolled by hand methods. The completed surface shall be true to finish grade and even and firm at all points.

D. Do not move heavy objects over areas to be sodded after the soil has been prepared.

E. A satisfactory stand is defined as a cover of living grass of specified species, after true leaves are formed in which no gaps larger than five (5) inches square occur.

F. Areas determined by the Landscape Architect to be solid rock will be exempt from this requirement.

3.13 REMOVAL OF EXISTING GRASS

A. The Contractor is to remove existing grass and weeds from all areas for planting and resodding as designated on the plans. The existing stands are to be removed to a maximum depth of 1" so as to not disturb existing tree roots where present in those areas.

B. Aerate with a tined tiller to break up the upper 3" lightly not to damage tree roots. Pick up solids for discarding and cut cleanly any roots damaged.

C. Spread a light layer of topsoil not more than 1" in depth over the aerated area and fine grade to meet acceptance by the Landscape Architect. Apply fertilizer and lime to these areas as specified previously under "Areas to receive Sod" or "Preparation of Planting Beds" which ever the case may be.

PART 4 CLEANUP AND PROTECTION

4.1 SUMMARY

A. Keep Project Site clean and orderly during planting operations.

B. Clear grounds of debris, superfluous materials, and all equipment upon completion of Work. Remove from site to the satisfaction of the Landscape Architect and Owner.

C. Protect all work and materials from damage due to landscape operations and operations by other contractors, trades, and trespassers. Maintain protection until Date of Substantial Completion.

D. Contractor is responsible for theft of equipment and material at the site before, during and after installation, until Date of Substantial Completion of Work in total.

PART 5 LANDSCAPE MAINTENANCE

5.1 SUMMARY

A. Begin maintenance at commencement of Work of this Section and Continue until Substantial Completion and for thirty days after Substantial Completion of the project is issued, as part of Work of this section.

B. Provide labor, materials, equipment and means for proper maintenance of all materials on this project.

C. Contractor shall follow with maintenance methods described in these specifications.

5.2 SUPERVISION

A. Contractor shall provide quality workmanship with qualified landscape professionals to conduct the work in a manor that is satisfactory to the client.

B. The contractor shall have one point of contact for the client or client’s representative to be able to reach out to if there is an issue that needs to be addressed.

5.3 MAINTENANCE OF TREES, SHRUBS, SOD, AND SEED

A. Maintain all plants in a growing, well formed, healthy condition by watering, fertilizing, pruning, weeding, spraying, wrapping, straightening, replacement or by other necessary maintenance operations.

5.4 WATERING

A. Monitor owner's automatic watering system and schedule for proper watering of all plant material.

B. Advise Landscape Architect immediately in writing of recommended alterations due to weather or other conditions.

C. Water landscaped (and sodded) areas not covered by automatic watering system as frequently as necessary to maintain proper moisture level, using the following schedule as a guide:

1. Twice a month during March, April, May
2. Once a week during June, July, August, September
3. Seasonally adjust for Fall and Winter Months

5.5 FERTILIZING

A. Apply four (3) times a year to trees, shrubs, ground cover, and sod as per manufacturer's recommended application rate.

5.6 MOWING

A. Mow grass to a height of 2 to 2.5" when it reaches a height of 3", or as directed by Landscape Architect. Seeded and sodded lawns shall have at least one mowing before receiving Substantial Completion.

5.7 RESODDING

A. Rework and re-sod areas which fail to show a uniform stand of grass. Perform work with the same kind of sod applied and repeated until all areas are covered with a uniform stand of grass.

5.8 RESEEDING

A. Rework and seed areas which fail to show a uniform stand of grass. Perform work with the same kind of seed applied and repeated until all areas are covered with a uniform stand of grass.

5.9 SITE ANNUAL PLANTING

A. Replace annual plantings according to schedule in Drawings. Blooming plants shall be replaced as necessary throughout specified Maintenance Period to maintain blooming condition.

5.10 PRUNING

A. Remove dead wood as it becomes evident. Remove living portions of plants only at the direction of Landscape Architect.

5.11 WILT-PROOFING

A. Apply approved anti-desiccant to all evergreen trees during last two weeks in October (except pines).

5.12 SPRAYING

A. For each spraying combine approved insecticide and fungicide to provide maximum protection for all plant materials. Three sprays annually; in March, May, and August.

5.13 WEEDING

A. Two applications (Spring and Fall) of chemical pre-emergent spray, approved. Two applications (during growing season) of chemical contact spray (Round-Up, by Monsanto, or approved equal). Every other week manually weed (by hand) during the time period reflected on the maintenance schedule (ref. plans); remove all visible weeds.

5.14 MULCHING

A. Keep planting areas neat and uniformly mulched to specified depth on a continuous basis. In addition to replacing and re spreading mulch as necessitated during the maintenance period completely replenish mulch in all planting areas one time.

5.15 STRAIGHTENING

A. Maintain plants in their stable upright position and at the proper grade by straightening and tightening staking and guying apparatus and as approved by the Landscape Architect.

5.16 CLEAN-UP

A. Keep all planting areas neat, weeded and uniformly mulched on a continuous basis. Clean up adjacent walks and pavement where lettered as a result of maintenance operations, on a continuous basis.

PART 6 ACCEPTANCE AND GUARANTEE

6.1 SUBSTANTIAL COMPLETION

A. Submit written requests for inspection for Substantial Completion to the Landscape Architect at least three calendar days prior to anticipated date of inspection and testing.

B. Substantial Completion cannot be granted and at the same time no further applications for payment shall be for more than 85% of the Contract until there has been a walk - thru for planting at which time a "punch list" will be written consisting of items to be addressed and corrected by the Contractor immediately. Depending on the extent of work on the "punch list", the Landscape Architect will determine the job to be "substantially complete" or pending the completion of the "punch list".

C. Submit Record Drawings and Maintenance manuals to the Landscape Architect with written request for inspection.

D. Review the "punch list" work jointly with the Owner and Landscape Architect for Substantial Completion of the total (contract) work.

E. Upon completion of repairs and replacements found necessary at the time of review, the Owner and Landscape Architect will confirm the date of Substantial Completion and issue the written notice of Substantial Completion if all items on the punch list have been completed. If necessary, another punch list will be written to itemize any deficiencies still existing and will be attached to the written notice of substantial completion. The contractor shall complete all "punch list" items within 30 days while continuing maintenance.

F. The date of Substantial Completion will constitute the beginning date of the One - Year Guarantee. This date also constitutes the beginning of warranty responsibilities and acceptance by the Owner and Landscape Architect.

6.2 GUARANTEE

A. All work, products, equipment, and materials for one year, beginning at the Date of Substantial Completion as per the written notice of Substantial Completion.

B. Make good any damage, loss, destruction, or failure. Repairs and replacements shall be done promptly and at no additional cost to the Owner.

C. Repair damage to grade, plants, and other work, as necessary.

D. If the replacement is not acceptable during or at the end of the Guarantee Period, the Owner may elect either subsequent replacement or credit. Replacement products shall have a similar one-year guarantee from the time of replacement.

E. Guarantee applies to all unacceptable conditions or losses with exception of those due to acts of nature, vandalism, or Owner neglect, as determined by Landscape Architect. Act of Nature includes, but may not be limited to, high winds of hurricane or tornado force, sleet, hail, freezing rain and extreme cold (as determined by Landscape Architect). Contractor agrees to replace losses due to Acts of Nature at (*20%*) less than original contract price for the damaged Work.

PART 7 METHOD OF MEASUREMENT

7.1 METHOD OF MEASUREMENT

A. Plant material shall comply with these specifications and the plans in which each plant is listed and will be measured by the number of units of each kind of plant and size specified.

B. Sod shall comply with these specifications and quantified by the plans. The units of sod shall be measured in square yards.

PART 8 PAYMENT

8.1 PAYMENT

A. All of the landscape work described in these specifications and drawings shall be bid as lump sum. However, a schedule of values with unit cots for soil, bed prep, mulch, plant material, and sod shall be submitted as an attachment to the Landscape Contractor's bid.

B. Bidder shall verify quantities by his own take-off from the Drawings and notify the Landscape Architect of discrepancies before submitting his Bid.

C. Topsoil, Soil Amendments, Staking & Guying, Tree Wrapping, Mulching, and Watering during the maintenance period shall be considered a subsidiary obligation of the plant material installation and included in the bid.

END OF SECTION 329300

SECTION 33 3000 - SANITARY SEWERAGE SYSTEM (SITE WORK)

2.01 PVC SEWER PIPE INSTALLATION:

A. All pipe shall be inspected upon arrival. If any portion of a shipment is found to be defective in diameter or thickness, or found to be contaminated with fuel exhaust or any hydrocarbon material, the entire shipment shall be rejected and removed from the Project at no cost to the OWNER. Each section of pipe shall again be thoroughly inspected immediately prior to lowering it into the trench to insure that the interior is clean and to check for joint scratches, chipped ends, and imperfect gasket seats. Any and all defective pipe or fittings shall be rejected and removed from the job site. Any defective pipe or fitting discovered after the pipe is laid shall be removed and replaced with a satisfactory pipe or fitting without additional charge.

B. Handling - Pipe, fittings, manhole sections and accessories shall be loaded and unloaded by lifting with hoists or skidding so as to avoid shock or damage. Under no circumstances shall such materials be dropped. Pipe handled on skidways shall not be skidded or rolled against other pipe.

C. Care shall be taken to protect PVC pipe from prolonged exposure to direct sunlight (ultraviolet rays).

D. Excavated and Construction Materials - All excavated material and all construction materials used in prosecution of the work shall be deposited so as not to endanger the work, create unnecessary annoyance to the public, or interfere with natural drainage courses. During the progress of the work, all material piles shall be kept trimmed up and maintained in a neat, workmanlike manner.

E. Excavation and Backfilling for Sewer Pipe and Structures: Excavate in open cut all substances encountered to depth shown on drawings except where installation of cased sewer pipe is called for, if any.

1. In areas outside of existing or proposed paving, the remainder of the trench may be backfilled with select on-site soil deemed suitable for reuse by the Engineer. In areas beneath existing or proposed paving, the remainder of the trench shall be backfilled with select fill (borrow excavation – contractor furnished) consisting of a PI between 8 and 12 with a LL not more than 25.
2. Dispose of surplus material, if any, on a free-haul-off basis.
3. Maintain excavation to within plan depths.
4. Backfill any excess cuts below plan grade with washed gravel bedding, without expense to the Owner.
5. Maintain area adjacent to excavation in such a way as to avoid drainage of surface water into excavation.

6. Maintain "dry" trench and excavation by pumping, bailing, draining, or well pointing.

F. Noise, Dust and Odor Control - The CONTRACTOR's construction activities shall be conducted so as to eliminate all unnecessary noise, dust and odors. The use of oil or other material that may cause tracking for dust control shall not be permitted.

G. Installation shall be in accordance with ASTM D 2321.

H. The pipe manufacturer shall provide installation instructions and literature to the CONTRACTOR so that he will be aware of the manufacturer's recommended procedure and practice for installing the pipe and fittings. Copies of these instructions and other literature shall also be provided to the OWNER and ENGINEER. This instruction shall be included at no additional cost to the OWNER. The CONTRACTOR shall install all pipe and fittings according to the manufacturer's recommendations. The ENGINEER will not make recommendations or approve installation methods. Any failures of materials resulting from installation techniques (recommended by manufacturer or not) as well as labor associated with removal and replacement of failed materials will be the sole responsibility of the CONTRACTOR. The OWNER will not pay additional costs for failures of materials which result from installation procedures (regardless of whether or not the CONTRACTOR follows the manufacturer's installation guidelines).

I. Before laying the pipe out of the downstream manhole, any obstructions upstream of the manhole that may necessitate changing the line or grade of the pipeline shall be uncovered. The CONTRACTOR shall verify alignment, elevations, and grades prior to proceeding. The CONTRACTOR will be responsible for any necessary relaying and/or relocating of the pipe if the pipe is laid before verifying locations and elevations of known potential obstructions.

J. Pipe Trenches: Excavate trench to width of 6" minimum clearance and 9" maximum clearance each side of barrel of pipe.
1. Curve rounded trench bottom so that an arc equal to one fourth of outside of circumference of pipe rests on undisturbed material and/or bedding.
2. Cut bell holes accurately to size.
3. Safeguard all underground cables, lines, pipes, and conduits in excavation.
4. Perform hand excavation adjacent to existing lines and services .
5. Assume all responsibility for damages to persons property arising from disruption of underground features.
6. If interference between sewer and existing facility is encountered, notify Engineer so that provisions can be made for adjustment in a timely manner.
7. Conform to Engineer's instruction on adjustment of sewer line or otherwise.

K. Bedding: Class "B" bedding will be standard for this project, unless special bedding is authorized.

1. Replace any unstable soil encountered at plan depth with Class "B" bedding material upon authorization of Engineer.
2. Class B bedding shall consist of a 2 inch cushion of sand shaped with a template to a concave saddle in compacted or natural earth to such a depth that 15 percent of the height of the pipe rests on the sand cushion below the adjacent ground line.

L. Trench Support - Unsupported open cut for sewers will not be permitted where trenching may cause unnecessary damage to street pavement , trees, structures, poles, utilities, or other private or public property or where safety dictates. During the progress of the work, whenever and wherever it is necessary, the CONTRACTOR shall, at his expense, support the sides of the excavation by adequate and suitable sheeting, shoring, bracing, or other approved means. Such trench support material and equipment shall remain in place until backfilling operations have progressed to the point where the supports may be withdrawn without endangering persons or property. Sheeting shall be left in place only if so directed on the Plans. In such cases, the CONTRACTOR shall cut off the sheeting at the depth indicated on the Plans and remove the upper portion. If all the sheeting is to be removed, it shall be removed without causing damage to the pipe. No sheeting, shoring, or bracing will be paid for by the OWNER unless left in place according to the Plans or on written order of the ENGINEER.

M. Alignment and Grade - A laser shall be used for horizontal and vertical control of the sewer. Line and grade stakes shall be placed at 25 feet and 50 feet from the downstream manhole and then placed at every 100 foot station to the next manhole and used to verify alignment and grade. The laser unit shall be set up in such a manner that the alignment of the beam is through the pipe directly on the centerline of the pipe or outside the pipe directly above and parallel to the centerline of the pipe. If solvent-welded joints are used (or if chemical vapors from other sources are present in the pipe) and the laser unit is set up to aim through the pipe, a blower shall be used to provide positive continuous air circulation within the pipe to minimize deflection of the laser beam. A target shall be established on line and grade at each line and grade stake to check the setting of the laser beam as construction progresses. Also, the alignment of the pipe shall be checked at each line and grade stake by measuring horizontally from the stake to the centerline of the pipe, and the grade shall be checked with a level instrument and a grade pole set on the invert of the pipe. The CONTRACTOR shall ensure that the grade pole is vertically plumb when checking pipe grade.

N. Pipe Laying - The laying of sewer pipe on the prepared bed in finished trenches shall commence at the lowest point with the spigot ends pointing in the direction of flow. All pipe shall be laid with ends abutting and true to line and grade as shown on the Plans. Pipe sections shall be carefully fitted, matched and aligned so that they will form a sewer with a smooth and uniform invert when laid in the trench. In no case will the supporting of pipes on blocks be permitted.

O. No backfilling (except for securing pipe in place) over pipe will be allowed until the ENGINEER has had an opportunity to make an inspection of the joints, alignment and grade, in the section laid, but such inspection shall not relieve the CONTRACTOR of further

liability in case of defective joints, misalignment caused by backfilling and other such deficiencies that are noted later.

P. Backfilling: Backfill with material free from clods and rubble.
1. Backfill evenly and tamp layers not to exceed 6" in thickness until two feet of cover exists over pipe. Backfill shall achieve 98% Standard Proctor Density.
2. Backfill remainder of trench and adjacent to sewer structure in 9" layers (use 4" layers if utilizing hand operated tamping equipment), using mechanical tamping equipment on each and every layer to achieve a Standard Proctor Density of 98% or greater. All unsuitable material from trench shall be loaded into trucks and hauled off-site. ***In areas beneath existing or proposed paving, backfill material shall consist of a select fill material (borrow excavation – contractor furnished) with a liquid limit less than 25 and plasticity index between 8 and 12. In areas outside of existing or proposed paving, the contractor may utilized on-site soils if deemed suitable for reuse by the Engineer.***
3. Flooding and/or jetting is prohibited.
4. Special compaction is required where new or replacement paving is scheduled.
5. Compaction tests shall be performed on each and all layers by a certified testing lab. **Compaction tests shall be performed at no more than 400 feet apart or between manholes (whichever comes first) on sewer main lines and no more than 100 feet apart on sewer service lines if under paving (compaction tests not required on sewer service lines outside of paving areas). All compaction tests shall be paid for by the contractor at no expense to the owner.**

Q. Care should be taken to prevent flotation of the pipe in the event the trench should flood as well as when placing bedding material around the pipe.

R. Dewatering - Should water be encountered, the CONTRACTOR shall furnish and operate suitable pumping equipment of such capacity adequate to dewater the trench. The trench shall be sufficiently dewatered so that the laying and joining of the pipe is not performed in water. The CONTRACTOR shall convey all trench water to a natural drainage channel or storm sewer without causing any property damage.

S. The interior of the pipe shall be clean and dry as the work progresses. Whenever pipe laying operations are not in progress, the exposed end of the pipe shall be sealed with a plug or bulkhead fitted into the pipe bell, so as to exclude earth, water, or other material. During excavation and backfilling, the exposed end of the pipe should be blocked to prevent excavated material or backfill material from entering the pipe. A watertight plug or bulkhead shall also be installed and maintained in the most downstream manhole of the project throughout construction to prevent dirt, rocks, muddy water, or other debris from entering the existing sewer system. This plug or bulkhead shall <u>not</u> be removed until all the sewer has been installed, cleaned, tested, and accepted, unless directed otherwise by the ENGINEER.

T. If a length of pipe is cut to fit in a line, it shall be cut according to the manufacturers recommendations to leave a smooth end at right angles to the longitudinal axis of the pipe.

U. No fittings (except service wyes and repair couplings) shall be allowed in gravity sewers. Open ends of wyes shall be plugged or sealed until service laterals are installed.

V. Pipe Joints - Preparatory to making pipe joints, all joint surfaces shall be cleaned of all dirt, dust, and foreign matter and shall be dry, smooth and free of imperfections before placing jointing materials (ie. gaskets, lubricants, primers, adhesives, etc.). Gaskets, lubricants, primers, adhesives, or other jointing materials shall be used as recommended by the pipe or joint manufacturer's specifications. Generally, lubricants, primers and adhesives shall be placed on both the bell and spigot portions of the joint. The pipe shall then be placed, fitted, joined, and adjusted in such a workmanlike manner as to obtain the degree of water tightness required. In the event that pipe previously laid is disturbed due to any cause, it shall be removed and relaid.

W. Joints that show leakage will not be accepted. If after backfilling and inspection, any joints are found to be allowing groundwater to enter the sewer, such joints shall be sealed by the CONTRACTOR at no cost to the OWNER.

X. Protection of Trees - Special care shall be taken to avoid damage to trees and their root system. Machine excavation shall not be used when, in the opinion of the ENGINEER, it would endanger the trees. In general, where the trench falls within the limits of the limb spread, headers are required across the trench to protect the tree. The operation of all equipment, particularly when employing booms; the storage of materials; and the deposition of excavation shall be conducted in a manner that will not injure trees, trunks, branches or their roots unless such trees are designated on the Plans for removal.

2.02 PVC PLASTIC GRAVITY SEWER PIPE AND FITTINGS:

A. Solid wall PVC sewer pipe through 15" diameter shall be ASTM D3034. Solid wall PVC sewer pipe 18" diameter and larger shall be ASTM F679, Type I. Both types of solid wall PVC sewer pipe shall have ASTM D 3212 integral bell and spigot rubber gasketed joints. Pipe shall be SDR 26 for sizes up to 15 inch for all depths. Pipe shall be ASTM F679 PS 115 for sizes 18 inch and greater for all depths. Gasketed fittings shall conform to the same specifications and be supplied with the pipe.

B. All pipe shall be suitable for use as a gravity sewer conduit. Provisions must be made for contraction and expansion at each joint with a rubber ring. The bell shall consist of an integral wall section with a solid cross section rubber ring factory assembled, securely locked in place to prevent displacement. Pipe shall be supplied in lengths ten feet or greater. All pipe spigots shall have a "Home" mark to facilitate joint closure.

C. A manufacturer's certificate that the PVC material and pipe was manufactured and tested in accordance with the appropriate ASTM specification shall be furnished to the ENGINEER prior to installation of the pipe.

D. Pipe intended to be straight shall have a maximum deviation from straightness of 1/16 inch per linear foot when measured in accordance with ASTM D2122.

E. All pipe and fittings will be inspected by the ENGINEER or his authorized representative immediately prior to installation and all rejected pieces must be completely removed from the project. Pipe acceptable to the ENGINEER shall be substituted for rejected pieces at the CONTRACTOR's expense. No repaired pipe or fittings will be allowed; undamaged lengths of straight pipe may be salvaged by neatly sawing off the damaged portion of the pipe.

F. Pipe must be delivered to the job site by means which will adequately support it and not subject it to undue stresses. In particular, the load shall be so supported that the bottom rows of pipe are not damaged by crushing. Pipe shall be unloaded carefully and strung or stored as close to the final point of placement as a practical. Pipe must not be exposed to the direct rays of the sun for an extended period of time. If pipe is not to be installed shortly after delivery to the job site, it must be stored in shaded location and strung as needed.

G. All PVC pipe shall be tested for deflection after backfilling is completed.

H. Fittings: The fittings shall be made of PVC plastic having a cell classification of 12454-B, 12454-C, or 13343-C as defined in Specification D 1784.

I. Pipe Marking: Each standard and random length of pipe in compliance with this standard shall be clearly marked per the following example at intervals of 1.5 m (5 feet) or less (also applicable to ASTM F679 Gravity Sewer Pipe):
   a. Manufacturer's Name or Trademark.
   b. Nominal pipe size.
   c. The legend "Type PSM SDR 26 PVC Sewer Pipe"
   d. UNI-B-4 or ASTM D 3034.

J. Workmanship: The pipe and fittings shall be homogenous throughout and free from visible cracks, holes, foreign inclusions or other injurious defects. The pipe, shall be as uniform as commercially practical in color, capacity, density and other physical properties.

2.03 PIPE JOINTS

PVC sewer pipe joints shall be elastomerically gasketed conforming to ASTM D3212 integral bell and spigot type. The CONTRACTOR shall furnish evidence of satisfactory performance of the joint for previous installations.

A. Each size joint shall be qualified to have no leakage under various test conditions in conformance with ASTM Specification D 3213, joints for drain and sewer plastic pipes using flexible elastomeric seals. The joint shall provide a positive seal against infiltration or

exfiltration. All surfaces of the joint upon which the gasket may bear shall be smooth and free of such imperfections, fractures, or cracks that could adversely affect sealability. Joints shall comply with ASTM D 3212.

B. Test Specimens - The ENGINEER or his authorized representative may initially and periodically select random sewer pipe for test purposes. The tests shall be performed on lot less than two specimens and not more than 1 percent of the total pipe length of each size and joint type required for the project.

2.04 PRESSURE SEWER PIPE AND FITTINGS

A. General
In all areas where ductile iron pipe is not specifically shown, force mains and/or pump lines may be either Class 50 or 51 ductile iron or 200 psi SDR 21 PVC pipe.

B. Ductile Iron Pipe
Pipe shall be centrifugally cast, manufactured in accordance with the ANSI Specification A21.51, of Ductile Cast Iron, Grade 6-42-10, for the required operating pressures as shown on the Plans plus surge allowance of 100 psi, for five feet maximum cover for laying condition "B". Each pipe shall be hydrostatically tested, before shipment, to a minimum of 500 psi. Minimum nominal metal thickness shall be:

Size	3"	4"	6"	8"	10"
Class 50			0.25	0.27	0.29
		Class 51	0.25	0.26	

Joints shall be push-on joint incorporating a single molded rubber ring gasket, Type II, per Federal Specifications WW-P-42lb such as "Fastite", "Tyton" or "Super Bell-Tite" unless otherwise indicated on the Plans or hereinafter in these Specifications. Pipe shall be in nominal 16', 18', or 20' lengths.
Pipe shall be furnished tar coated outside and the manufacturer's standard "Enameline" inside to comply with ANSI Specification A21.4.

C. Cast or Ductile Iron Fittings
All fittings for ductile iron pipe shall be Class 250 mechanical joint cast iron conforming to ANSI Specifications A21.10 and A21.11 or ductile iron conforming to ANSI Specification A21.51, and shall meet the current requirements for the manufacturer's standards. Fittings shown on the Plans are intended to convey the general configuration, but the contractor shall furnish all fittings required.

Each fitting shall be certified by the manufacturer to have been tested and to have met the requirements of the governing standard specifications.

All fittings shall be furnished tar coated outside and the manufacturer's standard "Enameline" inside to comply with ANSI Specification A21.4.

D. Polyvinyl Chloride Pipe

(1) Polyvinyl Chloride pipe for force mains shall be made from Type 1, Grade 1 or 2, Polyvinyl Chloride plastic as defined in ASTM Specification D 1784, "Specifications for Rigid Poly (Vinyl Chloride) Compounds.

(2) Physical Properties

The pipe shall conform to Commercial Standard CS-256-63 or ASTM Specification D 2241-80 "Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR and Class T)" as it applies to Type I, Grade 1 or 2 Polyvinyl Chloride plastic pipe, SDR 21, water pressure rating of 200 psi at 23° C (72.4° F).

(3) Joints

The joints for pipe 1-1/2 inch in diameter and larger shall be push-on (bell and spigot) joints designed so that the pipe and fittings may be connected on the job without the use of solvent cement or any special equipment. The push-on joint shall be a single rubber gasket joint designed to be assembled by the positioning of a continuous, molded, rubber ring gasket in an annular recess in the pipe or fitting socket and the forcing of the plain end of the entering pipe into the socket, thereby compressing the gasket radically to the pipe to form a positive seal. The gasket and the annular recess shall be so designed and shaped that the gasket is locked in place against displacement as the joint is assembled. Details of the joint design and assembly shall be in accordance with the joint manufacturer's standard practice. The joints shall be designed so as to provide for the thermal expansion or contraction experienced with the total temperature change of at least 75° F in each joint per length of pipe. Joints shall comply with ASTM-D3139.

Joints for fittings shall be of the push-on type as described above unless otherwise noted or directed by the Engineer. Solvent welded type joints shall be allowed on certain types of valves, fittings and piping connections 3-inch and smaller in diameter. Generally solvent weld joints shall be limited to certain assemblies that can be pre-assembled in the shop and then installed together as a unit in the field. Examples include the ball valve and clean-out tee that form a unit in a Type A or B valve and clean-out assembly, the ball and check valve assembly that form a unit in a house service junction box, etc. Solvent cement joints shall be formed by deep-socket couplings integrally cast on the ends of the fittings or valves. Solvent cement shall conform to ASTM D-2564.

(4) Lubricant

Lubricant furnished for lubricating joints shall be non-toxic, shall not support the growth of bacteria, shall have no deteriorating effects on the gasket or pipe material, and shall not impart color, taste or odor to water. The lubricant containers shall be labeled with the manufacturer's name.

(5) Gasket

Gaskets shall meet all applicable requirements of ANSI Standard A21.11 and/or ASTM F477-76.

Gasket dimensions shall be in accordance with the manufacturer's standard design dimensions and tolerances. The gasket shall be of such size and shape as to provide an adequate compressive force against the spigot and after assembly to effect a positive seal under all conditions of joint and gasket tolerances. The trade name or trademark, size, mold number, gasket manufacturer's mark and year of manufacture shall be molded in the rubber on the back of gaskets.

Gaskets shall be vulcanized natural or vulcanized synthetic rubber. No reclaimed rubber shall be used. When two hardnesses of rubber are included in a gasket, the soft and hard portions shall be integrally molded and joined in a strong vulcanized bond. They shall be free of porous areas, foreign material and visible defects.

(6) Pipe Lengths

The pipe shall be furnished in nominal lengths of 20 feet. The pipe shall be supported at least every 10 feet of its length during all handling, and special care shall be taken to avoid placing undue stress on the pipe during handling, and any actions that may damage the bell or spigot ends of the pipe shall be avoided.

(7) Fittings

Fittings to be installed in conjunction with the low pressure force main (pumped sewer lines) shall be of the same material and quality as the pipe and have joints as described in this Section. The fittings shall be designed to withstand the same pressures required for the pipe. The supplier shall be capable of supplying fittings with combinations of spigot (plain) end and bell.

The pipe supplier shall be capable of supplying special pieces for use in connection PVC pipe to cast or ductile iron pipe.

(8) Marking of Pipe

As a minimum, the pipe shall have the following data applied to each piece:

1. Nominal Size
2. Type of Material
3. SDR or Class (color coded)
4. Manufacturer
5. NSF (National Safety Foundation seal of approval)
6. Quality Control Code

2.05 SEWER SERVICE CONNECTIONS, WYES, AND RISERS:

A. New service connection fittings and lines shall be six (6) inch diameter as supplied by the manufacturer of the gravity sewer pipe unless required otherwise by ENGINEER. All fittings located on the lateral shall be incidental and not be a separate pay item. Laterals shall be PVC or ABS according to ASTM D3034 or ASTM D2751, respectively, unless otherwise shown. Minimum wall thickness shall be SDR 35 for installations less than 16 feet in depth, and SDR 26 for installations from 16 to 25 feet in depth.

B. Minimum slope for lateral service lines shall be one percent (1.0%). All specifications for gravity sewer lines and appurtenances shall apply to lateral service lines.

C. Service laterals to be extended from main sewers over twelve feet (12') in depth where the property being served does not require the full depth, may be brought up to grade in the manner described for riser pipe. Service laterals from main sewers less than 12 feet in depth will be extended on a straight uniform grade from the main to the point of terminus. Depths of service laterals at the point of termination will be shown on the Plans or supplied by the ENGINEER. All sanitary sewer laterals shall be installed at least four feet (4') below the existing or proposed basement floor elevation at the point of connection to the sewer main. Service laterals shall be extended to the right-of-way line or easement line, as applicable, unless otherwise shown on the plans or directed by the ENGINEER. Laterals shall not exceed a depth of twelve feet (12') below finish grade at the end of the lateral at the right-of-way or easement line unless specifically authorized by the ENGINEER.

D. WYE BRANCHES:

1. Location: In general, wye branches shall be placed in the main sewer opposite each lot or property to which a house service may be extended.

2. Existing Sewers: Where a wye branch is to be installed in an existing sewer, the CONTRACTOR will be permitted to tap the sewer pipe and install the wye as directed by the ENGINEER. Wyes shall only be installed on the type of pipe for which they were designed. Wyes shall be approved by the ENGINEER.

3. Wyes shall be of the same material, strength, and joint as the sewer main pipe.

4. Where the wye branch is not designed for use with ABS or PVC service pipe, appropriate adapters shall be used to connect the lateral to the wye branch.

E. RISER PIPE:

Where the cover on the wye branch is in excess of twelve feet below average ground surface, a 45 degree bend and sufficient riser pipe (also installed at a 45 degree slope) shall be added to terminate at a depth of twelve feet below the ground surface, provided the property being served will not require additional depth.

F. CLOSURES:

1. Where no riser pipe or lateral is installed with the wye branches, the outlet of each wye branch shall be securely sealed with a restrained water tight closure that can be later removed without damage to the outlet.

2. ABS or PVC: All closures at the ends of ABS or PVC wye branches, risers or service laterals shall be made by installing a length of ABS or PVC pipe to the wye branch, riser or service lateral and solvent cementing an ABS or PVC cap to the spigot end. A sufficient length of pipe should be installed to permit removal of the closure and extending the line in the future. Mechanical plugs shall not be permitted.

3. All closures shall be capable of passing the sewer leakage test(s).

G. WYE POLES:

1. A wye pole shall be placed at the end of each wye branch, riser, or house service, as the case may be, extending to a point 6 inches below the end of the pipe to hold it firmly in position during backfilling. If the wye pole is pulled out, bent, or broken, the CONTRACTOR shall, at no cost to the OWNER, replace or straighten the pole. The wye pole shall be adjacent to the end of the pipe but not above it or against it.

2. Material: Wye poles shall be not less than a standard 2 x 4 and shall extend a minimum of 3 feet above the finished grade. The material used for wye poles shall be in good condition and shall be straight, sound and free from large or loose knots.

2.06 AIR RELEASE VALVES AND PITS:

A. Automatic sewage type air release valves and pits shall be installed on the force main at all high points in the lines as shown on the Plans. The exact location of air release valves shall be determined in the field by the ENGINEER.

B. Air release valves shall be the short version of Apco Model 400, Crispin 520, or equal.

Valves shall be 2-inch inlet diameter and shall be fitted with proper size of orifices. The body and cover shall be of cast iron, the trim shall be brass and the float shall be of stainless steel. The valves shall be suitable for use in lines having a maximum water pressure of 200 psi. The valve shall be supplied with backwash accessories.

C. Pits shall be pre-cast or built in place, complete with frame and cover, connecting galvanized steel piping, cutoffs, blowoffs and all accessories. Submittals shall be reviewed by the ENGINEER prior to placement in the field.

2.07 PRECAST CONCRETE MANHOLES:

A. Precast concrete manholes shall consist of reinforced riser sections, an eccentric cone or flat slab top section, and a base section, all conforming with details as shown on the Plans.
B. Precast reinforced concrete sections shall meet the requirements of the latest edition of ASTM Designation C-478, and shall not have more than two (2) holes for the purpose of handling.
C. Joints for precast sections shall be concrete pipe type and shall be sealed with preformed joint compound or rubber gaskets. Preformed joint compound shall meet Federal Specification SS-S00210(210-A) and AASHTO Specification M-198; rubber gaskets shall meet ASTM Designation C-443.
D. Manhole steps shall be coated corrosion resistant PS-2 steps as manufactured by M.A. Industries, Inc., Peachtree City, Georgia, "Surefoot" rubber encased steps as manufactured by Oliver Tire and Rubber Co., or approved equal.
E. Manhole frames and covers shall meet the requirement of ASTM Designation A-48 for "Gray Iron Castings, Class 25".
F. Flexible manhole pipe connectors shall be Kor-N-Seal as manufactured by NPC Systems, Inc.; Press Wedge II as manufactured by Press-Seal Gasket Corporation, or approved equal and shall meet ASTM Designation C-923.

2.08 PRECAST PUMPING STATIONS OR WET WELLS:

A. Precast concrete pumping stations or wet wells shall consist of reinforced riser sections, a flat slab top section, and a bottom, either poured at the job site by the Contractor or precast by the Manufacturer, all conforming with details as shown on the Plans.
B. Precast reinforced concrete sections shall meet the requirements of the latest edition of ASTM Designation C-478, and shall not have more than two (2) holes for the purpose of handling.

C. Joints for precast sections shall be concrete pipe type and shall be sealed with preformed joint compound or rubber gaskets. Preformed joint compound shall meet Federal Specification SS-S00210 (210-A) and AASHTO Specification M-198; rubber gaskets shall meet ASTM Designation C-443.

2.09 LINING FOR PUMPING STATIONS AND MANHOLES:

A. General:
1. All interior barrel and joint surface areas, which will be exposed to sewer liquids and gases, shall be prepared, coated, and cured as necessary to complete the installation of a coal tar epoxy lining in each concrete pipe section and manhole section, at the concrete pipe manufacturer's plant.
2. Waterproofing of manholes shall be performed using Xypex Crystalline Concrete Waterproofing **ONLY**. No other methods or equals shall be used for lining concrete manholes and pumping stations. See Appendix "A" for specifications on Xypex Crystalline Concrete Water Proofing.

B. Surface Preparation: All precast concrete units shall be prepared for lining by removing all laitance, form oil, and other loose, foreign, or deleterious materials which would adversely affect the bond of the lining compound to the pipe surface. Specifically, surface preparation shall consist of sandblasting and cleaning the barrel of the pipe and the joint surface areas on which coatings will be applied. Under no circumstances shall the lining be applied on "Green" concrete. All surfaces to be coated shall be essentially free of voids, cracks, inclusions or other structural defects. Any such defects shall be corrected by bagging or brushing the wet formed concrete and/or cement grouting the cured section. All grouting must be allowed to thoroughly cure before any coating is applied. The surfaces shall not be extremely rough or deeply textured nor shall they bear exposed aggregate. All mortar fins, concrete splatter and other protrusions shall be removed by appropriate means. Prior to applying specified coatings, the concrete surface shall be clean and properly prepared as specified herein and shall be dry to the extent that the surfaces to be coated are visibily dry and the concrete contains no greater than ten percent (10%) moisture as determined by measurement with a suitable moisture meter.
1. Surfaces to be coated shall be clean and dry. All grease, oil, dirt, salts and other foreign matter shall be removed by steam or detergent cleaning. Any such areas shall be allowed to thoroughly dry before any further surface preparation is performed. All surfaces to be coated shall be uniformly brush sandblasted to the extent that all loose or unsound concrete and latants are removed. All necessary precautions shall be employed to avoid excessive sandblasting so that a uniformly blasted concrete surface is produced that is clean and lightly etched. All blasted concrete surfaces shall be patched with an epoxy structural paste adhesive, if required, and have the prime coat applied within eight (8) hours and before surface

contamination or moisture absorption can occur. In order to avoid damaging previously applied coatings, work shall be scheduled such that complete concrete units are sandblasted and coated.

C. Application:
1. The pipe surface areas to be lined shall be blown off with air to remove all sand, dust and other loose materials immediately prior to application of the lining compound. The lining compound shall not be applied when the ambient temperature of below 40°F. The compound shall not be applied under adverse atmospheric conditions that will cause detrimental blistering, pinholing, or porosity of the film.
2. The coating shall be applied by the airless spray method, in three (3) coats, consisting of a primer, four (4) mils minimum dry film thickness, followed by two (2) coats each with a minimum dry film thickness of ten (10) mils, for a total minimum dry film thickness of twenty-four (24) mils.
3. The complete coating system shall be free of excessive runs, sags, drips, cracks, crazing, alligatoring, blisters, inclusions, excessive or deficient film thickness, voids, pinholes or other holidays, damaged area or any other defects. Any such deficiencies shall be corrected by removal and recoating. Depending upon air circulation and relative humidity conditions, the coating system should be cured sufficiently hard so that the pipe can be handled with minimal damage.

D. Surface Testing, Film Testing and Inspection: Surface temperature shall be determined with an appropriate dial thermometer. Pipe moisture content shall be determined by an appropriate moisture meter to assure proper condition of the surface before applying coatings. The primer and finish coats shall be inspected for continuity, pinholes, bore areas and holidays, with a non-destructive field-calibrated sparking holiday detector. Dry film thickness shall be determined with a non-destructive dry film gauge. All instruments shall be as recommended by the coating supplier.

E. Touch-Up and Repair: Excessive runs, sags, dips, cracks, crazing, alligatoring, blisters and inclusions shall be completely removed by suitable scraping, chipping, or grinding. Loose or poorly bonded coating and improperly cured coating shall be completely removed to a sound substrate by grinding or sandblasting. Excessive film thickness shall be reduced to below 24.0 mils by grinding or sandblasting. All deficient areas shall be wiped free of all surface contamination using clean rags soaked in specified thinner and the cleaned areas shall be allowed to dry. The deficient area shall then be thoroughly abraded and the abrasion shall be "feathered" out slightly beyond the perimeter of the affected area. Small areas may be abraded by hand or power tool sanding using medium grit garnet or sandpaper. Extensive areas may be abraded by uniform brush sandblasting. All necessary precautions shall be

employed, including temporary shielding where required, to protect adjacent coatings from damage curing sandblasting operations. All abraded areas shall be thoroughly swept clean and the specified coating applied the same day and before contamination can occur. The prepared areas shall then be primed and finish coated as specified, except that all coating may be applied unthinned and by brush. All coating shall be "feathered" out to the edge of the abraded area. The pipe shall be visually inspected at the job site before installation.

2.10 SEPARATION OF WATER AND SEWER MAINS:

A. Horizontal and Vertical Separation: Sewers shall be laid at least 10 feet horizontally from any existing or proposed water main. The distance shall be measured edge to edge. In cases where it is not practical to maintain a 10 foot separation, the appropriate reviewing agency may allow deviation on a case-by-case basis, if supported by data from the design engineer. Such deviation may allow installation of the sewer closer to a water main, provided that the water main is in a separate trench or on an undisturbed earth shelf located on one side of the sewer and at an elevation so the bottom of the water main is at least 18 inches (460 mm) above the top of the sewer.

If it is impossible to obtain proper horizontal and vertical separation as described above, both the water main and sewer must be constructed of slip-on or mechanical joint pipe complying with public water supply design standards of the agency and be pressure tested to 150 psi (1034 kPa) to assure watertightness before backfilling.

B. Crossings: Sewers crossing water mains shall be laid to provide a minimum vertical distance of 18 inches (460 mm) between the outside of the water main and the outside of the sewer. This shall be the case where the water main is either above or below the sewer. The crossing shall be arranged so that the sewer joints will be equidistant and as far as possible from the water main joints. Where a water main crosses under a sewer, adequate structural support shall be provided for the sewer to maintain line and grade. When it is impossible to obtain proper horizontal and vertical separation as stipulated above, one of the following methods must be specified:

1. The sewer shall be designed and constructed of PVC pipe and equal to water pipe, and shall be pressure tested at 150 psi (1034 kPa) to assure water tightness prior to backfilling.

2. Either the water main or the sewer line may be encased in a watertight carrier pipe which extends 10 feet (3 m) on both sides of the crossing, measured perpendicular to the water main. The carrier pipe shall be of materials approved by the regulatory agency for use in water main construction.

2.11 TESTING:

A. GRAVITY SEWER TESTING – LEAKAGE (SEWER MAINS):

All completed piping shall be tested as specified herein by low-pressure air test, exfiltration, or infiltration test after backfilling to test for leaks. The maximum leakage allowance for all sanitary sewers shall be 50 gallons per inch diameter per mile of pipe per 24 hours. If the level of the current prevailing groundwater is two feet (2') or more above the top of the sewer pipe, an infiltration test will be required. At the request of the ENGINEER, a low-pressure air test or exfiltration test will be performed instead of or in addition to an infiltration test if the ground water level is uncertain. Labor, equipment and supplies required for all tests shall be furnished by the CONTRACTOR. The CONTRACTOR shall flush and clean the sewer line to the satisfaction of the OWNER prior to testing. The ENGINEER shall witness and approve all leakage tests. In the event that the CONTRACTOR performs any test without witness by the ENGINEER, the CONTRACTOR will be required to test the section again at no cost to the OWNER. The CONTRACTOR and ENGINEER shall sign all test reports. Note that only four sections (approximately 1,200 - 1,600 feet) of sewer will be permitted to remain untested at any time.

1. Low Pressure Air Test:

After backfilling, the air test shall be conducted between two consecutive manholes. Low pressure air tests shall be in accordance with ASTM C 924, except as specified otherwise herein. All pipe outlets must be plugged in the section being tested with suitable test plugs. One of the plugs used at a manhole must be tapped and equipped for an air inlet connection for filling the line from the air compressor.

Air shall be supplied slowly to the test section until the internal pressure reaches approximately 4 pounds per square inch (psi). At least 2 minutes shall be allowed for the air pressure to stabilize. When the pressure has stabilized and is at or above 3.5 psi, the air supply shall be disconnected and timing shall begin. Timing shall continue until the pressure has dropped 1.0 psi. If the time elapsed before the pressure drops 1.0 psi is greater than the specified minimum holding time, the section shall be considered to have passed the test. If the time is less than the specified minimum holding time, the section shall be considered to have failed and must be repaired or replaced.

Minimum Holding Time shall be calculated from the following equation:
Holding Time (minutes) = 0.00037 x D2 x L / Q
where D = Pipe Diameter (inches)

L = Length of Pipe Tested (feet)

Q = Allowable Air Loss (ft3/min) from Table B.2.

An air pressure correction is necessary when the current prevailing groundwater is above the invert of the sewer line being tested. Under this condition, the air test pressure shall be increased 0.433 psi for each foot the groundwater level is above the invert of the pipe. All gauge pressures shall be increased by this amount. If the current prevailing groundwater is more than 27 inches above the invert of the pipe, the infiltration or exfiltration test should be used as required above. Thus, internal air pressures should never exceed 5.0 psi.

Table B.1. Minimum Holding Time for Low Pressure Air Test	
Nominal Pipe Size, in.	**Time per 100 ft.**
6	42 seconds
8	1 minute-12 seconds
10	1 minute-30 seconds
12	1 minute-48 seconds
15	2 minutes-6 seconds
18	2 minutes-24 seconds
21	3 minutes
24	3 minutes-36 seconds
27	4 minutes-12 seconds
30	4 minutes-48 seconds
33	5 minutes-24 seconds
36	6 minutes

Table B.2. Allowable Air Loss for Low Pressure Air Test	
Nominal Pipe Size, in.	**Air Loss (Q), ft3/min**

6 and 8	2
10	2.5
12	3
15	4
18	5
21	5.5
24	6
27	6.5
30	7
33	7.5
36	8
42	9
48	10
54	11
60	12
66	13
72	14

2. Infiltration Test:

The CONTRACTOR may elect to use an infiltration test when the level of the current prevailing groundwater is two feet (2') or more above the top of the sewer pipe, including all service laterals, at the highest point of the section being tested. The inlet end(s) of the upstream manhole shall be securely sealed. The downstream sewer shall be completed and open to allow the sewer to drain. The ENGINEER shall approve the length of sewer to be tested at one time. The ENGINEER may require that each manhole span be tested separately. The amount of infiltration shall be measured by means of a weir located in the downstream manhole. The test head shall be maintained for a period of at least 24 hours before the weir measurement is made. Infiltration shall not exceed 50 gallons per inch diameter per mile of pipe per 24

hours. This infiltration test may not be performed until the sewer line and manholes are completed and all known leaks are repaired. The CONTRACTOR will be required to correct all conditions that permit visible infiltration and may be required to relay sections with such conditions that cannot be corrected, even though infiltration is within allowable limits.

3. Exfiltration Test:

When the exfiltration test is selected, the inlet ends of the upstream and downstream manholes shall be sealed with watertight plugs or bulkheads, and the sewer along with the upstream manhole shall be filled with water until the elevation of the water in the upstream manhole is: 1) two feet (2') higher than the top of the sewer pipe, including all service laterals, at the highest point of the section being tested, or 2) two feet (2') above the level of the current prevailing groundwater, whichever is the higher elevation. The test level shall be clearly marked in the upstream manhole. The entire length of section to be tested shall be filled and maintained full of water for a period of at least 24 hours prior to the start of the test. If the water level in the upper manhole drops during this 24 hour period, the level shall be raised to the test level mark prior to start of the test. Exfiltration will be determined by measuring the amount of water required to maintain the marked water level for a period of 1 hour from the start of the test. The allowable leakage of 50 gallons per inch diameter per mile of pipe per 24 hours is based on a maximum difference in elevation of 8 feet between the water level in the upstream manhole and the invert of the pipe being tested in the lower manhole or the current prevailing groundwater level, whichever is higher. If this difference in elevation exceeds 8 feet, the allowable leakage shall be increased 5 percent for each 1 foot in excess of 8 feet. All observed leaks shall be corrected even if exfiltration is within the allowable limits.

4. Smoke Testing:

Smoke testing may be used only to locate leaks and in no case shall be considered conclusive. In all cases the smoke test shall be accompanied by an air test, exfiltration test or infiltration test. The ENGINEER may order a smoke test if another leakage test fails and the source of the leak cannot be determined by other means. Smoke testing may only be performed where ground water is low and the conduit is properly sealed. Smoke shall be blown into a sealed section of sewer under pressure, and the CONTRACTOR and ENGINEER shall observe for any smoke appearing on top of the ground indicating the presence of leaks. The ENGINEER may require that the CONTRACTOR excavate the sewer to determine the source of any smoke appearing during a smoke test. All leaks or breaks discovered by the smoke tests shall be repaired and/or corrected by the CONTRACTOR at his own expense in a manner acceptable to the ENGINEER.

Equipment and supplies required for smoke tests shall be furnished by the CONTRACTOR. Smoke tests may be performed by the CONTRACTOR at any time during construction at his option; however, any such tests shall not supplant the final tests of the completed work.

B. SEWER FORCE MAIN TESTING - LEAKAGE:

As a minimum, all sewer force mains shall be tested in accordance with the Hydrostatic Testing Requirements of AWWA C600.

1. All force mains shall be given a hydrostatic test of at least 1.5 times the shutoff head of the connected pumps or 150 psi, whichever is greater. Loss of water pressure during test shall not exceed 5 psi in a 2 hour period.

2. Where practicable, pipelines shall be tested between line valves or plugs in lengths of not more than 1500 feet.

3. The pipe shall be slowly filled with water and the specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the ENGINEER. The pump, pipe connection, and all necessary apparatus except the gauges shall be furnished by the CONTRACTOR. The ENGINEER will furnish the gauges for the test, but the CONTRACTOR shall furnish all necessary assistance for conducting the test. Before applying the specified test pressure, all air shall be expelled from the pipe. If permanent air vents are not located at all high points, the CONTRACTOR shall install corporation cocks at such points so the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied.

4. Duration of test shall not be less than two hours.

5. The test pressure shall not exceed the rated pressure of the valves in the pipeline.

6. Where leaks are visible at exposed joints and/or evident on the surface where joints are covered, the CONTRACTOR shall repair the joints, retighten the bolts, relay the pipe, or replace the pipe until the leak is eliminated--regardless of total leakage as shown by the hydrostatic test. Polyethylene encasement damaged from repairs must also be properly repaired or replaced to the satisfaction of the ENGINEER.

7. All pipe, fittings and other materials found to be defective under test shall be removed and replaced at the CONTRACTOR's expense.

8. Lines which fail to meet test shall be repaired and retested as necessary until test requirements are complied with.

9. The OWNER will provide water for testing the force mains; however, the CONTRACTOR will be responsible for piping or hauling the water if necessary. The CONTRACTOR shall not operate any valves on existing water mains. This shall be done by the OWNER.

10. No pipe installation will be accepted if the leakage is greater than that determined by the formula:

$$L = \frac{SD(P)^{1/2}}{133{,}200}$$

in which L is the allowable leakage, in gallons per hour; S is the length of pipeline tested, in feet; D is the nominal diameter of the pipe, in inches; and P is the average test pressure during the leakage test, in pounds per square inch gauge. Allowable leakage at various pressures and pipe sizes are shown in the Table below (from AWWA C600 - Table 6A):

Allowable Leakage Per 1,000 Feet of Pipeline* - gph

Avg. Test Pressure psi	3	4	6	8	10	12	14	16
250	0.36	0.47	0.71	0.95	1.19	1.42	1.66	1.90
225	0.34	0.45	0.68	0.90	1.13	1.35	1.58	1.80
200	0.32	0.43	0.64	0.85	1.06	1.28	1.48	1.70
175	0.30	0.40	0.59	0.80	0.99	1.19	1.39	1.59
150	0.28	0.37	0.55	0.74	0.92	1.10	1.29	1.47
125	0.25	0.34	0.50	0.67	0.84	1.01	1.18	1.34
100	0.23	0.30	0.45	0.60	0.75	0.90	1.05	1.20

Avg. Test Pressure psi	18	20	24	30	36	42	48	54
250	2.14	2.37	2.85	3.56	4.27	4.99	5.70	6.41
225	2.03	2.25	2.70	3.38	4.05	4.73	5.41	6.03
200	1.91	2.12	2.55	3.19	3.82	4.46	5.09	5.73
175	1.79	1.98	2.38	2.98	3.58	4.17	4.77	5.36
150	1.66	1.84	2.21	2.76	3.31	3.86	4.41	4.97
125	1.51	1.68	2.01	2.52	3.02	3.53	4.03	4.53
100	1.35	1.50	1.80	2.25	2.70	3.15	3.60	4.05

*If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.

C. TEST FOR DEFLECTION:

After the pipe has been laid and backfilled, the Engineer shall require appropriate deflection testing. This test is conducted by pulling a pointed mandrel through the pipe as described in Appendix "A." The Engineer shall designate the method of testing to be used.

Upon completion of backfill the maximum allowable deflection shall not exceed 5% of the pipe's base inside diameter in accordance with Appendix X2 of ASTM Specification D3034 and F679.

The base inside diameter of the pipe shall be determined in accordance with Appendix Section X1 of ASTM Specification D3034 and F679. Testing shall be conducted on a manhole to manhole basis or in total, as specified. To ensure accurate measurement, it is important that the line to be tested is completely water flushed.
This test will not be run for at least thirty (30) days after the trench has been backfilled. If the trench was dewatered, the water table will be permitted to recover to at least three- fourths of its previous depth above the pipe before this thirty (30) day period starts.

D. TEST REJECTION: Should the results of any test fail to meet the criteria established in these specifications, the Contractor shall, at Contractor’s expense, locate and repair the rejected section and retest until it is within specified allowance.

E. ALIGNMENT: Sewers shall be laid with straight alignment between manholes. Straight alignment shall be checked by either using a laser beam or lamping.

2.12 PUMPING AND BYPASSING:

A. Flow through existing sanitary sewers and manholes shall not be interrupted, except as follows. Flow may be interrupted long enough to reconfigure inverts in existing manholes or to core drill existing manholes, as necessary. Flow may also be interrupted to connect an existing sewer into a new sewer and to plug the outlet to be abandoned in the manhole. All situations requiring interruption of flows shall be carefully coordinated with the OWNER and ENGINEER at least three working days in advance. Anytime the flow through existing sanitary sewers or manholes is interrupted, the CONTRACTOR shall provide bypass pumping of the sewage to a truck or downstream manhole, as approved by the OWNER. Under no circumstances should sewage be allowed to surcharge new or existing sewers or manholes or to flow onto or into the ground. Length of bypass pumping shall be minimized as much as possible.

C. When pumping and bypassing is required, the CONTRACTOR shall supply the pumps, conduits, and other equipment to divert the flow of sewage around the sewer(s) or manhole(s) in which work is to be performed. The bypass system shall be of sufficient capacity to handle the same capacity as the sewer being bypassed, unless otherwise approved in writing by the ENGINEER. Pumps used for bypassing shall be capable of passing at least a 3" solid sphere, and bypass piping shall have a minimum size of 4" diameter. The CONTRACTOR will be responsible for furnishing the necessary labor and supervision to set up and operate the pumping and bypassing system. If pumping is required on a 24-hour basis, engines shall be equipped in a manner to keep noise to a minimum, and a spare back-up pump will be required. A spare back-up pump may be required at other locations or times as indicated in the construction documents. All fuel tanks for pump or generator motors shall be filled by the CONTRACTOR prior to leaving the job site if bypass pumping must continue. The CONTRACTOR will not suspend work for more than 24 hours during operation of a bypassing system, unless otherwise permitted by the ENGINEER.

2.13 MEASUREMENT AND PAYMENT:

A. Payment for all items of work required for installation of sanitary sewerage system (main or service) shall be included in the lump sum bid item.

END OF SECTION 33 3000

SECTION 00 00 01 – INDEX TO SPECIFICATIONS

SECTION NUMBER	SECTION NAME	PAGES
DIVISION ZERO – PROCUREMENT AND CONTRACTING REQUIREMENTS		
00 00 00	SPEC COVER	
00 01 01	PROJECT TITLE PAGE	
00 00 02	INDEX TO SPECIFICATIONS	
00 00 07	SMALL CONSTRUCTION STORM WATER GENERAL PERMIT AND SWPPP NARRATIVE	
00 01 15	LIST OF DRAWING SHEETS	
00 11 13	ADVERTISEMENT FOR BIDS	
00 21 13	INSTRUCTIONS TO BIDDERS	
00 42 13	PROPOSAL FORM	
00 50 00	CONTRACT FORMS	
00 72 00	GENERAL CONDITIONS	
00 73 00	SUPPLEMENTARY CONDITIONS	
DIVISION ONE - GENERAL REQUIREMENTS		
01 10 00	SUMMARY ALTERNATE ALLOWANCES	
01 21 00	ALLOWANCES	
01 25 13	PRODUCTS AND SUBSTITUTIONS	
01 29 00	SCHEDULES, REPORTS, & PAYMENTS	
01 33 00	SUBMITTALS	
01 42 00	DEFINITIONS AND STANDARDS	
01 45 29	QUALITY CONTROL SERVICES	
01 50 00	TEMPORARY FACILITIES	
01 57 13	TEMPORARY EROSION & SEDIMENTATION CONTROL	
01 71 23	CONSTRUCTION LAYOUT AND SURVEYING	
01 77 00	PROJECT CLOSE-OUT	
DIVISION TWO – EXISTING CONDITIONS		
02 30 00	SOIL INVESTIGATION	
02 41 19	SELECTIVE DEMOLITION	
DIVISION THREE - CONCRETE		
03 15 00	CONCRETE ACCESSORIES	
03 30 01	CONCRETE FORM WORK	
03 30 02	CONCRETE REINFORCEMENT	
03 54 13	SELF-LEVELING CONCRETE FLOOR UNDERLAYMENT	
DIVISION FOUR - MASONRY		
04 05 13	ADHEARED MASONRY VENEER SYSTEM	

DIVISION FIVE - METALS

05 12 00 STRUCTURAL STEEL
05 40 01 COLD-FORMED STEEL FRAMING AND SHEATHING
05 44 13 ENGINEERED LIGHT GAGE METAL TRUSS SYSTEM
05 50 00 METAL FABRICATIONS

DIVISION SIX – WOOD, PLASTICS AND COMPOSITES

06 10 00 ROUGH CARPENTRY
06 16 43 GYPSUM SHEATING (DENSGLASS)
06 20 00 FINISH CARPENTRY

DIVISION SEVEN - THERMAL AND MOISTURE PROTECTION

07 21 00 INSULATION
07 24 19 FIBERGLASS PIPE INSULATION
07 26 16 UNDER SLAB VAPOR BARRIER
07 28 00 FLUID APPLIED MEMBRANE AIR AND WATER BARRIERS
07 46 46 CEMENT FIBER SIDING AND PLANKING
07 62 00 SHEET METAL FLASHING AND TRIM
07 62 03 SEAMLESS GUTTERS AND DOWNSPOUTS
07 92 00 JOINT SEALERS

DIVISION EIGHT - OPENINGS

08 11 13 STEEL DOOR AND FRAMES
08 14 16 FLUSH WOOD DOORS
08 41 13 ALUMINUM ENTRANCES AND STOREFRONTS
08 55 13 IMPACE RESISTANT WINDOWS AND GLASS
08 71 00 DOOR HARDWARE
08 81 00 GLASS AND GLAZING

DIVISION NINE - FINISHES

09 21 16 GYPSUM DRYWALL ASSEMBLIES
09 51 23 ACOUSTICAL CEILING
09 65 00 RESILIENT FLOORING AND BASE
09 68 16 CARPETING
09 72 00 VINYL WALL COVERINGS
09 90 00 PAINTING

DIVISION TEN - SPECIALTIES

10 14 23 SPECIALTY SIGNS
10 28 00 TOILET ACCESSORIES
10 44 16 FIRE EXTINGUISHERS CABINETS AND ACCESSORIES.
10 95 00 MISCELLANEOUS SPECIALTIES

DIVISION TWELVE – FURNISHINGS

12 35 25 MEDICAL FACILITIES CASEWORK
12 36 61 SOLID SURFACE

DIVISION TWENTY-ONE – FIRE SUPPRESSION

21 01 00 FIRE PROTECTION GENERAL PROVISIONS
21 05 47 SEISMIC RESTRAINT OF FIRE PROTECTION EQUIPMENT AND SUSPENDED UTILITIES
21 11 19 FIRE DEPARTMENT CONNECTION
21 13 13 AUTOMATIC SPRINKER SYSTEMS

DIVISION TWENTY-TWO – PLUMBING

22 01 00 PLUMBING GENERAL PROVISIONS
22 07 19 PLUMBING INSULATION
22 11 16 DOMESTIC WATER PIPING AND VALVES
22 11 19 DIMESTIC WATER BACKFLOW PREVENTERS, TRAP PRIMERS, AND SHOCK ABSORBERS
22 13 16 SANITARY WASTE AND VENT PIPING
22 13 19 SANITARY WASTE PIPING SPECIALTIES
22 33 30 RESIDENTIAL, STORAGE ELECTRIC DOMESTIC WATER HEATERS
22 34 23 SUBMERSIBLE EFFLUENT PUMP
22 43 13 HEALTHCARE PLUMBING FIXTURES

DIVISION TWENTY-THREE – HEATING, VENTILATING, AND AIR CONDITIONING

23 01 00 GENERAL PROVISIONS OF HVAC SYSTEMS
23 05 13 ELECTRIC MOTORS
23 05 49 BASIC MATERIALS AND METHODS FOR HVAC
23 05 93 TESTING, ADJUSTING, AND BALANCING
23 07 10 INSULATION
23 09 23 DIRECT DIGITAL CONTROL BUILDING AUTOMATION SYSTEM
23 23 00 REFIDERANT PIPING SYSTEM
23 29 23 VARIABLE FREQUENCY MOTOR CONTROLLERS
23 31 10 SHEET METAL DUCTOWRK LOW PRESSURE
23 31 11 SHEET METAL DUCTWORK MEDIUM PRESSURE
23 33 10 SHEET METAL SPECIALTIES
23 34 50 SQUARE CENTRIFUGAL IN LINE FANS
23 63 13 AIR-COOLED CONDENSING UNITS
23 73 13 AIR HANDING UNIT MEDIUM OR LOW PRESSURE
23 75 56 MULTI INDOOR UNIT VARIABLE REFRIGERANT FLOW SYSTEM
23 81 26 SPLIT SYSTEM A/C UNITS

DIVISION TWENTY-SIX – ELECTRICAL

26 01 00 GENERAL PROVISIONS FOR ELECTRICAL SYSTEMS
26 05 19 CONDUCTORS 600 VOLT AND BELOW
26 05 26 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
26 05 29 SUPPORTING DEVICES AND HANGERS
26 05 34 RACEWAYS AND CONDUIT SYSTEMS
26 05 37 OUTLET BOXES
26 05 38 PULL AND JUNCTION BOXES
26 05 45 PAD TRANSFORMER ELECTRIC SERVICE
26 24 16 PANELBOARDS
26 27 26 WIRING DEVICES
26 28 18 SAFETY SWITCHES

26 29 13 INDIVIDUAL STARTERS AND CONTROLS
26 33 25 EMERGENCY BATTERY POWER STATION
26 43 00 SURGE PROTECTIVE DEVICES
26 51 00 INTERIOR LIGHTING AND LAMPS
26 56 00 EXTERIOR LIGHTING AND LAMPS

DIVISION TWENTY-SEVEN – COMMUNICATIONS

27 00 00 COMMUNICATIONS
27 05 26 GROUNDING AND BONDING FOR COMMUNICATIONS
27 05 28 FIRESTOPPING FOR COMMUNICATIONS

DIVISION TWENTY-EIGHT – ELECTRONIC SAFETY AND SECURITY

28 31 00 FIRE ALARM SYSTEM
28 37 00 LOW VOLTAGE ROUGH IN

DIVISION THIRTY-ONE – EARTHWORK

31 00 00 EARTHWORK
31 00 00 SITE EARTHWORK
31 00 01 CRUSHED CONCRETE
31 10 00 SITE CLEARING
31 31 16 TERMITE CONTROL

DIVISION THIRTY-TWO – EXTERIOR IMPROVEMENTS

32 13 00 CAST IN PLACE CONRETE PAVING AND EXTERIOR SLABS
32 13 13.50 CONCRETE FORMWORK – PAVING
32 13 13.51 CONCRETE REINFORCEMENT – PAVING
32 16 00 CONCRETE CURBS, GUTTERS, AND WALKS
32 17 23 PAVEMENT MARKINGS
32 84 00 IRRIGATION
32 93 00 PLANS SOIL SOD

DIVISION THIRTY-THREE – UTILITIES

33 11 00 WATER UTILITY DISTRIBUTION PIPING
33 30 00 SANITARY SEWERAGE SYSTEM (SITE WORK)
33 40 00 STORM DRAINAGE UTILITIES

SECTION 00 00 02 – ARCHITECTURAL INDEX

SECTION NUMBER	SECTION NAME	PAGES
DIVISION ZERO – PROCUREMENT AND CONTRACTING REQUIREMENTS		
00 00 00	SPEC COVER	1
00 01 01	PROJECT TITLE PAGE	1
00 00 02	INDEX TO SPECIFICATIONS	?
00 01 15	LIST OF DRAWING SHEETS	4
00 11 13	ADVERTISEMENT FOR BIDS	1
00 21 13	INSTRUCTIONS TO BIDDERS	10
00 42 13	PROPOSAL FORM	3
00 50 00	CONTRACT FORMS	1
00 72 00	GENERAL CONDITIONS	41
00 73 00	SUPPLEMENTARY CONDITIONS	15
DIVISION ONE - GENERAL REQUIREMENTS		
01 10 00	SUMMARY ALTERNATE ALLOWANCES	1
01 21 00	ALLOWANCES	1
01 25 13	PRODUCTS AND SUBSTITUTIONS	6
01 29 00	SCHEDULES, REPORTS, & PAYMENTS	2
01 33 00	SUBMITTALS	9
01 42 00	DEFINITIONS AND STANDARDS	4
01 45 29	QUALITY CONTROL SERVICES	3
01 50 00	TEMPORARY FACILITIES	8
01 77 00	PROJECT CLOSE-OUT	6
DIVISION TWO – EXISTING CONDITIONS		
02 30 00	SOIL INVESTIGATION	28
02 41 19	SELECTIVE DEMOLITION	5
DIVISION THREE - CONCRETE		
03 15 00	CONCRETE ACCESSORIES	13
03 30 01	CONCRETE FORM WORK	4
03 30 02	CONCRETE REINFORCEMENT	3
03 54 13	SELF-LEVELING CONCRETE FLOOR UNDERLAYMENT	3
DIVISION FOUR - MASONRY		
04 05 13	ADHEARED MASONRY VENEER SYSTEM	20
DIVISION FIVE - METALS		
05 12 00	STRUCTURAL STEEL	5
05 40 01	COLD-FORMED STEEL FRAMING AND SHEATHING	8
05 44 13	ENGINEERED LIGHT GAGE METAL TRUSS SYSTEM	4
05 50 00	METAL FABRICATIONS	9

DIVISION SIX – WOOD, PLASTICS AND COMPOSITES

06 10 00	ROUGH CARPENTRY	4
06 16 43	GYPSUM SHEATING (DENSGLASS)	3
06 20 00	FINISH CARPENTRY	6

DIVISION SEVEN - THERMAL AND MOISTURE PROTECTION

07 21 00	INSULATION	6
07 24 19	FIBERGLASS PIPE INSULATION	7
07 26 16	UNDER SLAB VAPOR BARRIER	2
07 28 00	FLUID APPLIED MEMBRANE AIR AND WATER BARRIERS	13
07 46 46	CEMENT FIBER SIDING AND PLANKING	5
07 62 00	SHEET METAL FLASHING AND TRIM	10
07 62 03	SEAMLESS GUTTERS AND DOWNSPOUTS	5
07 92 00	JOINT SEALERS	6

DIVISION EIGHT - OPENINGS

08 11 13	STEEL DOOR AND FRAMES	5
08 14 16	FLUSH WOOD DOORS	5
08 41 13	ALUMINUM ENTRANCES AND STOREFRONTS	6
08 55 13	IMPACE RESISTANT WINDOWS AND GLASS	4
08 71 00	DOOR HARDWARE	6
08 81 00	GLASS AND GLAZING	8

DIVISION NINE - FINISHES

09 21 16	GYPSUM DRYWALL ASSEMBLIES	9
09 51 23	ACOUSTICAL CEILING	5
09 65 00	RESILIENT FLOORING AND BASE	4
09 68 16	CARPETING	4
09 72 00	VINYL WALL COVERINGS	4
09 90 00	PAINTING	9

DIVISION TEN - SPECIALTIES

10 14 23	SPECIALTY SIGNS	3
10 28 00	TOILET ACCESSORIES	3
10 44 16	FIRE EXTINGUISHERS CABINETS AND ACCESSORIES.	3
10 95 00	MISCELLANEOUS SPECIALTIES	2

DIVISION TWELVE – FURNISHINGS

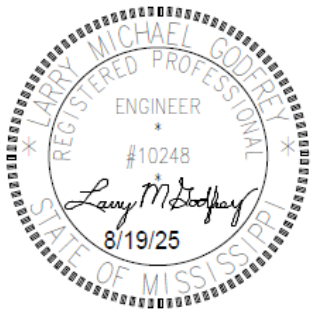
12 35 25	MEDICAL FACILITIES CASEWORK	8
12 36 61	SOLID SURFACE	3

DIVISION THIRTY-ONE – EARTHWORK

31 31 16	TERMITE CONTROL	4

SECTION 00 00 04 – STRUCTURAL INDEX

SECTION NUMBER	SECTION NAME	PAGES
DIVISION THREE - CONCRETE		
03 15 00	CONCRETE ACCESSORIES	4
03 30 00	CAST IN PLACE CONCRETE	13
03 30 02	CONCRETE REINFORCEMENT	3
DIVISION FIVE - METALS		
05 12 00	STRUCTURAL STEEL FRAMING	5
05 44 13	ENGINEERED LIGHT GAGE METAL TRUSS SYSTEM	4
DIVISION THIRTY-TWO - EARTHWORK		
31 00 00	EARTHWORK	8
31 00 01	CRUSHED CONCRETE	2



SECTION 00 00 06 – LANDSCAPING INDEX

SECTION NUMBER	SECTION NAME	PAGES
DIVISION TWENTY-TWO – PLUMBING		
32 84 00	IRRIGATION	12
32 93 00	PLANS SOIL SOD	15

SECTION 00 01 01 PROJECT TITLE PAGE

PROJECT MANUAL

1.01 Project Information

A. Project Name: Additions and Renovations to Asbury Hospice House

B. Project Location: Hattiesburg

C. Issue Date: 10/10/2025

D. CN# 24-4063C

1.02 Owner Information

A. Forrest General Hospital

B. 6051 US Highway 49

C. Hattiesburg, Mississippi 39402

D. Owner Project No. Owner Project Number

1.03 Architect Information

A. Landry Lewis Germany Architects, P.A.

B. 5211 Old Highway 11

C. Hattiesburg, MS 39402

D. 601-271-7711

E. www.llgarch.com

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END OF SECTION

SECTION 00 21 13 INSTRUCTIONS TO BIDDERS

FORM OF INSTRUCTIONS TO BIDDERS

1.01 SEE AIA A701, INSTRUCTIONS TO BIDDERS following this document.

1.02 The instructions in this document amend or supplement the Instructions To Bidders and other provisions of the Bidding and Contract Documents.

1.03 RELATED DOCUMENTS

1.03.A. Document 011000 - Summary.

1.03.B. Document 001113 - Advertisement for Bids.

1.03.C. Document 004213 - Proposal Form.

1.03.D. Document 007300 - Supplementary Conditions:

MODIFICATIONS TO FORM OF INSTRUCTION TO BIDDERS

2.01 The following modifications to AIA A701, INSTRUCTIONS TO BIDDERS amend or supplement the Instructions To Bidders and other provisions of the Bidding and Contract Documents as follows;

2.02 ARTICLE 4 BIDDING PROCEDURES

2.02.A. Add Subsection 4.1.2.1, "Proposals which do not include a number of days for Contract Time, where required to be inserted by the bidder, shall be considered incomplete. The Owner shall reserve the right to reject bids which do not include Contract Time."

2.02.B. Add Subsection 4.2.1.1, "Each bid must be accompanied by the bidder's certified check or a bid bond, duly executed by the bidder as principal and having surety thereon, a surety company approved by the Owner and signed by an agent resident of Mississippi, in the amount of five percent (5%) of the bid. All bid bonds must be accompanied by an appropriate Power of Attorney designating the Mississippi Resident Agent."

2.02.C. Add Subsection 4.3.1.1, "Bids shall be submitted as directed in Document 001113 - Advertisement For Bids. Bids may be submitted in person or, for those interested, bids can be electronically submitted at www.llgarchplans.com under the project name."

2.02.D. Add Subsection 4.4.4, "After submission of the bid, but prior to the closing time of the bid opening the bidder may modify their sealed bid by indicating on the outside of the sealed bid envelope a deduction or add to the base bid or to any alternates which may be appropriate. The modification must be initialed by the bidder or bidders authorized representative and include the date and time of the modification. No bid modifications can be made by fax, e-mail or telephone."

2.03 ARTICLE 5 CONSIDERATION OF BIDS

2.03.A. Add Subsection 5.3.3, "If the contract is awarded, the Owner shall give the apparent successful Bidder a Notice of Award within forty-five (45) calendar days after the date of the Bid opening."

2.03.B. Add Subsection 5.3.4, "The contractors, if requested by the Owner, shall require all contractors that submit a Bid to submit a Proposed Project Schedule and Schedule of Values to the Architect/Engineer within seventy-two (72) hours of the bid opening. If the

contract is bid per the Unit Price Form, then the submission of the Schedule of Values is not required."

2.03.C. Add Subsection 5.3.5, "Where required by law, award will be made based on the Lowest and Best Bid received in accordance with Title 31, Chapter 7 (§31 7 13 et seq.) of Mississippi Code of 1972 as amended. The Owner reserves the right to reject any and all bids and to waive informalities."

SUPPLEMENTARY INSTRUCTIONS

3.01 LIQUIDATED DAMAGES FOR FAILURE TO ENTER INTO CONTRACT

3.01.A. The successful bidder, upon his failure or refusal to execute and deliver the contract and bond required within ten days after he has received notice of the acceptance of his bid, will forfeit to the Owner as liquidated damages the security deposited with his bid.

3.02 PRE-BID CONFERENCE

3.02.A. A pre-bid conference may be held on a date and time to be specified by Addendum. Present will be the Architect, Mechanical and Electrical Engineers, representatives of the Owner relative to administration and maintenance. General Contractors as well as Mechanical, Electrical and other sub-contractors are encouraged to attend.

END OF SECTION

AIA® Document A701® – 2018

Instructions to Bidders

for the following Project:
(Name, location, and detailed description)

Additions and Renovations to
Asbury Hospice House
Forrest General Hospital
Hattiesburg, Mississippi
CN 24-4063C

THE OWNER:
(Name, legal status, address, and other information)

Forrest General Hospital
6051 US highway 49
Hattiesburg, Mississippi

THE ARCHITECT:
(Name, legal status, address, and other information)

Landry Lewis Germany Architects, P. A.
5211 Old Highway 11
Hattiesburg, Mississippi 3940

TABLE OF ARTICLES

1 DEFINITIONS

2 BIDDER'S REPRESENTATIONS

3 BIDDING DOCUMENTS

4 BIDDING PROCEDURES

5 CONSIDERATION OF BIDS

6 POST-BID INFORMATION

7 PERFORMANCE BOND AND PAYMENT BOND

8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

ADDITIONS AND DELETIONS:
The author of this document may have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

FEDERAL, STATE, AND LOCAL LAWS MAY IMPOSE REQUIREMENTS ON PUBLIC PROCUREMENT CONTRACTS. CONSULT LOCAL AUTHORITIES OR AN ATTORNEY TO VERIFY REQUIREMENTS APPLICABLE TO THIS PROCUREMENT BEFORE COMPLETING THIS FORM.

It is intended that AIA Document G612™–2017, Owner's Instructions to the Architect, Parts A and B will be completed prior to using this document.

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ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the Proposed Contract Documents. The Bidding Requirements consist of the advertisement or invitation to bid, Instructions to Bidders, supplementary instructions to bidders, the bid form, and any other bidding forms. The Proposed Contract Documents consist of the unexecuted form of Agreement between the Owner and Contractor and that Agreement's Exhibits, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, all Addenda, and all other documents enumerated in Article 8 of these Instructions.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, or in other Proposed Contract Documents apply to the Bidding Documents.

§ 1.3 Addenda are written or graphic instruments issued by the Architect, which, by additions, deletions, clarifications, or corrections, modify or interpret the Bidding Documents.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents, to which Work may be added or deleted by sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from, or that does not change, the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment, or labor for a portion of the Work.

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 By submitting a Bid, the Bidder represents that:

- **.1** the Bidder has read and understands the Bidding Documents;
- **.2** the Bidder understands how the Bidding Documents relate to other portions of the Project, if any, being bid concurrently or presently under construction;
- **.3** the Bid complies with the Bidding Documents;
- **.4** the Bidder has visited the site, become familiar with local conditions under which the Work is to be performed, and has correlated the Bidder's observations with the requirements of the Proposed Contract Documents;
- **.5** the Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception; and
- **.6** the Bidder has read and understands the provisions for liquidated damages, if any, set forth in the form of Agreement between the Owner and Contractor.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Distribution

§ 3.1.1 Bidders shall obtain complete Bidding Documents from the issuing office designated in the advertisement or invitation to bid, for the deposit sum, if any, stated therein.

§ 3.1.2 Any required deposit shall be refunded to Bidders who submit a bona fide Bid and return the paper Bidding Documents in good condition within ten days after receipt of Bids. The cost to replace missing or damaged paper documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the paper Bidding Documents, and the Bidder's deposit will be refunded.

§ 3.1.3 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the advertisement or invitation to bid, or in supplementary instructions to bidders.

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§ 3.1.4 Bidders shall use complete Bidding Documents in preparing Bids. Neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete Bidding Documents.

§ 3.1.5 The Bidding Documents will be available for the sole purpose of obtaining Bids on the Work. No license or grant of use is conferred by distribution of the Bidding Documents.

§ 3.2 Modification or Interpretation of Bidding Documents

§ 3.2.1 The Bidder shall carefully study the Bidding Documents, shall examine the site and local conditions, and shall notify the Architect of errors, inconsistencies, or ambiguities discovered and request clarification or interpretation pursuant to Section 3.2.2.

§ 3.2.2 Requests for clarification or interpretation of the Bidding Documents shall be submitted by the Bidder in writing and shall be received by the Architect at least seven days prior to the date for receipt of Bids.
(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall submit requests for clarification and interpretation.)

chris@llgarch.com

§ 3.2.3 Modifications and interpretations of the Bidding Documents shall be made by Addendum. Modifications and interpretations of the Bidding Documents made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3 Substitutions

§ 3.3.1 The materials, products, and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance, and quality to be met by any proposed substitution.

§ 3.3.2 Substitution Process

§ 3.3.2.1 Written requests for substitutions shall be received by the Architect at least ten days prior to the date for receipt of Bids. Requests shall be submitted in the same manner as that established for submitting clarifications and interpretations in Section 3.2.2.

§ 3.3.2.2 Bidders shall submit substitution requests on a Substitution Request Form if one is provided in the Bidding Documents.

§ 3.3.2.3 If a Substitution Request Form is not provided, requests shall include (1) the name of the material or equipment specified in the Bidding Documents; (2) the reason for the requested substitution; (3) a complete description of the proposed substitution including the name of the material or equipment proposed as the substitute, performance and test data, and relevant drawings; and (4) any other information necessary for an evaluation. The request shall include a statement setting forth changes in other materials, equipment, or other portions of the Work, including changes in the work of other contracts or the impact on any Project Certifications (such as LEED), that will result from incorporation of the proposed substitution.

§ 3.3.3 The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

§ 3.3.4 If the Architect approves a proposed substitution prior to receipt of Bids, such approval shall be set forth in an Addendum. Approvals made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3.5 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

§ 3.4 Addenda

§ 3.4.1 Addenda will be transmitted to Bidders known by the issuing office to have received complete Bidding Documents.

§ 3.4.2 Addenda will be available where Bidding Documents are on file.

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§ 3.4.3 Addenda will be issued no later than four days prior to the date for receipt of Bids, except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.4 Prior to submitting a Bid, each Bidder shall ascertain that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 Preparation of Bids

§ 4.1.1 Bids shall be submitted on the forms included with or identified in the Bidding Documents.

§ 4.1.2 All blanks on the bid form shall be legibly executed. Paper bid forms shall be executed in a non-erasable medium.

§ 4.1.3 Sums shall be expressed in both words and numbers, unless noted otherwise on the bid form. In case of discrepancy, the amount entered in words shall govern.

§ 4.1.4 Edits to entries made on paper bid forms must be initialed by the signer of the Bid.

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change" or as required by the bid form.

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall neither make additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name and legal status of the Bidder. As part of the documentation submitted with the Bid, the Bidder shall provide evidence of its legal authority to perform the Work in the jurisdiction where the Project is located. Each copy of the Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further name the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached, certifying the agent's authority to bind the Bidder.

§ 4.1.8 A Bidder shall incur all costs associated with the preparation of its Bid.

§ 4.2 Bid Security

§ 4.2.1 Each Bid shall be accompanied by the following bid security:
(Insert the form and amount of bid security.)

§ 4.2.2 The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and shall, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. In the event the Owner fails to comply with Section 6.2, the amount of the bid security shall not be forfeited to the Owner.

§ 4.2.3 If a surety bond is required as bid security, it shall be written on AIA Document A310™, Bid Bond, unless otherwise provided in the Bidding Documents. The attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of an acceptable power of attorney. The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 4.2.4 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until (a) the Contract has been executed and bonds, if required, have been furnished; (b) the specified time has elapsed so that Bids may be withdrawn; or (c) all Bids have been rejected. However, if no Contract has been awarded or a Bidder has not been notified of the acceptance of its Bid, a Bidder may, beginningdays after the opening of Bids, withdraw its Bid and request the return of its bid security.

§ 4.3 Submission of Bids

§ 4.3.1 A Bidder shall submit its Bid as indicated below:
(Indicate how, such as by website, host site/platform, paper copy, or other method Bidders shall submit their Bid.)

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As indicated in the Advertisement/Invitation for Bids.

§ 4.3.2 Paper copies of the Bid, the bid security, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address, and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

§ 4.3.3 Bids shall be submitted by the date and time and at the place indicated in the invitation to bid. Bids submitted after the date and time for receipt of Bids, or at an incorrect place, will not be accepted.

§ 4.3.4 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

§ 4.3.5 A Bid submitted by any method other than as provided in this Section 4.3 will not be accepted.

§ 4.4 Modification or Withdrawal of Bid

§ 4.4.1 Prior to the date and time designated for receipt of Bids, a Bidder may submit a new Bid to replace a Bid previously submitted, or withdraw its Bid entirely, by notice to the party designated to receive the Bids. Such notice shall be received and duly recorded by the receiving party on or before the date and time set for receipt of Bids. The receiving party shall verify that replaced or withdrawn Bids are removed from the other submitted Bids and not considered. Notice of submission of a replacement Bid or withdrawal of a Bid shall be worded so as not to reveal the amount of the original Bid.

§ 4.4.2 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids in the same format as that established in Section 4.3, provided they fully conform with these Instructions to Bidders. Bid security shall be in an amount sufficient for the Bid as resubmitted.

§ 4.4.3 After the date and time designated for receipt of Bids, a Bidder who discovers that it made a clerical error in its Bid shall notify the Architect of such error within two days, or pursuant to a timeframe specified by the law of the jurisdiction where the Project is located, requesting withdrawal of its Bid. Upon providing evidence of such error to the reasonable satisfaction of the Architect, the Bid shall be withdrawn and not resubmitted.

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 Opening of Bids

If stipulated in an advertisement or invitation to bid, or when otherwise required by law, Bids properly identified and received within the specified time limits will be publicly opened and read aloud. A summary of the Bids may be made available to Bidders.

§ 5.2 Rejection of Bids

Unless otherwise prohibited by law, the Owner shall have the right to reject any or all Bids.

§ 5.3 Acceptance of Bid (Award)

§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest responsive and responsible Bidder, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents. Unless otherwise prohibited by law, the Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's best interests.

§ 5.3.2 Unless otherwise prohibited by law, the Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the lowest responsive and responsible Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 Contractor's Qualification Statement

Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request and within the timeframe specified by the Architect, a properly executed AIA Document A305™, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted for this Bid.

§ 6.2 Owner's Financial Capability

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A Bidder to whom award of a Contract is under consideration may request in writing, fourteen days prior to the expiration of the time for withdrawal of Bids, that the Owner furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. The Owner shall then furnish such reasonable evidence to the Bidder no later than seven days prior to the expiration of the time for withdrawal of Bids. Unless such reasonable evidence is furnished within the allotted time, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

§ 6.3 Submittals

§ 6.3.1 After notification of selection for the award of the Contract, the Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, submit in writing to the Owner through the Architect:

.1 a designation of the Work to be performed with the Bidder's own forces;

.2 names of the principal products and systems proposed for the Work and the manufacturers and suppliers of each; and

.3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

§ 6.3.2 The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, withdraw the Bid or submit an acceptable substitute person or entity. The Bidder may also submit any required adjustment in the Base Bid or Alternate Bid to account for the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

§ 6.3.4 Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 Bond Requirements

§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder.

§ 7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.

§ 7.1.3 The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 7.1.4 Unless otherwise indicated below, the Penal Sum of the Payment and Performance Bonds shall be the amount of the Contract Sum.
00

§ 7.2 Time of Delivery and Form of Bonds

§ 7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to commence sooner in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1.

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond.

§ 7.2.3 The bonds shall be dated on or after the date of the Contract.

§ 7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix to the

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bond a certified and current copy of the power of attorney.

ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

§ 8.1 Copies of the proposed Contract Documents have been made available to the Bidder and consist of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.4 Building Information Modeling Exhibit, if completed:

.5 Drawings

Number	Title	Date
00 01 15	List of Drawings	10/10/2025

.6 Specifications

Section	Title	Date
00 00 00	Index to Specifications	10/10/2025

.7 Addenda:

Number	Date
To be determined	

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[ ] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017.)

[ ] The Sustainability Plan:

Title	Date	Pages

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents listed below:
(List here any additional documents that are intended to form part of the Proposed Contract Documents.)

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SECTION 00 42 13 PROPOSAL FORM

PROPOSAL OF (hereinafter called "Bidder"),

Firm Name: _____ ,

Operating as a _____ (corporation/ partnership/ individual)

Doing (State) Business as _____ .

FOR **Forrest General Hospital**, (hereinafter called "Owner").

The Bidder, in compliance with your Advertisement for Bids for the construction of THE FOLLOWING PROJECT:

ADDITIONS AND RENOVATIONS TO ASBURY HOSPICE HOUSE

CN 24-4063C

and having examined the plans and specifications with related documents and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project including the availability of materials and labor, hereby proposes to furnish all labor, materials, and supplies, and to construct the project in accordance with the Contract Documents, within the time set forth herein, and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents of which this proposal is a part.

ADDENDUMS: Bidder acknowledges receipt of the following addenda:

No. _____, No. _____, No. _____

No. _____, No. _____, No. _____

BASE BID: Bidder agrees to perform all of the General, Mechanical, and Electrical Construction, and all other work shown on drawings or specified herein for the sum of:

_____ ,

_____$_____

Amounts shall be shown in both words and figures. In case of discrepancy, the amount shown in words will govern.

CONTRACT TIME: Bidder hereby agrees to commence work under this contract on or before a date to be specified in a written "Notice to Proceed" from the Architect and to substantially complete the project within THE FOLLOWING consecutive calendar days;

_____ Days **(Bidder to insert days)**

OWNERS RIGHTS:

Bidder understands that the Owner reserves the right to reject any or all bids and to waive any informalities in the bidding.

BID SECURITY:

Enclosed is a bid bond signed by a Mississippi Agent or certified check payable to the Owner in the sum equal to at least five percent (5%) of the base bid. This sum is to become the property of the Owner in the event the contract, Contract Bond and Certificate of Insurance are not executed within ten (10) days of Notification of Bidder of acceptance of bid. These liquidated damages are for the delay and additional expense to the Owner.

BIDDER QUALIFICATIONS:

I certify that I meet all qualifications specified for this project, and that for Base Bids exceeding $50,000.00 I possess a Mississippi Certificate of Responsibility valid for this project. Mississippi Certificate of Responsibility Number _____ .

Note: when the bidder is a joint venture, the joint venture Mississippi Certificate of Responsibility Number is _____ .

OR the joint venture member firms and their respective Mississippi Certificate of Responsibility Numbers are _____ .

Bidder certifies that he is: **(initial)**

a Mississippi Resident Contractor _____

OR a Non Resident Contractor _____

When a non resident contractor submits a bid for a Mississippi public project, he shall attach thereto a copy of his resident State's current law pertaining to such State's treatment of non resident contractor as required by Title 31, Chapter 3 - 31-3-21 (3) of the Mississippi Code of 1972 as amended.

ACCEPTANCE

I agree to hold this proposal open for acceptance for 45days after the bid date and certify that I am authorized to enter my firm into a binding contract if this proposal is accepted.

SIGNATURE

Signed: _____ Date: _____ .

Printed Name: _____ .

Title: _____ .

Firm: _____ .

(Exact name of firm corresponding to Mississippi Certificate of Responsibility Number and Bid Bond as applicable and as it is to appear in a contract).

Address: _____ .

City/State/Zip: _____ .

Office: (_____) _____ Cell: (_____) _____

END OF PROPOSAL - END OF SECTION

SECTION 00 73 00 SUPPLEMENTARY CONDITIONS

PART 1 GENERAL

1.1 INTRODUCTION

A. The following supplements modify the “General Conditions of the Contract for Construction”, AIA Document A201-2017. Where a portion of the General Conditions is modified or deleted by these Supplementary Conditions, the unaltered portions of the General Conditions shall remain in effect.

1.2 ARTICLE 1 GENERAL PROVISIONS

B. §1.1.7 Instruments of Service

1. Add the following Sections:

a. §1.1.7.1 The Project Manual is a volume assembled for the Work which may include the bidding requirements, sample forms, Conditions of the Contract and Specifications.

C. §1.2 Correlation and Intent of the Contract Documents

1. Add the following Sections after Section 1.2.2:

a. §1.2.2.1 In the case of conflicts or discrepancies between Drawings and Division 2-50 of the Specifications or within or among the Contract Documents and not clarified by addendum, the Architect will determine which takes precedence in accordance with Sections 4.2.11, 4.2.12, and 4.2.13. Interpretations will be based on the following priorities:

1) .1 Modifications

2) .2 The Agreement

3) .3 Addenda, with those of later date having precedence over those of earlier date

4) .4 The Supplementary Conditions

5) .5 The General Conditions of the Contract for Construction

6) .6 Division 1 of the Specifications

7) .7 Drawings and Divisions 2-50 of the Specifications

8) .8 Other Documents specifically enumerated in the Agreement as part of the Contract Documents

D. §1.7 Digital Data Use and Transmission

1. Add the following Sections:

a. §1.7.1 Contractor’s Use of Instruments of Service in Electronic Form.

b. §1.7.1.1 The Architect may, with the concurrence of the Owner, furnish to the Contractor versions of instruments of Service in electronic form. The Contract Documents executed or identified in accordance with Subparagraphs 1.1.2 and 1.1.7 shall prevail in case of an inconsistency with versions made through electronic operations involving computers.

c. §1.7.1.2 The Contractor shall not transfer or reuse instruments of Service in electronic form without prior written consent of the Architect.

E. Add Section §1.9 Periodic Meetings

1. Add the following Sections:

a. §1.9.1 Representatives of the Owner, Contractor and Architect shall meet periodically at mutually agreed-upon intervals for the purpose of establishing procedures to facilitate cooperation, communication and timely responses among the participants.

b. §1.9.2 By participating in this arrangement, the parties do not intend to create additional contractual obligations or modify the legal relationships which may otherwise exist.

1.3 ARTICLE 2 OWNER

A. §2.3 Information and Services Required of the Owner

1. Delete §2.3.6 and substitute the following:

a. §2.3.6 The Owner shall furnish the Contractor one set of PDF Contract Documents. Additional contract documents may be provided from on hand copies produced and returned during the bidding process. The Contractor may purchase additional copies or print the pdf documents at his own expense.

1.4 ARTICLE 3 CONTRACTOR

B. §3.2 Review of Contract Documents and Field Conditions by Contractor

1. Add the following Section:

a. §3.2.5 The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for evaluating and responding to the Contractor's requests for information that are not prepared in accordance with the Contract Documents or where the requested information is available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner-provided information, Contractor-prepared coordination drawings, or prior Project correspondence or documentation. Reimbursements may be funds retained in the Contractor's Application for Payment.

C. §3.4 Labor and Materials

1. Add the following after Section 3.4.2:

a. §3.4.2.1 After the Contract has been executed, the Owner and the Architect will consider requests for the substitution of products in place of those specified only under the conditions set forth in the General Requirements (Division 1 of the Specifications). By making requests for substitutions, the Contractor:

1) .1 represents that the Contractor has personally investigated the proposed substitute product and determined that it is equal or superior in all aspects to that specified.

2) .2 represents that the Contractor will provide the same warranty for the substitution as the Contractor would have provided for the product specified.

3) .3 certifies that the cost data presented is complete and includes all related costs for the substituted product and for Work that must be changed as a result of the substitution, except for the Architect's redesign costs, and waives all claims for additional costs related to the substitution which subsequently become apparent; and

4) .4 shall coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.

b. §3.4.2.2 The Owner shall be entitled to reimbursement from the Contractor amounts paid to the Architect for reviewing the Contractor's proposed substitutions and to make agreed-upon changes in the Drawings and Specifications resulting from such Substitutions. Reimbursements may be funds retained in the Contractor's Application for Payment.

D. §3.8 Allowances

1. Delete §3.8.2.2 and substitute the following:

a. §3.8.2.2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; except that if installation is included as part of the allowance in Division 1-50 of the Specifications, the installation and labor costs for greater or lesser quantities of Work shall be determined in accordance with Article 7;

E. §3.9 Superintendent

1. Delete §3.9.2 and substitute the following:

a. §3.9.2 The Contractor, as soon as practicable after award of the Contract, but no later than the preconstruction conference, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to the proposed superintendent or (2) that the Architect requires additional time to review. Failure of the Architect to reply within the 14 day period shall constitute notice of no reasonable objection.

2. Delete §3.9.3 and substitute the following:

a. §3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

3. Add the following Section:

a. §3.9.4 The Contractor shall employ a superintendent or an assistant to the superintendent who will perform as a coordinator for mechanical and electrical Work. The coordinator shall be knowledgeable in mechanical and electrical

systems and capable of reading, interpreting and coordinating Drawings, Specifications, and shop drawings pertaining to such systems. The coordinator shall assist the Subcontractors in arranging space conditions to eliminate interference between the mechanical and electrical systems and other Work and shall supervise the preparation of coordination drawings documenting the spatial arrangements for such systems within restricted spaces. The coordinator shall assist in planning and expediting the proper sequence of delivery of mechanical and electrical equipment to the site. Space priorities within restricted areas shall be: (1) mechanical systems, (2) plumbing systems, (3) fire sprinkler piping systems.

F. §3.12 Shop Drawings, Product Data and Samples

1. Add the following Section:

a. §3.12.11 The Architect's review of Contractor's submittals will be limited to examination of an initial submittal and one (1) resubmittal. The Owner is entitled to obtain reimbursement from the Contractor amounts paid to the Architect for evaluation of additional resubmittals. Reimbursements may be funds retained in the Contractor's Application for Payment.

1.5 ARTICLE 4 ARCHITECT

A. §4.2 Administration of the Contract

1. Add the following after Section 4.2.2:

a. §4.2.2.1 The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for site visits made necessary by the fault of the Contractor or by defects and deficiencies in the Work. Reimbursements may be funds retained in the Contractor's Application for Payment.

2. Add the following after Section 4.2.14:

a. §4.2.14.1 Contractor's request for information shall be prepared and submitted in accordance with Division 1 "General Requirements" sections on AIA Document G716-2004. The Architect will return without action requests for information that does not conform to requirements of the Contract Documents.

1.6 ARTICLE 5 SUBCONTRACTORS

A. §5.2 Award of Subcontracts and Other Contracts for Portions of the Work

1. Add the following Section:

a. §5.2.5 Not later than twenty-one days after the date of commencement of the Work, the Contractor shall furnish in writing to the Owner through the Architect the names of persons or entities proposed as subcontractors, manufacturers, fabricators, material suppliers, equipment suppliers, and systems for the products, identified in the General Requirements (Division 1 of the Specifications).

1.7 ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

A. §6.1 Owner's Right to Perform Construction and to Award Separate Contracts

1. Add the following Section:

a. §6.1.5 The Contractor, including his subcontractors, shall keep informed of the progress and the detailed work of the Owner or other Contractors and shall immediately notify the Architect of lack of progress or delays by other Contractors which are affecting Contractor's Work. Failure of Contractor to keep informed of the progress of the work of the Owner or other Contractors and / or failure of Contractor to give notice of lack of progress or delays by the Owner or other Contractors shall be deemed to be acceptance by Contractor of the status of progress by other Contractors for the proper coordination and completion of Contractor's Work. If, through acts or neglect on the part of the Contractor, the Owner or any other Contractor or subcontractor shall suffer loss or damage or assert any claims of whatever nature against the Owner, the Contractor shall defend, indemnify and hold harmless the Owner from any such claims or alleged damages, and the Contractor shall resolve such alleged damages or claims directly with the other Contractors or subcontractors.

1.8 ARTICLE 7 CHANGES IN THE WORK

A. §7.1 General

1. Add the following Section:

a. §7.1.4 The combined overhead and profit included in the total cost to the Owner of a change in the Work shall be based on the following schedule:

1) .1 For the Contractor, the Work performed by the Contractor's own forces, fifteen percent of the cost.

2) .2 For the Contractor, for Work performed by the Contractor's Subcontractors, five percent of the amount due the Subcontractor.

3) .3 For each Subcontractor or Sub-subcontractor involved, for Work performed by that Subcontractor's or Sub-subcontractor's own forces, ten percent of the cost.

4) .4 For each Subcontractor involved, for Work performed by the Subcontractor's Sub-subcontractor, ten percent of the amount due the Sub-subcontractor.

5) .5 Cost to which overhead and profit is to be applied shall be determined in accordance with Subparagraph 7.3.4.

6) .6 In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials and Subcontracts. Labor and materials shall be itemized in the manner prescribed above. Where major cost items are Subcontracts, they shall be itemized also. In no case will a change involving over Five Hundred Dollars be approved without such itemization.

B. §7.2 Change Orders

1. Substitute the following Section:

a. 7.2 CHANGE ORDERS

7.2.3 The maximum cost included in a Change Order for profit and overhead is limited to 10 percent (10%) of the total of the actual cost for materials, labor and subcontracts. Profits and overhead include: all taxes, fees, permits, insurance, bond and office expenses. Detail the proposal with all substantiating information, including material receipts, labor rates and man hour totals. All Subcontractors shall acquiesce to the same requirements when participating in a Change Order.

1.9 ARTICLE 8 TIME

A. §8.2 Progress and Completion

1. Delete §8.2.1 and substitute the following:

a. §8.2.1 Time limits stated in the Contract Documents are of the essence to the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work and that the Contractor is fully capable of properly completing the work within the Contract time.

B. §8.3 Delays and Extension of Time

1. Delete §8.3.1 and substitute the following:

a. §8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine. However, to the fullest extent permitted by law, and notwithstanding any other provisions in the Contract Documents, the Owner, and the Architect and their agents and employees shall not be liable for any damage for delay whether for direct or indirect costs, extended home office overhead, idle or inefficient labor or equipment, cost escalations or monetary claims of any nature arising from or attributable to delay by any cause whatsoever. The Contractor’s sole and exclusive right and remedy for delay by any cause whatsoever is an extension of the Contract Time but no increase in the Contract Sum.

2. Delete §8.3.2 and substitute the following:

a. §8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15. Any delay, interference, hindrance or disruption, from whatever source or cause, in the progress of the Contractor’s Work shall be a basis for an extension of time unless the delay, interference hindrance or disruption is (1) the fault and the responsibility of the Contractor, its subcontractors and suppliers and (2) directly affects the overall completion of the Work as reflected on the critical path of the updated Construction Schedule. The contractor expressly agrees that the Owner shall have the benefit of any float in the construction schedule and delay in construction activities which do

not affect the overall completion of the work does not entitle the Contractor to any extension in the Contract Time.

1) .1 Any claims by the Contractor for an increase in Contract Time must follow the procedures and limits a set forth in Article 15 “Claims and Disputes” including, but not limited to the requirement that the Contractor give notice of any claim for extension in Contract Time within twenty-one (21) days after occurrence of the event giving rise to such claim.

3. Add the following Sections:

a. §8.3.4 This provision specifies the procedure for the determination of time extensions for unusually severe weather. In order for the Owner and Architect to award a time extension under this clause, the following conditions must be satisfied:

1) .1 The weather experienced at the project site during the contract period must be found to be unusually severe, that is, more severe than the adverse weather anticipated for the project location during the time allotted to achieve Substantial Completion.

2) .2 The unusually severe weather must actually cause a delay in the completion of the project. The delay must be beyond the control and without the fault of negligence of the contractor.

b. §8.3.5 The schedule of monthly anticipated adverse weather delays is based on National Oceanic and Atmospheric Administration (NOAA) or similar data for the project location and will constitute the base line for weather time evaluations. The Contractor’s activity durations for inclusion in the progress schedule must reflect these anticipated adverse weather delays in all weather dependent activities.

c. §8.3.6 Monthly anticipated adverse weather delay workdays based on five (5) day work week, unless Contractor stipulates a different work schedule prior to Notice to Proceed.

d. §8.3.7 Upon acknowledgement of the Notice to Proceed (NTP) and continuing throughout the contract, the Contractor shall record on the daily report, the occurrence of adverse weather and resultant impact to normally scheduled work. Actual adverse weather delay days must prevent work on the overall projects’ critical activities for 50 percent or more of the contractor’s scheduled workday. The number of actual adverse weather days shall include days impacted by adverse weather (even if adverse weather occurred in previous month), be calculated chronologically from the first to the last day of each month and be recorded as full days. If the number of actual adverse weather delay days exceeds the number of days anticipated in paragraph 8.3.5 above, the Owner and the Architect will convert any qualifying delays to calendar days giving full consideration for equivalent fair weather workdays and issue a modification in accordance with the contract.

1.10 ARTICLE 9 PAYMENTS AND COMPLETION

A. §9.3 Applications for Payment

1. Delete §9.3.1 and substitute the following:

a. §9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents. The form of Application for Payment, duly notarized, shall be a current authorized edition of AIA Document G702™-1992, Application and Certificate for Payment, supported by a current authorized edition of AIA Document G703™-1992, Continuation Sheet.

2. Add the following after Section 9.3.1.2:

a. §9.3.1.3 Until final payment, the Owner will hold retainage in the amount of five percent (5%) and the amount retained by the prime contractor from each payment due the subcontractor shall not exceed the percentage withheld by the owner from the prime contractor. On contracts of which the total amount is Two Hundred Fifty Thousand Dollars ($250,000.00) or greater, or on any contract with a subcontract, regardless of amount, five percent (5%) shall be retained until the work is at least fifty percent (50%) complete, on schedule and satisfactory in the architect’s and/or engineers opinion, at which time fifty percent (50%) of the retainage held to date shall be returned to the prime contractor for distribution to the appropriate subcontractors and suppliers. Provided, however, that future retainage shall be withheld at the rate of two and one-half percent (2 ½ %).

b. §9.3.1.4 The full contract retainage may be reinstated if the manner of completion of the work and its progress do not remain satisfactory to the Architect.

c. §9.3.1.5 The contractors shall submit with each Application for Payment a monthly certification to the project architect listing subcontractors and payments to those subcontractors paid by funds received from the prior Application for Payment. This certification shall be submitted on a form entitled “Affidavit Certifying Payment To All Subcontractors” and will be provided to the contractor by the architect.

d. §9.3.2 Add the following clarifications:

Payment on materials stored off site may be approved by the Architect and the Owner after the Contractor has submitted the following items:

1) An acceptable Lease Agreement between the General Contractor and the owner of the land, or building, where the materials are stored covering the specific area where the materials are located.

2) Consent of Surety, or other acceptable Bond, to cover the materials stored off-site.

3) All Perils Insurance coverage for the full value of materials stored off-site.

4) A bill of sale from the manufacturer to the general contractor for the store materials

5) A complete list and inventory of materials manufactured, stored and delivered to the storage site and materials removed from the storage site and delivered to the job site.

6) A review by the Architect of the materials stored off-site prior to release of payment.

7) Guarantee no storage costs, additional delivery fees, or subsequent costs to the owner.

B. §9.8 Substantial Completion

1. Add the following after Section 9.8.3:

a. §9.8.3.1 The Architect will perform no more than two (2) inspections to determine whether the Work or a designated portion thereof has attained Substantial Completion in accordance with the Contract Documents. The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for additional inspections. Reimbursements may be funds retained in the Contractor’s Application for Payment.

C. §9.10 Final Completion and Final Payment

1. Add the following after Section 9.10.1:

a. §9.10.1.1 The Architect will perform no more than two (2) inspections to determine whether the Work or a designated portion thereof has attained Final Completion in accordance with the Contract Documents. The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for additional inspections. Reimbursements may be funds retained in the Contractor’s Application for Payment.

D. Add Section §9.11 Liquidated Damages:

1. Add the following Sections:

a. §9.11.1 It is hereby understood and mutually agreed, by and between the contractor and the Owner, that the date of beginning, rate of progress, and the time of completion of the work to be done hereunder are essential conditions of this contract, and it is further mutually understood and agreed that the work embraced in this contract shall be commenced on a date to be specified in the work order.

b. §9.11.2 The contractor agrees that said work shall be prosecuted regularly, diligently, and uninterruptedly at such rate of progress as will ensure substantial completion thereof within the time specified. It is expressly understood and agreed by and between the contractor and the Owner, that the time of completion of the work described herein is a reasonable time for the completion of same, taking into consideration the average climactic range and usual industrial conditions, prevailing in this locality.

c. §9.11.3 If the said contractor shall neglect, fail or refuse to complete the work within the time herein specified, then the contractor does hereby agree as a part of the consideration for the awarding of this contract to pay to the Owner the amount specified herein, not as a penalty but as liquidated damages for such breach of contract as hereinafter set forth, for each and every calendar day that the contract shall be in default after the time stipulated for completing the work.

d. §9.11.4 The said amount is fixed and agreed upon by and between the contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain, and said amount is agreed to be the amount of damages which the Owner would sustain and said amounts shall be retained from time to time by the Owner from current periodical estimates.

e. §9.11.5 It is further agreed that time is of the essence of each and every portion of this contract and of the specifications wherein a definite and certain length of time is fixed for the performance of any act whatsoever. Where under the contract an additional time is allowed for the completion of any work, the new time limit fixed by such extension shall not be charged with liquidated damages or any excess cost when the delay in completion of the work is due to unforeseeable cause beyond the control and without the fault of the contractor, including, but not restricted to, extreme acts of God, or the public enemy, acts of the Owner, acts of another contractor in the performance of a contract with the Owner, fires, floods, epidemics, and quarantine restrictions: provided; however, that the contractor shall, within seven (7) days from the beginning of such delay, notify the Owner, in writing of the causes of the delay, who shall ascertain the facts and extent of the delay and notify the contractor within a reasonable time of its decision in the matter.

f. §9.11.6 The contractor is familiar with the weather in the area; therefore, contractor has considered and computed weather in contractor's calculation of time necessary to complete this contract within the specified calendar days and accordingly agrees that rain, dryness, heat or cold will not be a basis for extension of the completion date, unless otherwise stipulated in the Contract Documents.

g. §9.11.7 It is agreed and understood that the project be substantially complete on or before the time set forth on the Contractor’s proposal form commencing on a date set forth in a notice to proceed from the Architect to the Contractor. If the said contractor shall neglect, fail or refuse to complete the work within the time specified herein, then the contractor shall pay to the Owner the sum of $500.00 for each and every calendar day after the time stipulated herein for the substantial completion of the work and the Owner may deduct the said sum of $500.00 per day from any balance due the contractor, as liquidated damages for loss and default as herein set forth, as herein set forth, which daily sum is agreed to be a reasonable sum for liquidated damages for this project.

1.11 ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

A. §10.2 Safety of Persons and Property

1. Add the following after Section 10.2.4:

    a. §10.2.4.1 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary, the Contractor shall give the Owner reasonable advance notice in writing.

1.12 ARTICLE 11 INSURANCE AND BONDS

A. §11.1 Contractor's Insurance and Bonds

1. Add the following after Section 11.1.1:

    a. §11.1.1.1 The insurance required by Subparagraph 11.1.1 shall be written for not less than the following limits, or greater if required by law:

        1) .1 General Liability (Commercial General Liability Including XCU):

            a) General Aggregate: $1,000,000 Aggregate.

            b) Products & Completed Operations: $1,000,000 Aggregate.

            c) Personal & Advertising Injury: $500,000 Per Occurrence.

            d) Bodily Injury & Property Damage: $500,000 Per Occurrence.

            e) Fire Damage Liability: $50,000 Per Occurrence.

            f) Medical Expense: $5,000 Per Person.

        2) .2 Owners & Contractors Protective Liability:

            a) Bodily Injury and Property Damage: $1,000,000 Aggregate

            b) Bodily Injury & Property Damage: $500,000 Per Occurrence

        3) .3 Automobile Liability (Owned, Non-owned & Hired Vehicles):

            a) Contractor Insurance Option Number 1:

                1. Bodily Injury and Property Damage (Combined Single Limit):$500.000 Per Occurrence.

            b) Contractor Insurance Option Number 2:

                1. Bodily Injury: $250,000 Per Person.,

                2. Bodily Injury: $500,000 Per Accident.,

                3. Property Damage: $100,000 Per Occurrence.

        4) .4 Excess Liability (Umbrella on projects over $500,000):

            a) Bodily Injury & Property Damage (Combined Single Limit): $1,000,000 Aggregate

        5) .5 Workers' Compensation: (As Required by Statute)

        6) .6 Employers' Liability:

            a) Accident: $100,000 Per Occurrence.

            b) Disease: $500.000 Policy Limit.

            c) Disease: $100,000 Per Employee.

        7) .7 Property Insurance:

            a) General Builder's Risk: Equal to Value of Work.

b. §11.1.1.2 Liability Insurance shall include all major divisions of coverage and be on a comprehensive basis including:

1) .1 Premises Operations (including X, C and U coverages as applicable).

2) .2 Independent Contractors' Protective

3) .3 Products and Completed Operations.

4) .4 Personal Injury Liability with Employment Exclusion deleted

5) .5 Contractual, including specified provision for Contractor's obligation under paragraph 3.18.2 Owned, non-owned and hired motor vehicles.

6) .6 Broad Form Property Damage including Completed Operations.

c. §11.1.1.3 If the General Liability coverages are provided by a Commercial General Liability Policy on a claims-made basis, the policy date or Retroactive Date shall predate the Contract; the termination date of the policy or applicable extended reporting period shall be earlier than the termination date of coverages required to be maintained after final payment, certified in accordance with Subparagraph 9.10.2.

d. §11.1.1.4 If this insurance is written on a Commercial General Liability policy form, the certificates shall be ACORD form 25-S, completed and supplemented in accordance with AIA Document G715™-1991, Instruction Sheet and Supplemental Attachment for ACORD Certificate of Insurance 25-S.

e. §11.1.1.5 Performance Bond and Payment Bond:

1) .1 The Contractor shall furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder. Bonds may be obtained through the Contractor's usual source and the cost thereof shall be included in the Contract Sum. The amount of each bond shall be equal to 100 percent of the Contract Sum.

2) .2 The Contractor shall deliver the required bonds to the Owner not later than three days following the date the Agreement is entered into, or if the Work is to be commenced prior thereto in response to a letter of intent, the Contractor shall, prior to the commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished.

3) .3 The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney.

B. §11.2 Owner's Insurance

1. Delete §11.2.1 and substitute the following:

a. §11.2.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

2. Add the following Sections:
    a. §11.2.1.1 If the Owner is damaged by the failure of the Contractor to purchase and maintain such insurance without so notifying the Owner in writing, then the Contractor shall bear all reasonable costs attributable thereto.
3. Delete §11.2.2 and substitute the following:
    a. §11.2.2 Failure to Purchase Required Property Insurance. If the Contractor fails to purchase and maintain the required property insurance, with all the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, The Contractor shall inform the Owner in writing prior to commencement of the Work. Upon receipt of notice form the Contractor, the Owner may delay commencement of the Work and may obtain insurance that will protect the interests of the parties and deduct costs of insurance from contract by change order. If the Owner is damaged by the failure of the Contractor to purchase and maintain such insurance without so notifying the Owner in writing, then the Contractor shall bear all reasonable costs attributable thereto.
4. Delete §11.2.3 and substitute the following:
    a. §11.2.3 Notice of Cancellation or Expiration of Contractor's Required Property Insurance. The Contractor shall provide written notice of any cancellation or expiration of coverages required at least 30 days prior to any lapse in coverage event. Failure to notify Owner of any lapse in coverage event is the sole responsibility of the Contractor and any damages to the Owner or the Property shall be the Contractor's responsibility to bear all costs. Such notice requirement shall appear on the policy coverages page.
5. Delete §11.4 in its entirety.
6. Delete §11.5 in its entirety.

1.13 ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

A. §12.2 Correction of Work:
1. Add the following after Section 12.2.2.3:
    a. §12.2.2.4 Upon request by the Owner and prior to the expiration of one year from the date of Substantial Completion, the Architect will conduct, and the Contractor shall attend a meeting with the Owner to review the facility operations and performance.

1.14 ARTICLE 15 CLAIMS AND DISPUTES

A. §15.1.6 Claims for Additional Time
1. Delete §15.1.6.2 and substitute the following:
    a. §15.1.6.2 Unusually Adverse Weather Delays:
        1) .1 The Contractor shall anticipate delays in the progress of the Work, due to adverse weather, during the stipulated Contract Time in the amount of days published in recognized official data. If documented evidence (from recognized official data) indicates weather delays in excess of this amount, then they shall be declared as unusually adverse weather and then the Contractor may be granted an Extension of Time

for each Work Day, in excess of the normal days, in which the weather prevented work on the Project Site for fifty (50) percent or more of the Contractor's "Normal Work Day", but only if such prevented work was critical to the timely completion of the project.

2) .2 Contractor's "Normal Workday" shall be defined on the basis of Hours Per Day/Days Per Week as stated by the Contractor at the beginning of the Project. Example: If the Contractor indicates that his "normal" (regular) schedule is a 6-Day Work Week, meaning Monday through Saturday, then a rain on Sunday (since not a scheduled Workday) will not necessarily delay the Work of the Project. However, site conditions, as a result of the rain, could partially or fully prevent scheduled outside work on Monday (and thereafter) thereby making the Contractor eligible to apply for a Weather Delay Extension of Time on the basis of the conditions stated in the paragraph above.

2. Add the following Sections:

a. §15.1.6.3 Claims for increase in the Contract Time shall set forth in detail the circumstances that form the basis for the Claim, the date upon which each cause of delay began to affect the progress of the Work, the date upon which each cause of delay ceased to affect the progress of the Work and the number of days' increase in the Contract Time claimed as a consequence of each such cause of delay. The Contractor shall provide such supporting documentation as the Owner may require including, where appropriate, a revised construction schedule indicating all the activities affected by the circumstances forming the basis of the Claim.

b. §15.1.6.4 The Contractor shall not be entitled to a separate increase in the Contract Time for each one of the causes of delay which may have concurrent or interrelated effects on the progress of the Work, or for concurrent delays due to the fault of the Contractor.

B. §15.1.7 Waiver of Claims for Consequential Damages

1. Delete §15.1.7 and substitute the following:

a. §15.1.7 Waiver of Claims for Consequential Damages. The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. If, before expiration of 30 days from the date of execution for this agreement, the Owner obtains by separate agreement and furnishes to the Contractor a similar mutual waiver of all claims from the Architect against the Contractor for consequential damages which the Architect may incur as a result of any act or omission of the Owner or Contractor, then the waiver of consequential damages by the Owner and Contractor contained in this subparagraph 15.1.7 shall be applicable to claims by the Contractor against the Architect. This mutual waiver includes:

1) .1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

2) .2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising from the Work.

C. Delete §15.3 Mediation in its entirety including all subsections.

D. Delete §15.4 Arbitration in its entirety including all subsections.

E. Add Section §15.3 Resolution of Claims and Disputes

1. Add the following Sections:

a. §15.3.1 If a Claim has not been resolved after consideration of the foregoing and of further evidence presented by the parties or requested by the Architect, the Architect will notify the parties in writing that the Architect's decision will be made within seven days. After receipt of the Architect's decision, either party may file a claim in court for resolution of the dispute. However, any action or suit filed in court shall only be filed in the Chancery Court of the County of the Owner's principal place of business. In the event a legal action or suit is filed in a court other than the designated court, then the other party shall be entitled to have a case transferred to the designated court and be reimbursed for all attorney's fees and expenses incurred in transferring the case.

b. §15.3.2 Attorney's Fees: In the event of default or breach by any party hereto, the non-defaulting party shall have the right to enforce this contract and/or seek damages for its breach in the Courts of the county of the Owner's principal place of business. In addition to such other damages as may be provided herein or as may be proved by the non-defaulting party, the defaulting party shall be liable and responsible for all attorney's fees, court costs, expert witness fees or other out of pocket expenses incurred by the non-defaulting party as a result, directly or indirectly, of the breach or default by the defaulting party.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 10 00 SUMMARY

PART 1 GENERAL

1.1 PROJECT IDENTIFICATION

A. Project Name: Additions and Renovations to Asbury Hospice House

B. Owner's Name: FORREST GENERAL HOSPITAL

C. Architect's Name: Landry Lewis Germany Architects, P.A..

D. Drawings and Project Manual dated: 10/10/2025

1.1 ABBREVIATED WRITTEN SUMMARY

A. Briefly, and without force and effect upon contract documents, work of contract can be summarized as follows:

1. The work consists of Additions and Renovations to Asbury Hospice House, as well as a new parking area and covered drive-thru.

B. Refer to the following Sections for additional information related to the scope of work.

1. Allowances as described in Section 01 21 00 - Allowances are included in the scope of the work.

1.1 OWNER OCCUPANCY

A. Owner intends to occupy the Project upon Substantial Completion.

B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

C. Schedule the Work to accommodate Owner occupancy.

END OF SECTION

SECTION 01 21 00 ALLOWANCES

PART 1 GENERAL

1.1 GENERAL

A. Coordinate allowance work with related work to ensure that each selection is completely integrated and interfaced with related work. Requirements for the work of allowances are shown and specified to an extent established by the date of contract documents; additional requirements are established by change order. At the earliest possible date, advise the Architect of date each final allowance selection must be completed.

B. Submit proposals for allowance work as directed and in the manner specified for change orders. Indicate quantities, unit costs, and total purchase amounts. Taxes, insurance, bond, delivery charges and trade discounts are excluded. Where requested, furnish detailed breakdown of quantity survey. Deliver excess materials of allowance work to Owner's storage space, or dispose of by other means as directed.

2.1 ALLOWANCES SCHEDULE

A. Section 08 71 00 Door Hardware - Include the stipulated sum of $40,000.00 for purchase and delivery of Door Hardware

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 25 13 - PRODUCTS AND SUBSTITUTIONS

PART 1 GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

1.1 DESCRIPTION OF REQUIREMENTS:

A. Definitions: "Products" is defined to include purchased items for incorporation into the work, regardless of whether specifically purchased for project or taken from Contractor's stock of previously purchased products. "Materials," is defined as products which must be substantially cut, shaped, worked, mixed, finished, refined or otherwise fabricated, processed, installed or applied to form units of work. "Equipment" is defined as products with operational parts, regardless of whether motorized or manually operated, and particularly including products with service connections (wiring, piping, etc.). Definitions in this paragraph are not intended to negate the meaning of other terms used in contract documents, including "specialties," "systems," "structure," "finishes," "accessories," "furnishings," "special construction," and similar terms, which are self-explanatory and have recognized meanings in the construction industry.

B. Substitutions: The requirements for substitutions do not apply to specified Contractor options on products and construction methods. Revisions to contract documents, where requested by Owner, Architect or Engineer, are "changes" not "substitutions." Requested substitutions during bidding period, which have been accepted prior to Bid Date, are included in contract document and are not subject to requirements for substitutions as specified herein. Contractor's determination of and compliance with governing regulations and orders issued by governing authorities do not constitute "substitutions;" and do not constitute a basis for change orders, except as provided for in contract documents. Otherwise, Contractor's requests for changes in products, materials and methods of construction required by contract documents are considered requests for "substitutions," and are subject to requirements hereof.

C. Standards: Refer to Division-1 section "Definitions and Standards" for applicability of industry standards to products of project, and for acronyms used in text of specification sections.

1.1 QUALITY ASSURANCE:

A. Source Limitations: To the greatest extent possible for each unit of work, provide products, materials or equipment of a singular generic kind and from a single source.

B. Compatibility of Options: Where more than one choice is available as options for Contractor's selection of a product or material, select an option which is compatible with other products and materials already selected (which may have been from among options for those other products and materials). Total compatibility among options is not assured by limitations within contract documents but must be provided by Contractor. Compatibility is a basic general requirement of product/material selections.

1.1 SUBMITTALS:

A. Requests for Substitutions: Submit 3 copies, fully identified for product or method being replaced by substitution, including related specification section and drawing number(s), and fully documented to show compliance with requirements for substitutions. Include product data/drawings, description of methods, samples where applicable, Contractor's detailed comparison of significant qualities between specified item and proposed substitution, statement of effect on construction time and coordination with other affected work, cost information or proposal, and Contractor's statement to the effect that proposed substitution will result in overall work equal-to-or-better-than work originally indicated.

1.1 PRODUCT DELIVER-STORAGE-HANDLING:

A. General: Deliver, handle and store products in accordance with manufacturer's recommendations and by methods and means which will prevent damage, deterioration, and loss including theft. Control delivery schedules to minimize long-term storage of products at site and overcrowding of construction spaces. In particular, provide delivery/installation coordination to ensure minimum holding or storage times for products recognized to be flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other sources of loss.

1.1 WARRANTIES (GUARANTEES):

A. Categories of Specific Warranties: Warranties on the work are in several categories, including those of General Conditions, and including (but not necessarily limited to) the following specific categories related to individual units of work specified in sections of Divisions 2 through 16 of these specifications:

B. Special Project Warranty (Guarantee): A warranty specifically written and signed by Contractor for a defined portion of the work; and, where required, countersigned by subcontractor, installer, manufacturer or other entity engaged by Contractor.

C. Specified Product Warranty: A warranty which is required by contract documents, to be provided for a manufactured product incorporated into the work; regardless of whether manufacturer has published a similar warranty without regard for specific incorporation of product into the work or has written and executed a special project warranty as a direct result of contract document requirements.

D. Coincidental Product Warranty: A warranty which is not specifically required by contract documents (other than as specified in this Section) but which is available on a product incorporated into the work, by virtue of the fact that manufacturer of product has published warranty in connection with purchases and uses of product without regard for specific applications except as otherwise limited by terms of warranty.

E. Refer to individual sections of Divisions 2 through 16 for the determination of units of work which are required to be specifically or individually warranted, and for the specific requirements and terms of those warranties (or guarantees).

F. General Limitations: It is recognized that specific warranties are intended primarily to protect Owner against failure of the work to perform as required, and against deficient, defective and faulty materials and workmanship, regardless of sources. Except as otherwise indicated, specific warranties do not cover failures in the work which result from: 1) Unusual and abnormal phenomena of the elements, 2) The Owner's misuse, maltreatment or improper maintenance of the work, 3) Vandalism after time of substantial completion, or 4) Insurrection or acts of aggression including war.

G. Related Damages and Losses: In connection with Contractor's correction of warranted work which has failed, remove and replace other work of project which has been damaged because of such failure, or must be removed and replaced to provide access for correction of warranted work.

H. Consequential Damages: Except as otherwise indicated or required by governing regulation, special project warranties and product warranties are not extended to cover damage to building contents (other than work of Contract) which occurs because of failure of warranted work.

I. Reinstatement of Warranty Period: Except as otherwise indicated, when work covered by a special project warranty or product warranty has failed and has been corrected by replacement or restoration, reinstate warranty by written endorsement for the following time period, starting on date of acceptance of replaced or restored work.

1. A period of time ending upon date original warranty would have expired if there had been no failure.

J. Replacement Cost, Obligations: Except as otherwise indicated, costs of replacing or restoring failing warranted units or products is Contractor's obligation, without regard for whether Owner has already benefited from use through a portion of anticipated useful service lives.

K. Rejection of Warranties: Owner reserves the right, at time of substantial completion or thereafter, to reject coincidental product warranties submitted by Contractor, which in opinion of Owner tend to detract from or confuse interpretation of requirements of contract documents.

L. Contractor's Procurement Obligations: Do not purchase, subcontract for, or allow others to purchase or sub-subcontract for materials or units of work for project where a special project warranty, specified product warranty, certification or similar commitment is required, until it has been determined that entities required to countersign such commitments are willing to do so.

PART 2 PRODUCTS

2.1 GENERAL PRODUCT COMPLIANCE’S:

A. General: The compliance requirements, for individual products as indicated in contract documents, are multiple in nature and may include generic, descriptive, proprietary, performance, prescriptive, compliance with standards, compliance with codes, conformance with graphic details and other similar forms and methods of indicating requirements, all of which must be complied with. Also "allowances" and similar provisions of contract documents will have a bearing on selection process.

B. Procedures for Selecting Products: Contractor's options for selecting products are limited by contract document requirements, and governing regulations, and are not controlled by industry and governing regulations, and are not controlled by industry traditions or procedures experienced by Contractor on previous construction projects. Required procedures include, but are not necessarily limited to, the following for various indicated methods of specifying:

1. Single Product/Manufacturer Name: Provide product indicated, except advise Architect/Engineer before proceeding, where known that named product is not a feasible or acceptable selection.

C. "Or Equal": Where named products in specifications text are accompanied by the term "or equal," or other language of similar effect, comply with those contract document provisions concerning "substitutions" for obtaining Architect's approval (by change order) to provide an unnamed product. "Named", except as otherwise indicated, is defined to mean manufacturer's name for product, as recorded in published product literature, of latest issue as of date of contract documents. Refer requests to use products of a later (or earlier) model to Architect for acceptance before proceeding.

D. Standards, Codes and Regulations: Where only compliance with an imposed standard, code or regulation is required, selection from among products which comply with requirements including those standards, codes and regulations, is Contractor's option.

E. Performance Requirements: Provide products which comply with specific performances indicated, and which are recommended by manufacturer (in published product literature or by individual certification) for application indicated. Overall performance of a product is implied where product is specified with only certain specific performance requirements.

F. Prescriptive Requirements: Provide products which have been produced in accordance with prescriptive requirements, using specified ingredients and components, and complying with specified requirements for mixing, fabricating, curing, finishing, testing and similar operations in manufacturing process.

G. Visual Matching: Where matching with an established sample is required, final judgment of whether a product proposed by Contractor matches sample satisfactorily is Architect's judgment. Where no product within specified cost category is available, which matches sample satisfactorily and complies with requirements, comply with contract document provisions concerning, "substitutions" and "change orders" for selection of a matching product outside established cost category or, of a product not complying with requirements.

H. Visual Selection: Except as otherwise indicated, where specified product requirements include "...as selected from manufacturer's standard colors, patterns, textures…" or words of similar effect, the selection of manufacturer and basic product (complying with requirements) is Contractor's option, and subsequent selection of color, pattern and texture is Architect's selection. Where specified product requirements include "...as selected from standard colors, patterns, textures available within the industry...", or words to that effect, selection of product (complying with requirements, and within established cost category) is Architect's selection, including designation of manufacturer where necessary to obtain desired color, pattern or texture.

2.1 SUBSTITUTIONS:

A. Conditions: Contractor's request for substitution will be received and considered when extensive revisions to contract documents are not required and changes are in keeping with general intent of contract documents; when timely, fully documented and properly submitted; and when one or more of following conditions is satisfied, all as judged by Architect. Otherwise, requests will be returned without action except to record non-compliance with these requirements.

1. Where request is directly related to an "or equal" clause or other language of same effect in contract documents.
2. Where required product, material or method cannot be provided within Contract Time, but not as a result of Contractor's failure to pursue the work promptly or to coordinate various activities properly.
3. Where required product, material or method cannot be provided in a manner which is compatible with other materials of the work, or cannot be properly coordinated therewith, or cannot be warranted as required, or cannot be used without adversely affecting Owner's insurance coverage on completed work, or will encounter other substantial non-compliance's which are not possible to otherwise overcome except by making requested substitution, which Contractor thereby certifies to overcome such non-compatibility, non-coordination, non-warranty, non-insurability or other non-compliance as claimed.
4. Where required product, material or method cannot receive required approval by a governing authority, and requested substitution can be so approved.
5. Where substantial advantage is offered Owner, in terms of cost, time, energy conservation or other valuable considerations, after deducting offsetting responsibilities Owner may be required to bear, including additional compensation to Architect for redesign and evaluation services, increased cost of other work by Owner or separate contractors, and similar considerations.

B. Work-Related Submittals: Contractor's submittal of (and Architect's acceptance of) shop drawings, product data or samples which relate to work not complying with requirements of contract documents, does not constitute an acceptable or valid request for a substitution, nor approval thereof.

2.1 GENERAL PRODUCT REQUIREMENTS:

A. General: Provide products which comply with requirements, and which are undamaged and unused at time of installation, and which are complete with accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for intended use and effect.

B. Standard Products: Where available, provide standard products of types which have been produced and used previously and successfully on other projects and in similar applications.

C. Continued Availability: Where additional amounts of a product, by nature of its application, are likely to be needed by Owner at a later date for maintenance and repair or replacement work, provide a standard, domestically produced product which is likely to be available to Owner at such later date.

D. Nameplates: Except as otherwise indicated for required approval labels, and operating data, do not permanently attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view either in occupied spaces or on exterior of the work.

E. Labels: Locate required labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface which, in occupied spaces, is not conspicuous.

F. Equipment Nameplates: Provide permanent nameplate on each item of service-connected or power operated equipment. Indicate manufacturer, product name, model number, serial number, capacity, speed, ratings and similar essential operating data. Locate nameplates on an easily accessed surface which, in occupied spaces, is not conspicuous.

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submittals.

B. Related Requirements: Individual submittal requirements specified for each unit of work are in addition to those identified in this section. Refer to other Division 00 and 01 sections and contract documents for administrative submittal requirements.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.4 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1.5 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:

1. Project name.
2. Date.

3. Name of Architect, Contractor, subcontractor, manufacturers & suppliers.
4. Name of firm or entity that prepared submittal.
5. Unique submittal number, including revision identifier.
6. Category and type of submittal, purpose, and description.
7. Specification Section references. Include paragraph number, as appropriate.
8. Drawing number and detail references, as appropriate.
9. Indication of full or partial submittal.
10. Location(s) where product is to be installed, as appropriate.
11. Warranty and guarantee information for each product, material, installation, etc.
12. Other necessary identification.
13. Remarks.
14. Signature of transmitter.

B. Options: Identify options requiring selection by Architect.

C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. Paper Submittals:
1. Action Submittals: Submit three copies of each submittal unless otherwise indicated. The architect will retain one copy and return the remaining copies.
2. Informational Submittals: Submit two copies of each submittal unless otherwise indicated. The architect will not return copies.
3. Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using AIA Document G810 or equivalent transmittal form.

E. Electronic Submittals: Prepare submittals as a PDF package, incorporating complete information into each PDF file. Name the PDF file with the submittal number.

1.6 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Section. Types of submittals are indicated in individual Specification Sections. Architect may request additional submittals as needed.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.

a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.

D. Color & Finish Selections: Submittals requiring the Architect to approve finishes, textures, or color selections may be partially approved at the discretion of the Architect. No color selections will be made until all shop drawings, product samples, etc. have been received for all related portions of the work. No extension of the Contract Time will be authorized because of failure to provide color selections enough in advance of the Work to permit processing, including resubmittals.

E. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block, and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

F. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

G. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

H. Coordination with volumes: Coordinate each submittal with the appropriate Volume as required to organize distribution to the design team.

1.7 SUBMITTAL REQUIREMENTS

A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.

3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

    a. Wiring diagrams that show factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data unless submittal based on Architect's digital data drawing files is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional engineer if specified.

2. Paper Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 24 by 36 inches.

3. BIM Incorporation: Where required, develop and incorporate Shop Drawing files into BIM established for Project.

C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.

1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
2. Identification: Permanently attach label on unexposed side of Samples that includes the following:

    a. Project name and submittal number.

b. Generic description of Sample.
c. Product name and name of manufacturer.
d. Sample source.
e. Number and title of applicable Specification Section.
f. Specification paragraph number and generic name of each item.

3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units, showing the full range of colors, textures, and patterns available.

   a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected. Provide additional sets where required by individual specification section.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

   a. Number of Samples: Submit two sets of Samples. Architect will retain one Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.

      1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

D. Product Schedule: Where required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.

E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

G. Certificates:

1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
2. Installer Certificates: Submit written statements on manufacturer's letterhead, certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

    a. Name of evaluation organization.

b. Date of evaluation.
c. Time period when report is in effect.
d. Product and manufacturers' names.
e. Description of product.
f. Test procedures and results.
g. Limitations of use.

1.8 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

C. BIM Incorporation: Where required, incorporate delegated-design drawing and data files into BIM established for Project.

1. Prepare delegated-design drawings in the following format: Same digital data software program, version, and operating system as original Drawings.

1.9 CONTRACTOR'S REVIEW

A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Contractor's Approval: Indicate Contractor's approval for each submittal. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

1. Architect will reject submittals received from Contractor that do not have Contractor's review and approval.

1.10 ARCHITECT'S REVIEW

A. Action Submittals: Architect will review each submittal and return indicating via markup the appropriate action as follows;

1. Marked “Approved”: Final unrestricted release. Work may proceed, provided it complies with contract documents.

2. Marked “Approved as Noted”: Final but restricted release. Work may proceed, provided it complies with the notations and corrections indicated on submittal and with the contract documents.

3. Marked “Returned for Resubmittal”: Do not proceed with work. Revise in accordance with notations thereon and resubmit without delay. Do not allow submittals to be used in connection with performance of the work.

4. Marked “No Action Required”: Other action. Where submittal is returned for other reasons, with Architect explanation included.

B. Informational Submittals: Architect will review each submittal and will not return it or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Architect will return without review or discard submittals received from sources other than Contractor.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013300

Submittal Cover Sheet – Landry Lewis Germany Architects, P.A.

CN #: _____ Project Name: _____

Submittal #: _____ Revision #: _____ Date: _____

Specification Section Reference: _____

Or Drawing Sheet Detail Reference: _____

Full ☐ Partial ☐ Resubmittal ☐ Supplemental ☐

Prepared by

Name: _____ Email: _____

Company: _____ Cell: _____

Reviewed by General Contractor

Name: _____ Email: _____

Company: _____ Cell: _____

Contractor shall indicate specific products, options, sizes, models, etc. to be used for this project

A/E Action Required: Color, style, pattern, data needed ☐ Samples provided or attached ☐

GC Remarks:

GC Review/Stamp:

LLGA Review/Stamp:

LLGA Remarks:

SECTION 01 50 00 - TEMPORARY FACILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF REQUIREMENTS:

A. Definitions: Specific administrative and procedural minimum actions are specified in this section, as extensions of provisions in General Conditions and other contract documents. These requirements have been included for special purposes as indicated. Nothing in this section is intended to limit types and amounts of temporary work required, and no omission from this section will be recognized as an indication by Architect that such temporary activity is not required for successful completion of the work and compliance with requirements of contract documents. Provisions of this section are applicable to, but not by way of limitation, utility services, construction facilities, security/protection provisions, and support facilities.

1.3 QUALITY ASSURANCE:

A. General: In addition to compliance with governing regulations and rules/recommendations of franchised utility companies, comply with specific requirements indicated and with applicable local industry standards for construction work (published recommendations by local consensus "building councils").

B. ANSI Standards: Comply with applicable provisions of ANSI A10- Series standards on construction safety, including A10.3, A10.4, A10.5, A10.6, A10.7, A10.8, A10.9, A10.10, A10.11, A10.12, A10.13, A10.14, A10.15, A10.17, A10.18, A10.20, and A10.22. NFPA Code: Comply with NFPA Code 241 "Building Construction and Demolition Operations."

1.4 JOB CONDITIONS:

A. General: Establish and initiate use of each temporary facility at time first reasonably required for proper performance of the work. Terminate use and remove facilities at earliest reasonable time, when no longer needed or when permanent facilities have, with authorized use, replaced the need.

B. Conditions of Use: Install, operate, maintain and protect temporary facilities in a manner and at locations which will be safe, non-hazardous, sanitary and protective of persons and property, and free of deleterious effects.

PART 2 - PRODUCTS AND EXECUTION

2.1 TEMPORARY UTILITY SERVICES:

A. The types of services required include, but not by way of limitation, water, sewerage, surface drainage, electrical power and telephones. Where possible and reasonable, connect to existing franchised utilities for required services; and comply with service companies' recommendations on materials and methods, or engage service companies to install services. Locate and relocate services (as necessary) to minimize interference with construction operations.

1. Electrical Power: Tie into existing building system if possible.
   a. Utility cost shall be paid by owner.

2. Potable Water: Tie into existing buildings system if possible.
   a. Utility cost shall be paid by owner.

3. Gas and other utilities: Tie into utilities as indicated on the plans for permanent connections.
   a. Utility cost shall be paid by the owner.

2.2 TEMPORARY CONSTRUCTION FACILITIES:

A. GENERAL

1. The types of temporary construction facilities required include, but not by way of limitation, water distribution, drainage, dewatering equipment, enclosure of work, heat, ventilation, electrical power distribution, lighting, hoisting facilities, stairs, ladders, and roads. Provide facilities reasonably required to perform construction operations properly and adequately.

B. WATER DISTRIBUTION:

1. Mechanical contractor shall pipe to each floor level and provide hose lengths sufficient to reach entire area of construction work, not less than 3/4" hose size. Prevent freezing of water distribution by either prompt drainage after each use, or by suitable protection. Maintain 30 psi minimum water pressure at hose outlets.

C. ENCLOSURE

1. Before the building is enclosed and at any time work is performed outside the building enclosure, each contractor shall provide all heating, equipment, fuel, labor, supervision and maintenance necessary to protect his work and material against injury from the elements, including but not limited to dampness and cold. Each contractor shall provide approved temporary heating devices, electrical power, adequate and proper fuel, enclosures, etc., required for performing the work of his trades.

2. The general contractor shall enclose the building as soon as possible after starting construction and notify all contractors in writing when enclosure is completed. The building shall be considered enclosed when the walls have been constructed, a watertight

roof has been applied and all doors, windows and other openings have been closed in an approved manner with permanent and/or temporary closures which provide in the opinion of the Architect a sufficient number of operating window units for the escape of construction moisture.

D. CONSTRUCTION HEAT

1. Construction heat shall be all heat, whether furnished by temporary heating units or by the permanent heating system, necessary to heat the building enclosure prior to the Owner's assumption of responsibility for the building heat.

E. RESPONSIBILITY

1. After enclosure, the general contractor will be fully responsible for providing construction heat until the building is accepted for occupancy by the Owner.

F. PERMANENT HEATING AND VENTILATION SYSTEM

1. The mechanical contractor shall furnish permanent heating and ventilating systems to heat and ventilate all building areas using heat and air from the permanent systems when available.

2. The electrical contractor shall furnish the electrical service, wiring and equipment necessary to utilize the permanent and temporary heating and ventilating systems, completing same concurrently with mechanical work.

3. The electrical contractor shall pay the costs for making electrical connections to heating or ventilating equipment or controls for temporary use other than to permanently located equipment.

4. Operate the heating and air supply systems used during construction to provide proper temperature and relative humidity for the work of each contractor. Maintain minimum temperature and humidity conditions as follows:

5. Maintain a minimum temperature of 50 degrees at all times in the spaces involved during the placing, setting, and curing of concrete, plaster, ceramic tile, or similar materials. Supply heat in a manner that will prevent the rapid drying of materials. Supply air for drying of materials.

6. Before delivery of materials and during the installation of finished woodwork, applying paint or varnish finishes, or applying impervious membranes or fabrics such as vinyl, maintain a minimum temperature of 70 degrees. Before installation dry the structure out by heat and ventilation to such an extent that moisture contained within partitions, walls, floors, or other structures will not adversely affect the installation or application of finished materials. Maintain a temperature of not less than 70 degrees in spaces where composition flooring is being laid and has been laid for the duration of the contract.

7. At a date established in substantial completion certificate or beneficial occupancy, whichever is earlier, the Owner will assume responsibility for providing heat to all parts of the building and all contractors will be relieved of their duties to furnish construction heat.

G. TEMPORARY POWER AND LIGHTING SYSTEM

1. The electrical contractor will provide a temporary light and power system within the building for the use of each contractor as specified herein.

2. Electrical Power: The electrical contractor will provide and maintain weatherproof, grounded, power distribution system sufficient to accommodate construction operations requiring power, use of power tools, electrical heating, lighting, and start-up testing of permanent electric-powered equipment prior to its permanent connection to electrical system. Provide overload protection. Locate multiple outlets (not less than 4-gang), spaced so that entire area of construction can be reached by power tools on a single extension cord of 100' maximum length.

3. Lighting: The electrical contractor will provide and maintain sufficient temporary lighting to ensure proper workmanship everywhere; by combined use of daylight, general lighting, and portable plug-in task lighting. Provide general lighting with local switching which will enable energy conservation during periods of varying activity (work-in-progress, traffic only, security check, lock-up, etc.).

4. Provide uniformly spaced general lighting equivalent to not less than one 200-watt incandescent lamp per 1000 square feet of floor area, and one 100-watt lamp per fifty feet of corridor.

5. Additional Power or Lighting: Contractor requiring any additional temporary lighting and power shall arrange to have the electrical contractor make a proper connection to the temporary system and provide facilities to suit their requirements to the extent possible and be responsible for the cost and maintenance thereof.

6. Portable Tools: Each contractor shall be responsible for maintaining portable tools and appliances operated from the temporary light and power system with suitable cords and plugs in good condition and with non-current-carrying parts grounded through a grounding conductor.

7. Maintenance and Repair: The temporary light and power system shall be used under the direction of the electrical contractor to the extent that in the event of heavy loading, he shall designate where loads may be connected so as to prevent overloading of circuits. Each contractor shall coordinate his use of temporary power so that the demand does not exceed the service available.

8. The repair of any damage to the system, including replacement of blown fuses, resulting from misuse or from connecting faulty equipment into the system, shall be paid for by each contractor responsible for the damage. Although the temporary light and power system is furnished for the use of each contractor, the components and materials furnished by the electrical contractor shall remain his property and any costs attributed to loss or damage to same shall be reimbursed by each contractor whose employees are found to be responsible for said loss and damage.

9. Each contractor requiring power for loads larger than those defined available and for electric welders shall make his own arrangements for these facilities and pay the energy costs for same. Remove such facilities immediately after work is completed.

H. PERMANENT ELECTRICAL SERVICE

1. In accordance with the job progress and conditions, the electrical contractor will make the permanent electrical service and distribution system for the building available for use for testing and adjusting of equipment and for operation of the required heating and ventilating equipment that is installed in permanent position. Enclosures and partitions must be in place around the major items of electrical equipment before such equipment may be energized.

I. PROTECTION OF EXISTING WORK

1. Where work is conducted above, or adjacent to, roofs, protect the roof with a minimum of 3/4" plywood. **Storage of materials will not be permitted on any roof unless noted otherwise by structural engineer of record for project.**
2. **No scaffolding all on existing roof.**

J. CONSTRUCTION AIDS

1. Scaffolding and staging shall be provided by contractor for both interior and exterior work as required. Furnish, install and maintain scaffolding in accordance with requirements of all laws and regulations in effect.

K. LIFTING DEVICES AND HOISTING FACILITIES

1. Contractor shall provide lifting devices necessary for the proper and efficient movement of materials; provide operating personnel for equipment as required. Equipment shall be provided with safety devices as required by local and state codes.

L. ACCESS PROVISIONS

1. Provide ramps, stairs, ladders and similar temporary access elements as reasonably required to perform the work and facilitate its inspection during installation. Comply with reasonable requests of governing authorities performing inspections.

2.3 SECURITY/PROTECTION PROVISIONS:

A. The types of temporary security and protection provisions required include, but not by way of limitation, fire protection, barricades, warning signs/lights, site enclosure fence, building enclosure/lockup, personnel security, theft prevention program and similar provisions intended to minimize property losses, personal injuries and claims for damages at project site. Provide security/protection services and systems in coordination with activities and in a manner to achieve 24-hour, 7-day-per-week effectiveness.

B. SECURITY

1. The Owner will not be responsible for the safety of contractor's work, material and/or equipment.

C. FIRE EXTINGUISHERS

1. Provide types, sizes, numbers and locations as would be reasonably effective in extinguishing fires during early stages, by personnel at project site. Provide Type A

extinguishers at locations of low-potential for either electrical or grease-oil-flammable liquids fires; provide Type ABC dry chemical extinguishers at other locations; comply with recommendations of NFPA No. 10. Post warning and quick-instructions at each extinguisher location, and instruct all personnel at project site, at time of their first arrival, on proper use of extinguishers and other available facilities at project site. Post local fire department call number on each telephone instrument at project site.

D. SITE ENCLOSURE FENCE

1. At earliest reasonable date enclose project site, or portion thereof determined by Contractor to be sufficient to contain entire construction activity.

2. At minimum, the Contractor shall provide the following site enclosure:
   a. Chain link steel fence with gates for both personnel and trucks. Locks shall be held under strict security control.
      1) 6’-0” minimum height fence and gates.

3. Sidewalk Covers: General contractor shall provide protected covered walkway to protect pedestrians walking along street. Extent and specific requirements shall be as required by building officials for city or authority having jurisdiction.

E. Where site enclosure fencing is installed in existing concrete or asphalt paving the Contractor shall patch/repair as required upon removal and prior to final application for payment

2.4 TEMPORARY SUPPORT FACILITIES:

A. The types of temporary support facilities required include, but not by way of limitation, field offices, storage sheds, fabrication sheds, sanitary facilities, drinking water, first aid facilities, telephones, thermometer, project identification signs, clean-up facilities, waste disposal service, rodent/pest control and similar miscellaneous general services, all as may be reasonably required for proficient performance of the work and accommodation of personnel at the site including Owner's and Architect's personnel. Discontinue and remove temporary support facilities, and make incidental similar use of permanent work of the project, only when and in manner authorized by Architect; and, if not otherwise indicated, immediately before time of substantial completion. Locate temporary support facilities for convenience of users, and for minimum interference with construction activities.

B. Material Storage: The contractor and each subcontractor shall make suitable provisions for his own office and for the storage of his materials and provide such temporary weatherproof sheds as may be necessary for the protection of his materials. The foregoing structures and equipment shall remain the property of such contractor and upon completion of the work the structures shall

C. Sanitary Facilities: At general contractor's option, provide either piped (wet) toilet facilities or self-contained toilet units of type acceptable to governing authorities, adequate (at all stages of construction) for use of personnel at project site. Provide separate facilities for male and female personnel when both sexes are working (in any capacity) at project site.

1. Use of owners’ facilities are not allowed

D. Drinking Water: General contractor shall provide dispenser-type, cold drinking water units; adequate in number and locations for personnel at project site. Furnish paper cups and waste receptacles.

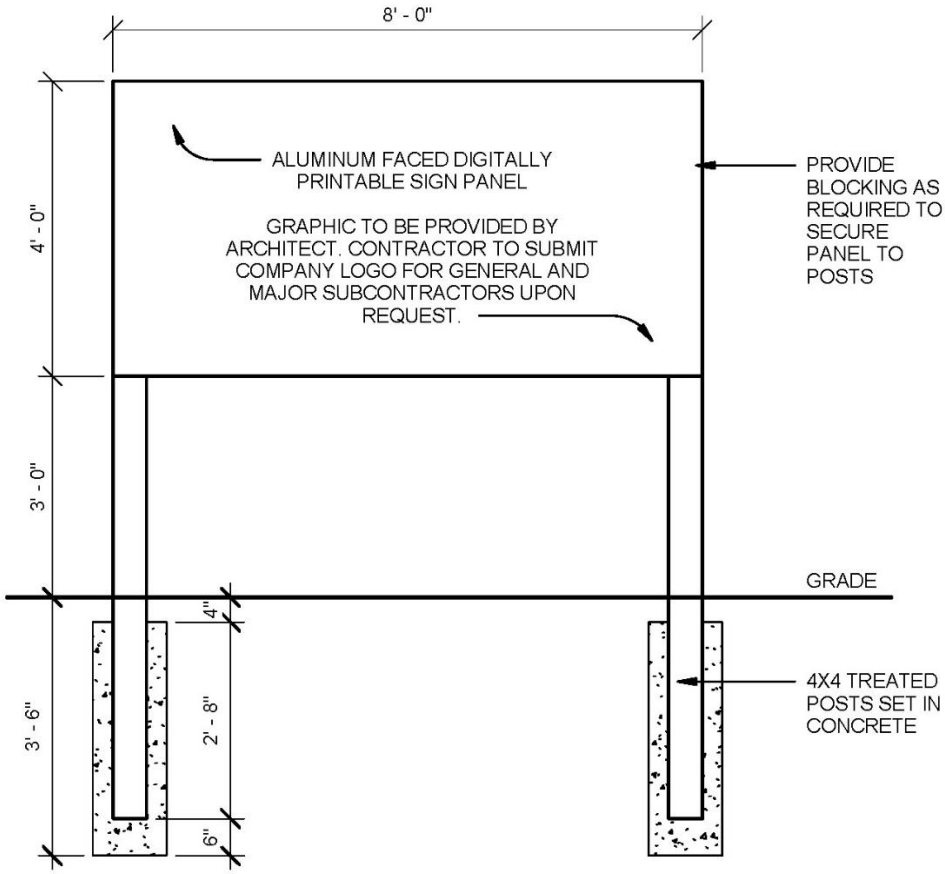
E. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide job site project identification sign complying with the drawing immediately following the end of this section. Signage to be manufactured & provided by a signage company acceptable to the Architect. Submit for review and approval identification sign construction, materials, and submittal requirements for digital graphics to be provided by the Architect.

2. Other Signs: Provide temporary directional signs for construction personnel and visitors as required. All other signs to be placed on the site by any contractor or subcontractor must be approved by the Architect as to size, quality, type and location.

3. Contractor shall maintain and touch up signs so they are legible at all times.

F. Repair of Damaged Items: The contractor who installed the temporary facilities is responsible for maintaining said facilities; however, misuse, damage or destruction of another contractor's or subcontractor's facilities shall be paid for by the contractor whose employees were responsible for said loss or damage. If responsible party is unknown, the cost to correct or replace shall be prorated to all contractors and subcontractors on the job at the time of such damage.



PROJECT SIGN
NO SCALE

END OF SECTION

SECTION 01 57 13 - TEMPORARY EROSION & SEDIMENTATION CONTROL

1.1 GENERAL

1.1.0 SECTION INCLUDES:

A. Prevention of erosion due to construction activities.

B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.

C. Restoration of areas eroded due to insufficient preventive measures.

D. Performance bond.

E. Compensation of **Forrest County General Hospital** for fines levied by authorities having jurisdiction due to non-compliance by the general contractor.

1.1.1 RELATED DOCUMENTS: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work specified in this section.

A. Site Clearing – Section 31 1000

B. Site Earthwork – Section 31 0000 (Site Work)

C. Turf and Grasses – Section 32 9200

D. Storm Water Pollution Prevention Plan (SWPPP) – Sheet C3.0 of Project Plans

E. MDEQ Small Construction Notice of Intention (SCNOI) – Section 00 0102.

1.1.2 PERFORMANCE REQUIREMENTS:

A. Comply with all requirements of U.S. Environmental Protection Agency for erosion and sedimentation control, as specified for the National Pollutant Discharge Elimination System (NPDES), Phases I and II, under requirements for the 2012 Construction General Permit (CGP), whether the project is required by law to comply or not.

B. Also comply with all more stringent requirements of State of Mississippi Department of Environmental Quality Small Construction Notice of Intent.

C. Best Management Practices Standard: Federal Highway Administration Best Management Practices for Erosion and Sediment Control.

D. Utilize the Storm Water Pollution Prevention Plan provided on Sheet C3.0 of the Project Plans and add additional measures as necessary to insure sediment does not leave the project site. Submit periodic inspection reports as required.

E. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
   a. Obtain and pay for permits and provide security required by authority having jurisdiction.
   b. ***Forrest County General Hospital will withhold payment equivalent to all fines resulting from non-compliance with applicable regulations.***

F. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.

G. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
   a. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
   b. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.

H. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
   a. Control movement of sediment and soil from temporary stockpiles of soil.
   b. Prevent development of ruts due to equipment and vehicular traffic.
   c. If erosion occurs due to non-compliance with these requirements, restore eroded areas ***(including areas outside of project limits)*** at no cost to Forrest County General Hospital.

I. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
   a. Prevent windblown soil from leaving the project site.
   b. Prevent tracking of mud onto public roads outside site.
   c. Prevent mud and sediment from flowing onto sidewalks and pavements.
   d. If erosion occurs due to non-compliance with these requirements ***(including areas outside of project limits)***, restore eroded areas at no cost to Forrest County General Hospital.

J. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
   a. If sedimentation occurs, install or correct preventive measures immediately at no cost to Forrest County General Hospital; remove deposited sediments; comply with requirements of authorities having jurisdiction.
   b. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.

K. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.

a. If sedimentation occurs, install or correct preventive measures immediately at no cost to Forrest County General Hospital; remove deposited sediments; comply with requirements of authorities having jurisdiction.

L. Open Water: Prevent standing water that could become stagnant.

M. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

N. ***Sod areas with slopes exceeding 3:1, slopes and bottom of all detention ponds, and the inverts/slopes of all drainage swales/ditches. Also sod areas as necessary to control erosion until lawn is established and/or as indicated on construction plans.***

1.1.4 SPECIAL PROJECT WARRANTY: Warrant temporary lawns through the duration of the project until such time that permanent erosion control measures are installed.

1.2 SUBMITTALS

A. See submittal process required by Architect.

B. Storm Water Pollution Prevention Plan (SWPPP)
1. Submit any anticipated revisions to the SWPPP provided within 2 weeks after Notice to Proceed.
2. Submit any anticipated revisions to the SWPPP provided not less than 30 days prior to anticipated start of clearing, grading, or other work involving disturbance of ground surface cover.
3. Any anticipated revisions to the provided SWPPP should include:
   a. Site plan identifying soils and vegetation, existing erosion problems, and areas vulnerable to erosion due to topography, soils, vegetation, or drainage.
   b. Measurements of existing turbidity of waterways.
   c. Site plan showing grading; new improvements; temporary roads, traffic accesses, and other temporary construction; and proposed preventive measures.
   d. Where extensive areas of soil will be disturbed, include storm water flow and volume calculations, soil loss predictions, and proposed preventive measures.
   e. Schedule of temporary preventive measures, in relation to ground disturbing activities.
   f. Other information required by law.
   g. Format required by law is acceptable, provided any additional information specified is also included.
4. Obtain the approval of the Plan by authorities having jurisdiction.
5. Obtain the approval of the Plan by Forrest County General Hospital.

C. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.

D. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.

E. Maintenance Instructions: Contractor shall continue to inspect and maintain temporary measures after issuance of Substantial Completion until Final Acceptance of the project is awarded.

1.3 PRODUCTS

1.2.1 TOPSOIL:

A. Stripped topsoil will be stockpiled for re-use in landscape work. If quantity of stockpiled topsoil is insufficient, provide additional topsoil as required to complete landscape work.

B. Provide, where required, new topsoil which is fertile, friable, natural loam, surface soil, reasonably free of subsoil, clay lumps, brush, weeds and other litter and without roots, stumps, gravel, and other extraneous or toxic matter harmful to plant growth.

1. Obtain topsoil from local sources or from areas having similar soil characteristics to that found at project site. Obtain topsoil only from naturally, well-drained sites where topsoil occurs in a depth of not less than 4"; do not obtain from bogs or marshes.

2. ***Any topsoil that contains weeds and miscellaneous vegetation may be rejected by the Engineer or Owner.*** Contractor shall ensure topsoil utilized from off-site locations is free of vegetation that may inhibit landscaping or lawn.

C. Contractor shall provide topsoil for the entire project site at a depth of not less than 4". Additional topsoil beyond what exists on the project site may be necessary and shall be included in the lump sum bid item. In the event that excess topsoil remains after all landscaping work is complete, the contractor shall haul off all remaining topsoil.

1.2.2 SOIL AMENDMENTS:

A. Lime: Natural limestone containing not less than 85% of total carbonates, ground so that not less than 90% passes a 10-mesh sieve and not less than 50% passes a 100 mesh sieve. Lime used by farms in the vicinity is acceptable.

B. Commercial Fertilizer: Complete fertilizer of neutral character, with some elements derived from organic sources and containing following percentages of available plant nutrients:

1. For lawns, provide fertilizer with equal percentages of nitrogen, phosphoric acid and potassium, and which will provide not less that 1 3/4 lbs. of actual nitrogen per 1000 sq. ft. of lawn area. Provide nitrogen in a form that will be available to lawn during initial period of growth.

1.2.3 GRASS MATERIALS:

A. Grass Seed:

1. Provide fresh, clean, new-crop seed complying with tolerance for purity and germination established by Official Seed Analysts of North America. Provide seed of grass species, proportions and minimum percentages of purity, germination, and maximum percentage of weed seed, as specified.

2. "Seeding Schedule" is attached at end of this section.

B. Sod: Provide strongly rooted sod, not less than 2 years old and free of weeds and undesirable native grasses. Provide only sod capable of growth and development when planted (viable, not dormant). Provide sod composed of the following:

1. Centipedegrass (Eremochloa ophiuroides).

1.2.4 SOIL EROSION NETTING: A flexible matting, of very open construction, designed to act as a reinforcing matrix for vegetative roots.

1.2.5 MULCH: Use one of the following:
1. Straw or hay.
2. Wood waste, chips, or bark.
3. Erosion control matting or netting.

1.2.6 BALES: Air dry, rectangular straw bales.
1. Cross Section: 14 by 18 inches (350 by 450 mm), minimum.
2. Bindings: Wire or string, around long dimension.

1.2.7 Bale Stakes: One of the following, minimum 3 feet (1 m) long:
1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot (1.98 kg per linear m).
2. Wood, 2 by 2 inches (50 by 50 mm) in cross section.

1.2.8 Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:

1. Average Opening Size: 30 U.S. Std. Sieve (0.600 mm), maximum, when tested in accordance with ASTM D4751.
2. Permittivity: 0.05 sec^-1, minimum, when tested in accordance with ASTM D4491.
3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D4355 after 500 hours exposure.
4. Tensile Strength: 100 lb-f (450 N), minimum, in cross-machine direction; 124 lb-f (550 N), minimum, in machine direction; when tested in accordance with ASTM D4632.
5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D4632.
6. Tear Strength: 55 lb-f (245 N), minimum, when tested in accordance with ASTM D4533.
7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.

1.2.9 Silt Fence Posts: One of the following, minimum 5 feet (1500 mm) long:

1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot (1.98 kg per linear m).
2. Softwood, 4 by 4 inches (100 by 100 mm) in cross section.
3. Hardwood, 2 by 2 inches (50 by 50 mm) in cross section.

1.3 EXECUTION

1.3.1 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

1.3.2 PREPARATION

A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

1.3.3 SCOPE OF PREVENTIVE MEASURES

A. Construction Entrances: Traffic-bearing aggregate surface.
   1. Width: As required; 20 feet (7 m), minimum.
   2. Length: 50 feet (16 m), minimum.
   3. Install in locations as necessary to prevent tracking of mud onto right-of-way.
   4. See section 1.4 for installation requirements.

B. Linear Sediment Barriers: Made of silt fences.
   1. Provide linear sediment barriers:
      a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
      b. Along the top of the slope or top bank of drainage channels and swales that traverse disturbed areas.

c. Along the toe of cut slopes and fill slopes.
d. Perpendicular to flow across the bottom of existing and new drainage channels and swales that traverse disturbed areas or carry runoff from disturbed areas; space at maximum of 200 feet (60 m) apart.
e. Across the entrances to culverts that receive runoff from disturbed areas.

2. Space sediment barriers with the following maximum slope length upslope from barrier:
a. Slope of Less Than 2 Percent: 100 feet (30 m)..
b. Slope Between 2 and 5 Percent: 75 feet (23 m).
c. Slope Between 5 and 10 Percent: 50 feet (15 m).
d. Slope Between 10 and 20 Percent: 25 feet (7.5 m).
e. Slope Over 20 Percent: 15 feet (4.5 m).

D. Storm Drain Curb Inlet Sediment Trap: As detailed on drawings.

E. Storm Drain Drop Inlet Sediment Traps: As detailed on drawings.

F. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.

G. Soil Stockpiles: Install silt fence around the perimeter of the stock pile and protect the stockpile using one of the following measures:
1. Cover with polyethylene film, secured by placing soil on outer edges.
2. Cover with mulch at least 4 inches (100 mm) thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches (150 mm) of straw or hay.

H. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.
1. Wood Waste: Use only on slopes 3:1 or flatter; no anchoring required.

I. Temporary Seeding: Use where temporary vegetated cover is required and/or as required to comply with the Storm Water Pollution Prevention Plan (SWPPP) and Small Construction Notice of Intent (SNCOI).

1.4 INSTALLATION

A. Traffic-Bearing Aggregate Surface (Construction Entrance):
1. Excavate minimum of 6 inches (150 mm).
2. Place geotextile fabric full width and length, with minimum 12 inch (300 mm) overlap at joints.
3. Place and compact at least 12 inches (150 mm) of 1.5 to 3.5 inch (40 to 90 mm) diameter stone.

B. Silt Fences:
1. Store and handle fabric in accordance with ASTM D4873.
2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch (405 mm) high barriers with minimum 36 inch (905 mm) long posts spaced at 6 feet (1830 mm) maximum, with fabric embedded at least 4 inches (100 mm) in ground.
3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch (710 mm) high barriers, minimum 48 inch (1220 mm) long

posts spaced at 6 feet (1830 mm) maximum, with fabric embedded at least 6 inches (150 mm) in ground.

4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet (6 m), use nominal 32 inch (810 mm) high barriers with woven wire reinforcement and steel posts spaced at 4 feet (1220 mm) maximum, with fabric embedded at least 6 inches (150 mm) in ground.
5. Install with top of fabric at nominal height and embedment as specified.
6. Embed bottom of fabric in a trench on the upslope side of fence, with 2 inches (50 mm) of fabric laid flat on bottom of trench facing upslope; backfill trench and compact.
7. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches (460 mm), with extra post.
8. Fasten fabric to wood posts using one of the following:
   a. Four 3/4 inch (19 mm) diameter, 1 inch (25 mm) long, 14 gage nails.
   b. Five 17-gage staples with 3/4 inch (19 mm) wide crown and 1/2 inch (12 mm) legs.
9. Fasten fabric to steel posts using wire, nylon cord, or integral pockets.
10. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches (300 mm) high with post spacing not more than 4 feet (1220 mm).

C. Straw Bale Rows:
1. Install bales in continuous rows with ends butting tightly, with one bale at each end of row turned uphill.
2. Install bales so that bindings are not in contact with the ground.
3. Embed bales at least 4 inches (100 mm) in the ground.
4. Anchor bales with at least two stakes per bale, driven at least 18 inches (450 mm) into the ground; drive first stake in each bale toward the previously placed bale to force bales together.
5. Fill gaps between ends of bales with loose straw wedged tightly.
6. Place soil excavated for trench against bales on the upslope side of the row, compacted.

D. Mulching Over Large Areas:
1. Dry Straw and Hay: Apply 2-1/2 tons per acre; anchor using dull disc harrow or emulsified asphalt applied using same spraying machine at 100 gallons of water per ton of mulch.
2. Wood Waste: Apply 6 to 9 tons per acre.
3. Asphalt: Apply at 1200 gallons per acre.
4. Erosion Control Matting: Comply with manufacturer's instructions.

E. Mulching Over Small and Medium Areas:
1. Dry Straw and Hay: Apply 4 to 6 inches depth.
2. Wood Waste: Apply 2 to 3inches depth.
3. Pine Needles: Apply 2 to 3 inches depth.

4. Asphalt: Apply 1/4 gallon per square yard.
5. Erosion Control Matting: Comply with manufacturer's instructions.

F. Temporary Seeding:
1. When hydraulic seeder is used, seedbed preparation is not required.
2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.
3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft.
4. On soils of very low fertility, apply 13-13-13 fertilizer at rate of 12 to 16 pounds per 1000 sq ft.
5. Incorporate fertilizer into soil before seeding.
6. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch deep.
7. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion. It is the responsibility of the contractor to provide temporary irrigation equipment/labor as necessary to establish/maintain temporary erosion control measures.
8. Repeat irrigation as required until grass is established.
9. Do not use wet seed or seed which is moldy or otherwise damaged in transit or storage.
10. Sow seed using a spreader or seeding machine. Do not seed when wind velocity exceeds 5 miles per hour. Distribute seed evenly over entire area by sowing equal quantity in 2 directions at right angles to each other.
11. Sow not less than the quantity of seed specified or scheduled.
12. Rake seed lightly into top 1/8" of soil, roll lightly, and water with a fine spray.
13. Lay sod within 24 hours from time of stripping. Do not plant dormant sod or if ground is frozen.
14. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod strips; do not overlap. Stagger strips to offset joints in adjacent courses. Work from boards to avoid damage to subgrade or sod. Tamp or roll lightly to ensure contact with subgrade. Work sifted soil into minor cracks between pieces of sod; remove excess to avoid smothering of adjacent grass.
15. Anchor sod on slopes with wood pegs to prevent slippage.
16. Water sod thoroughly with a fine spray immediately after planting.

SEEDING SCHEDULE:

Date	Seed Type	Min % Pure Lbs. Live Seed	Lbs. Seed Per Acre
March – September	Centipede (Eremochloa ophiuroides) (Hulled)	97	44
September – March	Same as above but unhulled	97	44
	Plus Ryegrass Lolium Multiform	97	76

1.5 MAINTENANCE

A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches (13 mm) or more rainfall at the project site, and daily during prolonged rainfall.

B. Repair deficiencies immediately.

C. Silt Fences:
   1. Promptly replace fabric that deteriorates.
   2. Remove silt deposits that exceed one-third of the height of the fence.
   3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

D. Straw Bale and/or Wattle Rows:
   1. Promptly replace bales/wattles that fall apart or otherwise deteriorate unless need has passed.
   2. Remove silt deposits that exceed one-half of the height of the bales/wattles.
   3. Repair bale/wattle rows that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

E. Clean out temporary sediment control structures weekly and relocate soil on site.

F. Place sediment in appropriate locations on site; do not remove from site.

G. ***Maintain lawns by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, regrading and replanting as required to establish a smooth, acceptable lawn, free of eroded or bare areas until such time that Final Acceptance is made.***

1.5 CLEAN UP

A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Engineer.

B. Clean out temporary sediment control structures that are to remain as permanent measures.

C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

1.6 INSPECTION AND ACCEPTANCE:

A. When landscape work is completed, including maintenance, Engineer will, upon request, make an inspection to determine acceptability, but not prior to date of substantial completion of project.

B. Where inspected landscape work does not comply with requirements, replace rejected work and continue specified maintenance until re-inspected by Engineer and found to be acceptable.

1.7 PAYMENT

All temporary erosion control items shall be paid for as part of the lump sum contract amount. Erosion Control payment shall be made on a percentage basis as the project progresses.

END OF SECTION 01 57 13

SECTION 01 71 23 - CONSTRUCTION LAYOUT AND SURVEYING

1.01 SCOPE:

A. This section includes lay out of the site by a Professional Engineer and/or Professional Surveyor.

1.02 LAYOUT OF WORK:

A. ***Layout of the work shall be the responsibility of the Contractor and shall be performed by a Professional Surveyor and/or Engineer registered in the State of Mississippi.*** The Project Engineer shall furnish the Contractor with an autocad file (after execution of the Electronic Disclosure) along with a list of bench marks and reference points within the construction area.

1.03 PAYMENT

A. All site layout including fees from Professional Engineer and/or Professional Surveyor shall be included in the lump sum base bid item and shall be full compensation for furnishing all labor and equipment necessary to perform the work.

END OF SECTION 01 71 23

SECTION 01 77 00 - PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF REQUIREMENTS:

A. Definitions: Closeout is hereby defined to include general requirements near end of Contract Time in preparation for final acceptance, final payment, normal termination of contract, occupancy by Owner and similar actions evidencing completion of the work. Specific requirements for individual units of work are specified in sections of Divisions 2 through 16. Time of closeout is directly related to "Substantial Completion"; and therefore, may be either a single time period for entire work which have been certified as substantially complete at different dates. That time variation (if any) shall be applicable to other provisions of this section.

B. Final payment will not be approved until all close-out documentation have been received.

1.3 SUBSTANTIAL COMPLETION:

A. The contractor shall have completed the following:

1. Deliver tools, spare parts, extra stocks of materials, and similar physical items to Owner.

2. Make final change-over of locks and transmit keys to Owner and advise Owner's personnel of change-over in security provisions.

3. Complete start-up testing of systems, and instructions of Owner's operating/maintenance personnel. Discontinue (or change over) and remove from project site temporary facilities and services along with construction tools and facilities, mock-ups, and similar elements.

B. Inspection Procedures: Upon receipt of contractor's request, Architect will either proceed with inspection or advise contractor of prerequisites not fulfilled. Following initial inspection, Architect will either prepare certificate of substantial completion, or advise contractor of work which must be performed prior to issuance of certificate; and repeat inspection when requested and assured that work has been substantially completed. Results of completed inspection will form initial "punch-list" for final acceptance.

1.4 FINAL ACCEPTANCE:

A. General: Prior to requesting Architect's final inspection for certification of final acceptance and final payment as required by General Conditions, complete the following and list known exceptions (if any) in request:

B. Submit final payment request with final releases and supporting documentation not previously submitted and accepted, include certificates of insurance for products and completed operations where required.

1.5 FORM OF CLOSE-OUT DOCUMENTS:

A. Contractor shall submit all required documents in one initial complete package. Partial submittals will be returned to the Contractor.

B. Prior to Final Payment the Contractor shall provide the closeout documents in the following format: digital storage device (USB Drive).

C. All closeout documents must be provided on the device. (Operation and Maintenance Manuals may be in a separate binder if necessary)

1. Each item shall be named.

2. Each item shall be numbered with the item number listed below.

3. Shall include all as-built drawings and specifications, operation manuals, maintenance manuals and all items listed below.

1.6 REQUIRED CLOSE-OUT DOCUMENTS:

A. Submit copies of original Contract, Bonds, Certificate of Insurance and all Change Orders. (Two required - photocopies acceptable)

B. AIA Document G702 Application and Certificate for Payment, for the final request for payment, (Three notarized originals required)

C. AIA Document G707 Consent of Surety to Final Payment, completed in full by bonding company with Power of Attorney. (Two notarized originals required)

D. AIA Document G706 Contractor’s Affidavit of Payment of Debts and Claims. (Two notarized originals required)

E. AIA Document G706A Contractor's Affidavit of Release of Liens. (Two notarized originals required)

F. Notice of Substantial Completion with an attached punch list. (Two copies required)

G. Notarized Letter from the General Contractor with the following Statements exactly as shown: (Two notarized originals required)

1. "We hereby certify that all bills for labor and materials incorporated into the above captioned project under our contract, have been paid and that the Owner is released from any and all claims and/or damages under this contract."

2. “We hereby certify that the Project has been constructed in accordance with the contract documents.”

3. "We hereby certify that all material incorporated in this project are non-asbestos containing materials".

H. Guarantee of Work: (Two notarized originals required)

1. Sworn statement that all work is guaranteed against defects in materials and workmanship for one year from date of owner's acceptance, except where specified for longer periods.

2. All guarantees and warranties shall be obtained in the Owner's name.

3. Word the Guarantee as follows: (All four paragraphs)

"We hereby guarantee all work performed by us on the above captioned project to be free from defective materials and workmanship for a period of one year or such longer period of time as may be called for in the contract documents for such portions of the work.

Within the guaranty period, if repairs or changes are requested in connection with guaranteed work which, in the opinion of the Owner, are rendered necessary as a result of the use of materials, equipment or workmanship which are inferior, defective or not in accordance with the terms of the contract, the Contractor shall promptly, upon receipt of notice from and without expense to the Owner, place in satisfactory condition in every particular, all such guaranteed work, correct all defects therein and make good all damages to the building, site, equipment or contents thereof which, in the opinion of the Owner, is the result of the use of materials, equipment or workmanship which are inferior, defective or not in accordance with the terms of the contract; and make good any work or materials or the equipment and contents of said buildings or site disturbed in fulfilling any such guaranty.

If after notice, the Contractor fails to proceed promptly to comply with the terms of the guaranty, the Owner may have the defects corrected and the Contractor and his Sureties shall be liable for all expense incurred.

All special guarantees applicable to definite parts of the work stipulated in the project manual or other papers forming part of the contract shall be subject to the terms of this paragraph during the first year of the life of such special guaranty."

I. As Built Record Drawings:

1. Maintain one complete set of contract document drawings for recording substantial deviations from the work originally shown. The mechanical and electrical contractors shall maintain a separate set of documents at all times, throughout the project. If items are discovered which are uncharted or unknown, record such item and location for future referenced by the owner. Locate deviation by dimension and or scale for site and building work from known, visible and obvious point of reference. Note all items changed by addendum and change orders.

2. The Contractor shall keep in reserve one complete set of plans for use as the “As Built Drawings”. All deviations from the original plans, shall be flagged with a “cloud” and noted and dimensioned if necessary. Each drawing shall be noted as “As Built Drawing”

3. In addition, the Contractor shall scan the “As Built Drawings” to disc in PDF format and provide one disc to the Architect for transmittal to the owner.

J. As Built Record Specifications

1. Maintain one copy of specifications, including addenda, change orders and similar modifications issued in printed form during construction, and mark-up variations (of substance) in actual work in comparison with text of specifications and modification as issued. Give particular attention to substitutions, selection of options, and similar information on work where it is concealed or cannot otherwise be readily discerned at a later date by direct observation. Note related record drawing information and product data, where applicable. Upon completion of mark-up, submit to Architect for Owner's records.

K. Record Product Data (Shop Drawings, Brochures, Submittals, etc.):

1. Maintain two copies of each product data submittal, and mark-up significant variations in actual work in comparison with submitted information, include both variations in product as delivered to site, and variations from manufacturer's instructions and recommendations for installation. Give particular attention to concealed products and portions of the work which cannot otherwise be readily discerned at a later date by direct observation. Note related change orders and mark-up of record drawings and specifications. Upon completion of mark-up, submit complete set to Architect for Owner's records.

L. Maintenance Manuals:

1. Organize maintenance-and-operating manual information into suitable sets of manageable size, and bind into individual binders properly identified and indexed (thumb-tabbed), include emergency instructions, spare parts listing, copies of warranties, wiring diagrams, recommended "turn-around" cycles, inspection procedures, shop drawings, product data, and similar applicable information. Bind each manual of each set in a heavy-duty 2", three-ring vinyl-covered binder, and include pocket folders for folded sheet information. Mark identification on both front and spine of each binder.

M. Roofing Guarantees Manufacturer’s guarantees. (Two originals required)

N. Roofing Guarantee-Service:

1. Service Guarantee, copies at end of Section. (Two originals required)

O. Permits, Licenses and Certificates

1. For the Owner's records, submit copies of building and other permits, licenses, certifications, city/county inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence and records established in conjunction with compliance with standards and regulations bearing upon performance of the work. (Two required - photo copies acceptable)

P. Termite Treatment Warranty for five (5) years from date of treatment. (Two originals required)

Q. Door Guarantee (Two originals required)

R. Store Front System and Aluminum Entrance Doors for two (2) years. (Two originals required)

S. Warranty on Insulating Glass Units for ten (10) years. (Two originals required)

T. Maintenance instructions for resilient floor covering. (Two required - photocopies acceptable)

U. Maintenance instructions for flooring. (Two required - photocopies acceptable)

V. Listing of all required materials (List of stock materials to be left with the Owner). Carpet, tile, ceiling, shingles etc. When and where signed and received by whom, with owner. (Two required - photocopies acceptable)

W. Mississippi State Department of Health – Project completion documents:
1. In addition to the items listed above, the contractor shall submit all applicable items listed for MSDH Close Out Document Requirements. The checklist is attached to the end of this section.

PART 2 - PRODUCTS (not applicable)

PART 3 - EXECUTION

3.1 CLOSEOUT PROCEDURES:

A. General Operating/Maintenance Instructions: Arrange for each installer of work requiring continuing maintenance or operation to meet with Owner's personnel at project site to provide basic instruction needed for proper operation and maintenance of entire work, include instructions by manufacturer's representatives where installers are not expert in the required procedures. Review maintenance manuals, record documentation, tools, spare parts and materials, lubricants, fuels, identification system, control sequences, hazards, cleaning and similar procedures and facilities. For operational equipment, demonstrate start-up, shut-down, emergency operations, noise and vibration adjustments, safety, economy/efficiency adjustments, energy effectiveness, and similar operations. Review maintenance and operations in relation with applicable warranties, guarantee from manufacturers and serviced guarantee, agreements to maintain, bonds, and similar continuing commitments.

3.2 FINAL CLEANING:

A. General: Special cleaning for specific units of work is specified in sections of Divisions 2 through 16. General cleaning during progress of work is specified in General Conditions and as temporary services in "Temporary Facilities" section of this Division. Provide final cleaning of the work at time indicated consisting of cleaning each surface or unit of work to normal "clean" condition expected for a first-class building cleaning and maintenance program. Comply with manufacturer's instructions for cleaning operations. The following are examples, but not by way of limitation, of cleaning levels required:

1. Remove labels which are not required as permanent labels.

2. Clean transparent materials, including mirrors and window/door glass to a polished condition removing substances which are noticeable as vision-obscuring materials. Replace broken glass and damaged transparent materials.

3. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of dust, stains, films and similar noticeable distracting substances. Except as otherwise indicated, avoid disturbance of natural weathering of exterior surfaces. Restore reflective surfaces to original reflective condition.

4. Wipe surfaces of mechanical and electrical equipment clean, and similar equipment; remove excess lubrication and other substances.

5. Remove debris and surface dust from limited-access spaces including roofs, plenums, shafts, trenches, manholes, attics and similar spaces.

6. Clean plumbing fixtures to a sanitary condition, free of stains including those resulting from water exposure.

7. Clean light fixtures and lamps so as to function with full efficiency.

8. Clean project site (yard and grounds), including landscape development areas of litter and foreign substances. Sweep paved areas to a broom-clean condition; remove stains, petro-chemical spills and other foreign deposits. Rake ground which are neither planted nor paved to a smooth, even-textured surface.

9. Removal of Protection: Except as otherwise indicated or requested by Architect, remove temporary protection devices and facilities which were installed during course of the work to protect previously completed work during remainder of construction period.

10. Compliances: Comply with safety standards and governing regulations for cleaning operations. Do not burn waste materials at site, or bury debris or excess materials on Owner's property, or discharge volatile or other harmful or dangerous materials into drainage systems; remove waste materials from site and dispose of in a lawful manner.

11. Where extra materials of value remaining after completion of associated work have become Owner's property, dispose of these to Owner's best advantage as directed.

END OF SECTION

BURNS COOLEY DENNIS, INC.

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November 20, 2024

Charlie Williamson, AIA, AHA, CHC, NCARB
Forrest General Hospital
6051 US Highway 49
Hattiesburg, Mississippi 39401-7243

Report No. 240634

Geotechnical Exploration
Proposed Expansion
Asbury Hospice House Facility
Hattiesburg, Mississippi

Dear Mr. Williamson:

Submitted here is the report of our geotechnical exploration for the above-captioned project. This exploration was authorized by Mr. Ben Hester's execution of our contract agreement on October 2, 2024, and was generally performed in accordance with our Proposal No. 24001P-316 dated September 16, 2024.

We appreciate the opportunity to be of service. If you should have any questions concerning this report, please do not hesitate to call us.

Very truly yours,

BURNS COOLEY DENNIS, INC.

Amber Templeton Reeb

Amber Templeton Reeb, P.E.

Marcos V. F. Rodrigues, P.E.

MR/ATR/khb
Copies Submitted: (via-email)

TABLE OF CONTENTS

1.0 INTRODUCTION 1
- 1.1 Project Description 1
- 1.2 Purposes 1

2.0 FIELD EXPLORATION 2
- 2.1 General 2
- 2.2 Drilling Methods and Groundwater Observations 2
- 2.3 Sampling Methods 2
- 2.4 Field Classification, Sample Preservation, and Borehole Abandonment 3

3.0 LABORATORY TESTING 4
- 3.1 General 4
- 3.2 Strength Tests 4
- 3.3 Classification Tests 4
- 3.3 Water Content Tests 5

4.0 GENERAL SUBSURFACE CONDITIONS 5
- 4.1 General 5
- 4.2 Soil Stratification 5
- 4.3 Groundwater 6

5.0 DISCUSSION 6
- 5.1 General Soil Conditions 6
- 5.2 Expansive Clay Considerations 7
- 5.3 Design Considerations 7

6.0 RECOMMENDATIONS 9
- 6.1 Site Preparation and Earthwork Construction 9
- 6.2 Foundation Design Recommendations 11
  - 6.2.1 Stiffened Slab-on-Grade Foundation 11
  - 6.2.2 Potential Movement 12
- 6.3 Guideline Pavement Recommendations 13
- 6.4 Other Design and Construction Considerations 15

7.0 REPORT LIMITATIONS 16

FIGURES

1.0 INTRODUCTION

1.1 Project Description

Plans are being made for the expansion of the existing Asbury Hospice House facility located at 304 South 40th Avenue in Hattiesburg, Mississippi. The proposed expansion consists of a new building, drive-up canopy, and driveway. We understand that the new building will generally consist of a lightly loaded, one-story, wood- or steel-framed structure with plan dimensions of 70 ft by 100 ft and a finished floor elevation of 229.0 ft. The drive-thru canopy will be located along the south side of the building near the west end and the new driveway will be constructed just south of the new building.

Existing surface elevations within the proposed construction area for the new building range from about 226.0 ft to 228.0 ft. Based on the topographic contours and finished floor elevation provided, we anticipate up to about 3 ft of fill will be required to achieve planned grades within the building area. Predominantly fill and some cut may be required to establish final grades along the new driveway. The proposed construction area is open and covered with grass. A site plan showing the proposed expansion is presented on Figure 1 of this report.

1.2 Purposes

The specific purposes of this exploration were:

1) to make exploratory soil borings within the area planned for construction of the new expansion;

2) to verify field classifications and to evaluate pertinent physical properties of the soils encountered in the borings by means of visual examination of the soil samples in the laboratory and routine tests performed on the samples; and

3) after analysis of the soil boring and laboratory test data, to provide recommendations for site preparation, earthwork construction, and building foundation design and construction, and to also provide guideline recommendations for pavement design and construction.

Our current scope of work does not include: environmental study; detailed slope and trench stability analyses; dewatering analyses; detailed pavement design; structural foundation design; review of plans and specifications; responses to contractor requests for information (RFIs); and construction phase services.

2.0 FIELD EXPLORATION

2.1 General

Subsurface soil conditions within the areas planned for construction of the proposed expansion were explored by means of five (5) borings. Borings 1, 2, and 3 were made to an exploration depth of 15 ft within the planned construction area for the building and drive-thru canopy. Borings 4 and 5 were made to a depth of 6 ft along the new driveway. The approximate locations of the borings are shown on Figure 1. The borings were located in the field by means of visual sighting and taped measurements from staked building corners using distances scaled from the site plan we were furnished.

All soils were classified in general accordance with the Unified Soil Classification System. A synopsis of the Unified Soil Classification System is presented on Figure 2 along with symbols and terminology typically utilized on graphical soil boring logs. Graphical logs of the borings are presented on Figures 3 through 7. The graphical logs illustrate the types of soil and stratification encountered with depth below the existing ground surface at the individual boring locations. Surface elevations included on the graphic boring logs were estimated from ground elevation contours shown on the furnished topographic survey map and should be considered approximate. Approximate GPS coordinates for the boring locations as determined by our drilling personnel using a hand-held device are shown at the bottom of the graphical boring logs within the “Comments” section.

2.2 Drilling Methods and Groundwater Observations

The borings were advanced full depth by dry augering. Observations were made continuously during auger drilling to detect free water entering the open boreholes. Notes pertaining to groundwater observations are included at the bottom right corner of the graphic boring logs.

2.3 Sampling Methods

Relatively undisturbed samples were obtained in Borings 1, 2, and 3 by pushing a 3-in. OD Shelby tube sampler approximately 2 ft into the soil within the depth intervals illustrated as shaded portions of the "Samples" column of the graphic logs for Borings 1, 2, and 3. A disturbed

sample of the soils encountered in Boring 1 was obtained by driving a standard 2-in. OD split-spoon sampler 18 in. into the soil with a 140-lb hammer falling freely a distance of 30 in. The depth at which the split-spoon sample was taken is indicated by a crossed-slashed symbol under the "Samples" column of the graphic log for Boring 1. The number of blows required to drive the split-spoon sampler each 6-in. increment (total of 18 in. of penetration) is recorded under the "Field SPT Data" column of the graphic log for Boring 1. The standard penetration test (SPT) blow count required to penetrate the last foot (sum of the second and third blow count values) is considered the N_{60} value and is plotted as a small circled “x” in the data section of the graphic log for Boring 1. The Shelby tube and split-spoon samples were obtained at approximate 3-ft to 5-ft intervals of depth in Borings 1, 2 and 3.

Disturbed samples of the soils encountered in Borings 4 and 5 were obtained directly from the auger cuttings at approximate 2-ft and 3-ft depth intervals. Disturbed auger cutting samples were also taken near the ground surface in Borings 1, 2, and 3. The depths at which the auger cutting samples were obtained are illustrated as small I-shaped symbols under the "Samples" column of the graphic boring logs.

2.4 Field Classification, Sample Preservation, and Borehole Abandonment

All soils encountered during drilling were examined and classified in the field by a geotechnical engineering technician. Each undisturbed Shelby tube sample was extruded from the sampling tube in the field. An approximate 6-in. long portion of each Shelby tube sample was sealed with melted paraffin in a cylindrical cardboard container to prevent moisture loss and structural disturbance. An additional portion of each Shelby tube sample, a representative portion of the split-spoon sample and the auger cutting samples were sealed in jars to provide material for visual examination and testing in the laboratory. Unless other disposition is requested, we routinely discard soil samples after about six months of storage. The boreholes were plugged with soil cuttings after completion of drilling and sampling.

3.0 LABORATORY TESTING

3.1 General

All of the soil samples were examined in the laboratory by a geotechnical engineer and tests were performed on the samples to verify field classifications and to assist in evaluating the strengths and volume change properties of the soils encountered. The types of laboratory tests performed are described in the following paragraphs.

3.2 Strength Tests

The undrained shear strength characteristics of the soils encountered in the borings were investigated by means of visual estimates of consistency, from the results of the standard penetration tests and from the results of unconfined compression (UC) and unconsolidated undrained (UU) triaxial compression tests performed on selected undisturbed Shelby tube samples. The cohesions resulting from the UC and UU triaxial compression tests are plotted as small open circles and triangles, respectively, in the data section of the graphic logs. The water content and dry density were also determined for the compression test specimens. The water contents are plotted as small shaded circles in the data section of the graphic boring logs. The dry densities are tabulated to the nearest lb per cu ft under the "Dry Density" column of the logs.

3.3 Classification Tests

The classifications and volume change properties of the fine-grained soils encountered in the borings were investigated by means of Atterberg liquid and plastic limit tests. The results of the liquid and plastic limit tests are plotted as small crosses interconnected by dashed lines in the data section of the graphic boring logs. In accordance with the Unified Soil Classification System, fine-grained soils are classified as either clays or silts of low or high plasticity based on the results of Atterberg limit tests. The numerical difference between the liquid limit and plastic limit is defined as the plasticity index (PI). The magnitudes of the liquid limit and plasticity index and the proximity of the natural water content to the plastic limit are indicators of the potential for a fine-grained soil to shrink or swell upon changes in moisture content or to consolidate under loading. The proximity of the natural water content to the plastic limit is also

an indicator of soil strength. In one instance, the sample being tested was found to be nonplastic and "NP" was recorded in the data section of the graphic log for Boring 5.

3.4 Water Content Tests

Water content tests were performed on all samples upon which strength tests were not conducted to corroborate field classifications and to extend the usefulness of strength, plasticity and SPT blow count data. The results of the water content tests are plotted as small shaded circles in the data section of the graphic boring logs. The water content data have been interconnected on the logs to illustrate a continuous profile with depth.

4.0 GENERAL SUBSURFACE CONDITIONS

4.1 General

A general description of subsurface soil and groundwater conditions revealed by the borings made for this exploration is provided in the following paragraphs. The graphical logs shown on Figures 3 through 7 should be referred to for specific soil and groundwater conditions encountered at each boring location. Stick logs of the borings are shown in profile on Figure 8 to aid in visualizing subsurface soil conditions. Tabulated adjacent to the stick logs are Atterberg liquid and plastic limits, water contents, dry densities, cohesions, and SPT blow count.

4.2 Soil Stratification

Borings 1, 2 and 3 were made within the planned construction area for the building and Borings 4 and 5 were made along the new driveway.

The ground surface at Borings 1 and 5 was found to be directly underlain by apparent fill materials consisting of silts (ML). The silt (ML) fill materials were encountered to approximate depths of 1.5 ft at Boring 1 and 2 ft at Boring 5. The silt (ML) fill materials are characterized as very loose and loose and are considered to have low to low-moderate strength and moderate to high-moderate compressibility. The silt (ML) fill materials have no potential for shrinking or swelling.

The ground surface at Boring 4 were found to be directly underlain by silty clays (CL) to a depth of 2 ft. Silty clays (CL) were also encountered from a depth of about 13 ft to the 15-ft termination depth of Borings 2 and 3. The silty clays (CL) are classified as stiff and very stiff with respect to consistency and are considered to have moderate to high strength and low to moderate compressibility. The silty clays (CL) are considered to have low shrink/swell potential.

Clays (CH) were encountered from the ground surface to a depth of about 13 ft at Borings 2 and 3, from a depth of about 1.5 ft to the 15-ft termination depth of Boring 1 and from a depth of about 2 ft to the 6-ft termination depth of Boring 4 and 5. The clays (CH) are classified as stiff, very stiff and hard with respect to consistency and are considered to have moderate to high strength and low to moderate compressibility. The clays (CH) are considered to be expansive with moderate to high shrink/swell potential.

4.3 Groundwater

Free water was not encountered during auger drilling for the borings. In our opinion, groundwater conditions at the site will primarily be influenced by rainfall, surface drainage, and by the rise and fall of water levels in nearby ditches, creeks, ponds or other bodies of water. Groundwater conditions at the site can also be influenced by man-made changes. Soils which did not exhibit free water during the short time period of drilling may exhibit water seepage at other times during construction and within excavations that remain open for an extended period of time or that are permanent. Surficial soils can become saturated and weak to relatively shallow depths during periods of prolonged and heavy rainfall.

5.0 DISCUSSION

5.1 General Soil Conditions

Subsurface soils encountered within the 15-ft maximum completion depth of the borings made for this exploration generally consist of silt (ML) fill materials and natural silty clays (CL) and clays (CH). With the exception of very loose and loose silt (ML) fill materials encountered to approximate depths of 1.5 ft at Boring 1 and 2 ft at Boring 5, the subsurface soils encountered in the borings are generally considered to have moderate to high strength and low to moderate compressibility. The very loose and loose silt (ML) fill materials are considered to have low to

low-moderate strength and moderate to high-moderate. The silts (ML) have no potential for shrinking and swelling. The silty clays (CL) are considered to have low shrink/swell potential.

Expansive clays (CH) were encountered the ground surface in Borings 2 and 3 and at approximate depths of 1.5 ft at Boring 1 and 2 ft at Borings 4 and 5. The expansive clays (CH) are considered to have moderate to high shrink/swell potential. Refer to the profile sheet found on Figure 8 for the approximate depths at which expansive clays (CH) were encountered in the borings.

5.2 Expansive Clay Considerations

The expansive clay (CH) soils can experience significant shrink/swell movements associated with seasonal moisture content fluctuations. Cover materials overlying expansive clay (CH) soils act as a buffer against seasonal moisture content changes caused by rainy weather, droughts and evapotranspiration. Thus, the potential magnitude of moisture content changes and associated shrink/swell movements within expansive clay (CH) soils is proportionate to the thickness of overlying cover materials. Seasonal moisture content changes and shrink/swell movements within expansive clay (CH) soils decrease as the thickness of cover materials increases. There is a general trend for expansive clay (CH) soils under structures to swell due to an increase in water content caused by capillary and vapor phase movement of moisture within the clays (CH). Expansive clay (CH) soils will also experience considerable swelling if directly supplied with water from rainfall, sprinkler systems, broken underground water and sewer pipes, or any other source. Trees growing adjacent to a building can extract a considerable amount of moisture from the ground resulting in localized shrinkage of expansive clay (CH) soils accompanied by vertical and lateral movements. Overburden removal associated with the establishment of finished grades lower than existing ground elevations will cause stress relief in expansive clay (CH) soils resulting in long-term rebound. Expansive clay (CH) soils will also experience long-term downhill creep movements, depending on slope steepness.

5.3 Design Considerations

From a geotechnical standpoint, the primary factors relevant to foundation design and construction for the proposed expansion are bearing capacity, settlement due to soil consolidation/compression under fill and structural loadings, and the shrinking and swelling of

the expansive clays (CH). A foundation should be utilized for the building that will accommodate the anticipated fill and structural loadings and also minimize future differential vertical movements resulting from either settlement due to soil consolidation under fill and structural loads or unpredictable shrinking and swelling of the expansive clays (CH).

It is our opinion that a slab-on-grade foundation made relatively stiff by means of perimeter and interior grade beams could be used for support of the new building provided: 1) column loads are less than 150 kips and wall loads do not exceed 7 kips per ft; 2) a minimum 5-ft thick buffer of low permeability and low shrink/swell potential soil is provided over the expansive clays (CH); and 3) our recommendations for site preparation and earthwork construction are implemented. The recommended minimum buffer thickness should be measured from the bottom of the floor slab and/or from the finished outside grades adjacent to each structure, whichever is lowest. The buffer of low permeability and low shrink/swell potential soil is intended to **minimize, not eliminate,** differential shrink/swell movements resulting from ordinary seasonal moisture content fluctuations within the expansive clays (CH). It should be recognized that no economically feasible construction will completely eliminate the potential for long-term differential movements caused by the expansive clays (CH).

Within the planned construction area for the building, the expansive clays (CH) were encountered at or near the ground surface; therefore, undercutting and backfilling will be required to remove expansive clays (CH) and create the recommended buffer over the expansive clays (CH). As previously stated, the stiffened slab-on-grade foundation in combination with the recommended soil buffer should **minimize, not eliminate,** future differential vertical movements within the building caused by shrinking and swelling of the expansive clays (CH) due to ordinary seasonal moisture content fluctuations.

It is our opinion that either flexible asphalt concrete or rigid Portland cement concrete pavement can be utilized for the pavement areas, provided not less than 3 ft of low permeability and low shrink/swell potential buffer soils directly underlie the pavement structure. Within the planned construction areas for the new driveway, the expansive clays (CH) were encountered at a depth of about 2 ft at Borings 4 and 5. Depending on proposed finished grades, undercutting may also be required within the new pavement areas.

Details of our recommendations for site preparation, earthwork construction, and foundation design and construction are included in the following subsections of this report. Guideline recommendations for pavement design and construction are also provided.

6.0 RECOMMENDATIONS

6.1 Site Preparation and Earthwork Construction

Unless otherwise noted, our recommendations for earthwork construction are the same for the building and pavement areas. As an initial step of site preparation within the planned construction areas, stripping should be performed throughout the construction areas to remove organic-laden surficial soils, vegetation, debris, topsoil, and any weak or high moisture content surficial soils. Next, excavation should be performed to remove any obviously weak or high moisture content soils exposed after stripping. As indicated previously, relatively weak silt (ML) fill materials were encountered from the ground surface to approximate depths of 1.5 ft at Boring 1 and 2 ft at Boring 5. The actual vertical and lateral extent of excavation required to remove weak soils must be determined in the field during earthwork construction. Excavation of these soils should extend laterally not less than 5 ft beyond the perimeter of the building and not less than 3 ft beyond the edges of pavements.

Undercutting should then be performed within the building area to create the recommended minimum 5-ft thick buffer of low permeability and low shrink/swell potential soils over the expansive clays (CH). As previously mentioned, expansive clays (CH) were encountered at or near the ground surface in building Borings 1, 2, and 3. Undercutting should also be performed throughout the pavement areas, as needed, to create the recommended buffer of low permeability and low shrink/swell potential soils. Expansive clays (CH) were encountered at a depth of about 2 ft at Borings 4 and 5. The actual vertical and lateral extent of undercutting required to remove expansive clays (CH) must be determined in the field during earthwork construction. Undercutting to remove expansive clays (CH) should extend laterally not less than 5 ft beyond the edges of the building and 3 ft beyond the edges of the pavement.

In order to minimize the amount of any excavation and undercutting, we recommend that a representative of Burns Cooley Dennis, Inc. be present to observe excavation/undercutting

operations and assist in evaluating the depth and lateral extent of any excavation and undercutting required.

Even though free water was not encountered during our field exploration, it could present itself as slow seepage which would accumulate into excavations that are left open for an extended period of time. Groundwater levels at the site can fluctuate seasonally, and will be influenced by rainfall and surface drainage. Groundwater control requirements will be dependent on the required depth of excavation, the season in which construction is performed and on rainfall preceding and during construction. The means and methods for intercepting, collecting and removing groundwater entering the excavation should be the sole responsibility of the earthwork contractor.

Prior to the placement of any fill materials, the soils exposed after stripping, any excavation and undercutting should be scarified to a minimum depth of 6 in. and compacted to not less than 95 percent of standard Proctor maximum dry density (ASTM D 698) with stability present. Alternatively, the exposed soils could be proofrolled with loaded dump trucks to demonstrate stability. Stability is defined as the absence of significant pumping, rutting or yielding of soils during compaction or proofrolling. If stability is not evident in some areas, either additional excavation, drying by processing, treatment of the in-situ soils with an admixture, or a combination of these approaches, might be required to achieve stable conditions.

The effort required to mitigate unstable soils will be influenced by the season of the year when earthwork is performed. The subsurface soils would likely be drier during the hot late summer and could weaken during heavy rainfall events. We recommend that earthwork be performed during a dry summer or fall season, if the schedule permits. It should be recognized that soils which are demonstrated to be adequately stable during stripping, any excavation, undercutting, scarification/compaction and/or proofrolling can become unstable if they are disturbed by construction traffic or if they are exposed to rainfall prior to filling.

The on-site fine-grained soils are susceptible to pumping when wet. The construction techniques, types of equipment utilized and site drainage provided during construction will have a great effect on the performance of the fine-grained soils. The routing of heavy, rubber-tired equipment should be controlled to minimize, as much as possible, traffic in the construction areas. All traffic should be discouraged during periods of inclement weather. It should be noted that soils which initially demonstrate adequate stability can become unstable if they are disturbed

by construction traffic. If pumping is initiated in the fine-grained soils, as a construction expedient the pumping can be counteracted by treating these materials with hydrated lime. It is estimated that about 4 to 8 percent hydrated lime by dry weight of soil could be required.

We recommend that backfilling and filling to achieve planned grades follow immediately after stripping, any excavation, undercutting, scarification/compaction and/or proofrolling. Imported fill materials should consist of select, nonorganic and debris-free silty clays (CL) having a plasticity index (PI) within the range of 10 to 24 and a liquid limit less than 45. The fill soils should be compacted from lifts not exceeding 9 in. in loose thickness to not less than 95 percent of standard Proctor maximum dry density (ASTM D 698) at moisture contents within 3 percentage points of the optimum water content. All backfill in confined areas and over utilities, storm drains, etc., should be placed in accordance with the preceding recommendations, except the lift thickness should be reduced to about 4 in. to 5 in. where hand-operated compaction equipment is used. Stability must be evident during compaction of each lift before any subsequent lifts of fill material are added. Fill materials should extend laterally not less than 5 ft beyond the perimeter of the building and not less than 3 ft beyond pavement edges and then slope down to natural ground at an inclination not steeper than 3H:1V. Finished site grades should be sloped to promote quick runoff of storm water and provide positive drainage away from the building and across the pavement areas.

Laboratory classification tests, including Atterberg limit determinations and grain-size analyses, should be performed on the fill soils initially and routinely during earthwork operations to check for compliance with the recommendations provided herein. Field moisture/density tests should be performed frequently in the scarified and compacted on-site soils and in each compacted lift of fill material to assist in evaluating whether the recommended moisture contents and dry densities are being achieved. As a guide for building earthwork construction, we suggest a minimum of one test per lift per 2,500 sq ft of surface area or portion thereof. A frequency of testing considered to be appropriate for the pavement areas is one test per lift for each 5,000 sq ft of surface area or portion thereof.

6.2 Foundation Design Recommendations

6.2.1 Stiffened Slab-on-Grade Foundation. The new building could be supported by a foundation system consisting of a slab-on-grade stiffened with perimeter grade beams, or turned-

down edges, and interior grade or tie beams. Grade beams should be utilized to support all exterior walls and all interior load-bearing and partition walls, or otherwise they should be spaced in a grid pattern on not greater than about 10-ft to 15-ft centers in each direction, or as otherwise directed by the project structural engineer. Any columns should be supported by widened portions of the grade beams. We recommend that grade beams or turned-down edges around the perimeter of the building be brought to bear at a depth not less than 24 in. below finished outside grade. Interior tie or grade beams should be brought to bear at a depth not less than 18 in. below the bottom of the slab. We recommend that grade beams be proportioned for critical combinations of dead, live and wind loads utilizing a net allowable soil bearing pressure of 1,500 lbs per sq ft. A net allowable soil bearing pressure of 2,000 lbs per sq ft should be utilized to dimension widened portions of grade beams used to support column loads. We recommend a minimum base width of 12 in. for the grade beams. The grade beams should be reinforced for both positive and negative bending. The floor slab should be reinforced for anticipated loading conditions and deflections and to minimize slab cracking. We recommend that the slab be reinforced with a grid of relatively closely spaced reinforcing bars in lieu of welded wire fabric.

We recommend that foundation excavations be left open for the shortest possible duration to minimize exposure of the bearing soils to rainfall. Drainage should be maintained away from the foundation excavations during construction. Soils exposed in the bottom of the excavations should be observed prior to concrete placement. If these materials are found to be weak or loose, overexcavation and backfilling will be required to provide strong soils immediately beneath foundation elements.

6.2.2 Potential Movement. With proper earthwork as recommended herein, and the building with column loads less than 150 kips and wall loads not greater than 7 kips per ft supported on a stiffened slab-on-grade foundation, total settlements under compressive structural loading are expected to be on the order of about 1 in. Differential vertical movements of the foundation resulting from potential long-term volumetric changes within the expansive clays (CH) cannot be predicted with any degree of accuracy; however, if proper drainage is maintained and no other unexpected sources of water develop, they are estimated to be within normally tolerable structural limits. The potential long-term differential movements due to normal

seasonal fluctuations in water content within the clays (CH) are generally expected to be on the order of about 3/4 in. over a horizontal distance of about 25 ft to 30 ft, provided that proper drainage is maintained and any leaks that develop in pipes are promptly repaired. It should be noted that differential movements of the magnitude stated in the preceding sentence could result in minor cracking of the foundation, walls and floor slab. The actual magnitude of the differential shrink/swell movements can be influenced by any number of events or circumstances that occur during the life of the structure. For example, surface drainage conditions, broken water pipes, trees and shrubs, etc., can influence the actual shrink/swell movements which develop. We emphasize that poor drainage, groundwater or other excess water in the building area could result in significant differential movement, up to several inches over a spacing of about 25 ft to 30 ft, and major cracking of the foundation, walls and floor slab, even with the minimum recommended buffer thickness.

6.3 Guideline Pavement Recommendations

Exact loadings have not been indicated, but we expect both light and heavy loading conditions for the site pavements. The client may have pavement standards they wish to utilize for the pavement structures for the light and heavy loadings. The following are provided for added guidance in lieu of client-provided pavement details. In areas to be paved, there is often some delay between completion of earthwork operations and placement of the pavement structure materials, possibly resulting in deterioration of subgrade conditions. Therefore, we recommend that density and stability of the subgrade soils be confirmed or re-established immediately prior to construction of the pavement.

In our opinion, either flexible asphalt concrete or rigid Portland cement concrete (PCC) pavement can be utilized for the pavement areas. Site preparation and earthwork construction should be performed for the areas to be paved in accordance with the recommendations given in the "Site Preparation and Earthwork Construction" section of this report. Guideline pavement recommendations are given in the following paragraphs that represent typical construction practice. However, we recommend that pavement thicknesses be verified for the actual expected traffic volumes and loadings using appropriate design parameters for the subgrade soils and pavement structure materials. If the subgrade soils are prepared and select fill materials are placed within the areas to be paved in accordance with recommendations provided in this report,

it is our opinion that a CBR of 5 would be appropriate to use as the subgrade support value for flexible asphalt concrete pavement. For PCC pavements, it is our opinion that a modulus of subgrade reaction (k) of 150 lbs per cu in. would be appropriate for the subgrade support value. Where a 6-in. thick granular subbase is utilized under PCC pavements as described in this report, the modulus of subgrade reaction can be increased up to 325 lbs per cu in.

It is our opinion that chemical treatment of the subgrade soils with hydrated lime will provide the best performing pavement system during construction and will extend the service life of the pavement. We recommend lime treatment for the top 12 in. of the subgrade utilizing 6 percent hydrated lime by dry weight of soil. The lime-treated subgrade soils should be compacted to not less than **98 percent** of standard Proctor maximum dry density (ASTM D 698). The lime treatment should be in accordance with Section 307 of the 2017 Edition of the Mississippi Standard Specifications for Road and Bridge Construction using the Class C lime treatment procedure. The lime treatment should extend not less than 2 ft beyond the back of curb or edge of pavement.

For light automobile and pickup truck traffic, the flexible pavement structure could consist of a 2-in. thick asphalt surface course and a 4-in. thick asphalt base course on the prepared subgrade soils. A thicker asphalt concrete pavement section should be utilized if the flexible pavement will be subjected to heavy truck traffic. For the heavier loading, the flexible pavement structure could consist of a 2-in. thick asphalt surface course and a 6-in. thick asphalt base course on the prepared subgrade soils. The asphalt concrete surface course materials should conform with all applicable specifications for SC-1, Type 8 presented in the 1990 Edition of the Mississippi Standard Specifications for Road and Bridge Construction. The asphalt concrete base course materials should conform with all applicable specifications for BB-1, Type 6.

For rigid pavement, jointed plain (unreinforced) PCC pavement can be utilized with limited use of steel reinforcement such as described herein. The minimum compressive strength of the concrete mixture should be 4,000 lbs per sq in. It is our opinion that a 5-in. thick PCC pavement cast directly upon the prepared subgrade soils would be appropriate for light automobile and pickup truck traffic. For heavy truck traffic, a 7-in. thick PCC pavement directly underlain and separated from the prepared subgrade soils by a granular subbase would likely be required. We recommend the use of 8-in. thick PCC pavement directly underlain and separated

from the prepared subgrade soils by a granular subbase immediately in front of any garbage dumpsters to provide support for the wheels of a garbage truck during loading.

We recommend the use of a 6-in. thick granular subbase directly under PCC pavements that support heavy truck traffic. This granular subbase is part of the pavement structure and prevents subgrade soils from pumping up through joints. We recommend that the granular subbase materials consist of No. 610 crushed limestone. The portion of the crushed limestone passing the No. 40 sieve should have a liquid limit not greater than 25 and a plasticity index not greater than 5. The crushed limestone should be compacted to not less than **100 percent** of standard Proctor maximum dry density (ASTM D 698) at moisture contents within 2 percentage points of the optimum water content. The pavement surface should be sufficiently elevated to allow drainage of the granular subbase.

General guidance for the design and construction of PCC pavements is presented in ACI 330 "Guide for the Design and Construction of Concrete Parking Lots," including proper jointing, thickened edges that receive heavy truck traffic, thickened edges or load transfer devices at construction joints, tie-bars, and steel reinforcement in irregular shaped slabs or panels. Joints should form panels that are approximately square with the longest panel dimension no more than 1.25 times the shortest panel dimension. The maximum joint spacing should be 10 ft for 5-in. thick and 15 ft for the 7-in. or 8-in. thick PCC pavements. The pavement joints should be properly sealed and maintained. We recommend that a jointing plan and details be developed for construction of the PCC pavements. Burns Cooley Dennis, Inc. can be contracted to provide this additional service if we are provided with a CAD file of the proposed site. As an alternative, BCD can be contracted to review and approve jointing layouts and details that are generated by others. The surface of the pavement should be crowned and sloped to promote quick runoff of storm water.

6.4 Other Design and Construction Considerations

If flower and shrub beds including sprinkler systems are placed adjacent to the building, the beds should be prepared such that they do not trap water, and sprinklers should be operated only enough to satisfy the water demands of the plants and shrubs. Excessive watering and ponding within the flower and shrub beds could result in downward percolation of water into the underlying foundation soils causing them to lose strength and causing expansive clays (CH) to

swell. Rainwater falling on the roof of the building should be collected and prevented from reaching the ground immediately adjacent to the building. Downspouts extending from roof gutters should be equipped with extensions at ground level that are sloped to emit collected rainwater not less than 7 ft away from the building. The downspouts could be connected to solid discharge pipes buried beneath the ground. We caution that these pipes should be flexible enough to accommodate some differential movement and all pipe connections must be leak free.

Trees remove water from the ground by transpiration causing vertical and horizontal shrinkage of fine-grained soils. To minimize these effects, we recommend that any trees planted for landscaping purposes be located at least one-half of their anticipated mature height away from the building. If the risk of more movement is acceptable to the owner, a less strict building-to-tree spacing of about 25 ft for hardwoods and 15 ft for pines could be utilized.

Final grades around the building should provide rapid and effective drainage of rainwater and downspout water away from the building, with no areas allowed for water to pond. Underground sources of water such as leaking water lines, sewer lines, etc., should be prevented as much as possible in the initial construction, and any leaks that develop should be promptly repaired.

The site for the new expansion at Asbury Hospice House facility in Hattiesburg, Mississippi lies within a relatively low seismic activity region according to the seismic zone mapping referenced in the International Building Code. Given the site soil profile as revealed by the borings and anticipated for the area based on our experience, a site class D could be used in a seismic load evaluation.

7.0 REPORT LIMITATIONS

The analyses, conclusions, and recommendations discussed in this report are based on conditions as they existed at the time of our field exploration and further on the assumption that the exploratory borings are representative of subsurface conditions throughout the areas explored. It should be noted that actual subsurface conditions between and beyond the borings might differ from those encountered at the boring locations. If subsurface conditions are encountered during construction that vary from those discussed in this report, Burns Cooley

Dennis, Inc. should be notified immediately in order that we may evaluate the effects, if any, on earthwork, foundation and pavement design and construction.

Burns Cooley Dennis, Inc. should be retained for a general review of final design drawings and specifications. It is advised that we be retained to observe earthwork, foundation and pavement construction for the project in order to help confirm that our recommendations are valid or to modify them accordingly. Burns Cooley Dennis, Inc. cannot assume responsibility or liability for the adequacy of recommendations if we do not observe construction.

This report has been prepared for the exclusive use of the Forrest General Hospital for specific application to the geotechnical-related aspects of design and construction for new expansion of the existing Asbury Hospice House facility located at 304 South 40th Avenue in Hattiesburg, Mississippi. The only warranty made by us in connection with the services provided is we have used that degree of care and skill ordinarily exercised under similar conditions by reputable members of our profession practicing in the same or similar locality. No other warranty, express or implied, is made or intended.

FIGURES

Approximate Boring Locations

PROPOSED EXPANSION
ASBURY HOSPICE HOUSE FACILITY
HATTIESBURG, MISSISSIPPI

BURNS COOLEY DENNIS, INC.
551 SUNNYBROOK ROAD
RIDGELAND, MISSISSIPPI 39157

JOB NO. 240634	SCALE: AS SHOWN	FIGURE 1

LOG OF BORING NO. 1

PROPOSED EXPANSION
ASBURY HOSPICE HOUSE FACILITY
HATTIESBURG, MISSISSIPPI

TYPE: 4" Continuous-flight auger

LOCATION: See Figure 1

DEPTH, ft	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	FIELD SPT DATA	DRY DENSITY LBS/CU FT	○- UC Cohesion, kips/sq ft △- UU (1 2 3 4) / SPT (N_{60}) ⊗ / PLASTIC LIMIT + / WATER CONTENT % ● / LIQUID LIMIT + (20 40 60 80)	% PASSING NO. 200 SIEVE
			SURFACE EL: 228.0 ±ft				
			Loose tan and light gray silt (ML) (POSSIBLE FILL)			10.6	
			Stiff tan, light gray and red clay (CH), slightly silty	4-6-4		10 ⊗ 30.8	
			- light gray below 4'				
5					94	24 1.55 51 + △ + 26.2	
						24.2	
10							
						23.5	
15							
			Note: SPT performed using Rope & Cathead. No energy correction factor is applied to calculate the plotted N_{60} values.				
20							

BORING DEPTH: 15 ft

DATE: 10/24/24

COMMENTS:
GPS Coordinates
N 31° 19' 14.0"
W 89° 20' 43.5"

GROUNDWATER DATA: No free water encountered during auger drilling.

240634.GPJ

BURNS COOLEY DENNIS, INC.
GEOTECHNICAL AND MATERIALS ENGINEERING CONSULTANTS

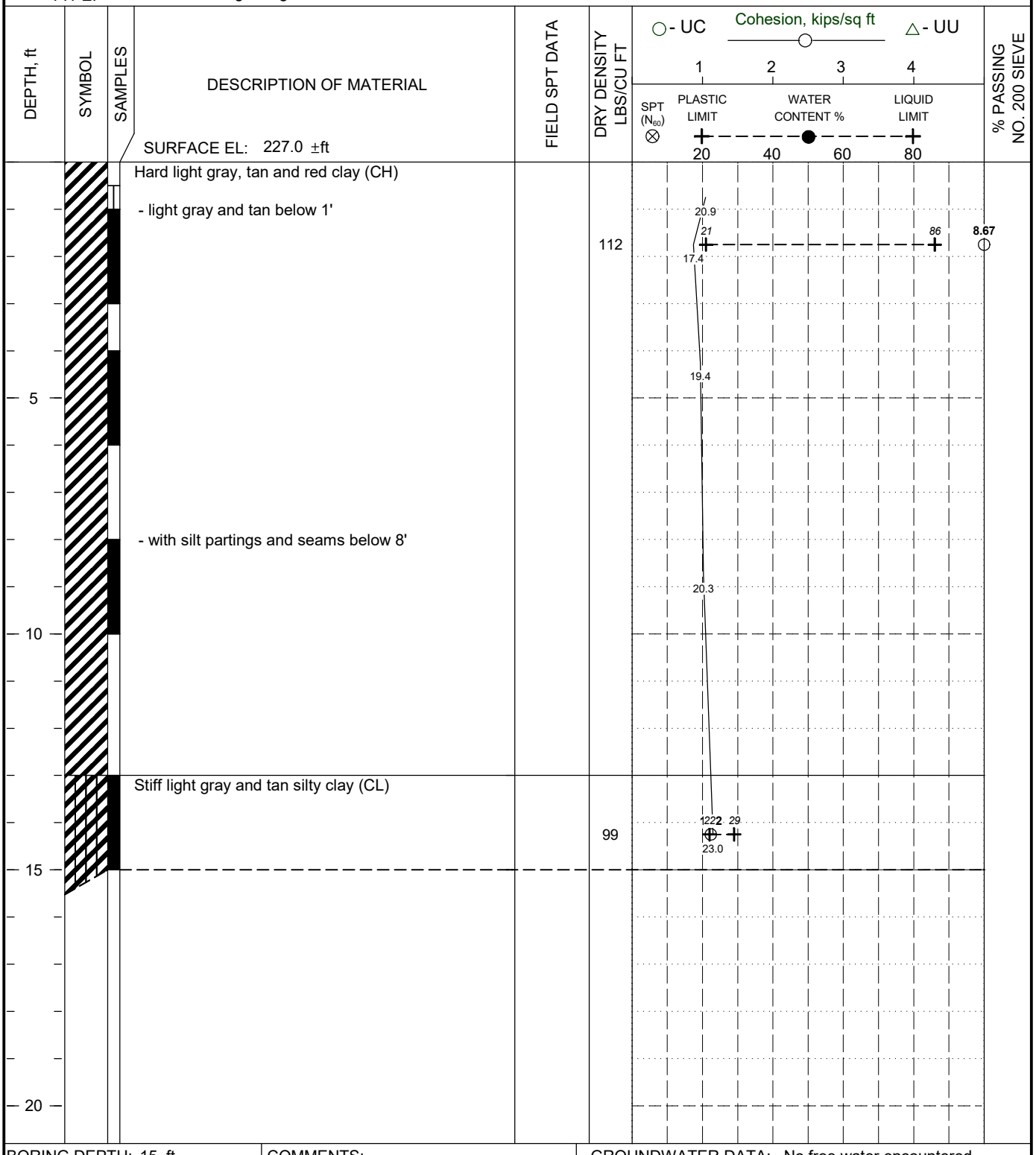
FIGURE 3

LOG OF BORING NO. 2

PROPOSED EXPANSION
ASBURY HOSPICE HOUSE FACILITY
HATTIESBURG, MISSISSIPPI

TYPE: 4" Continuous-flight auger

LOCATION: See Figure 1



BORING DEPTH: 15 ft

DATE: 10/24/24

COMMENTS:
GPS Coordinates
N 31° 19' 13.6"
W 89° 20' 42.9"

GROUNDWATER DATA: No free water encountered during auger drilling.

240634.GPJ

BURNS COOLEY DENNIS, INC.
GEOTECHNICAL AND MATERIALS ENGINEERING CONSULTANTS

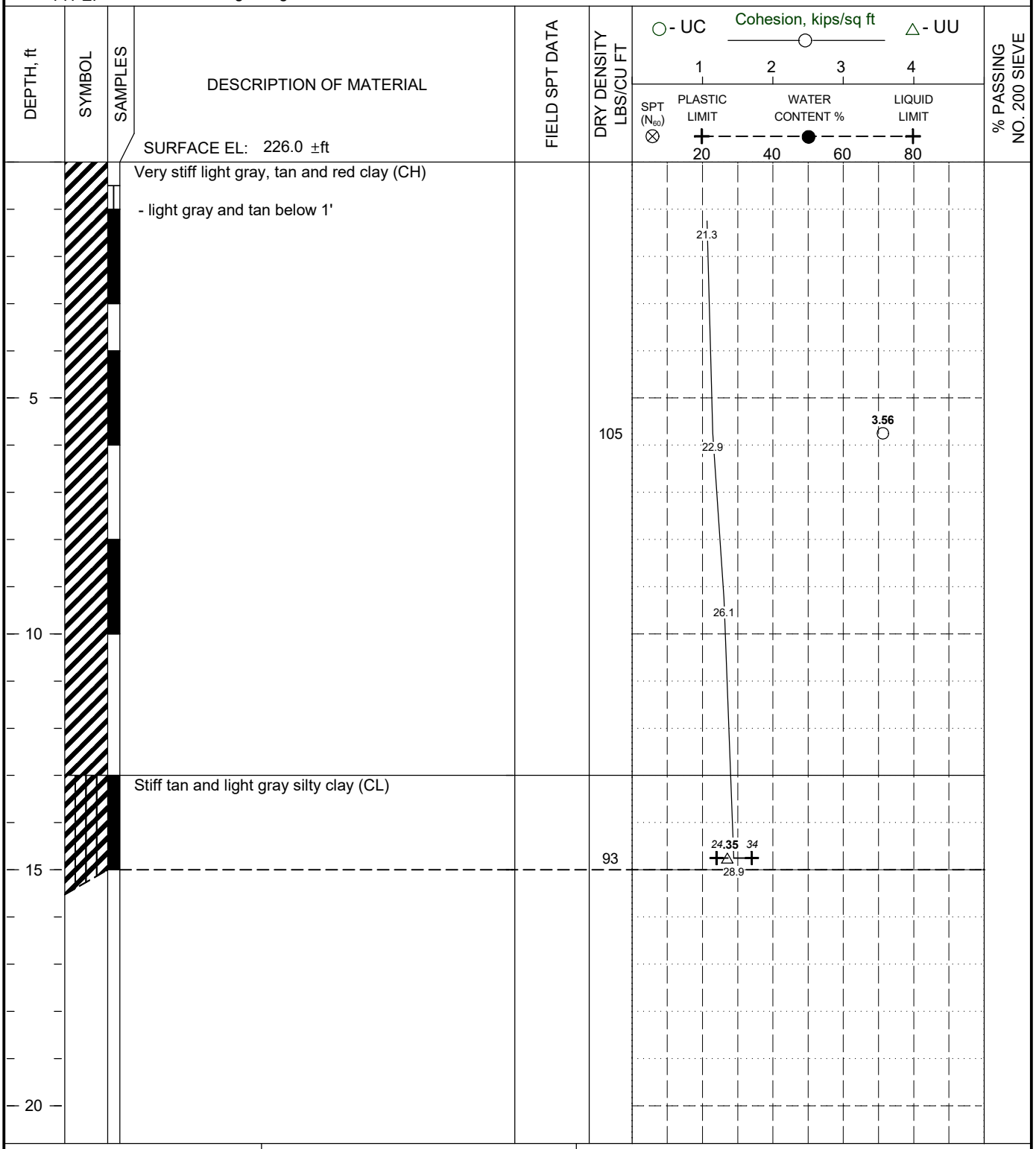
FIGURE 4

LOG OF BORING NO. 3

PROPOSED EXPANSION
ASBURY HOSPICE HOUSE FACILITY
HATTIESBURG, MISSISSIPPI

TYPE: 4" Continuous-flight auger

LOCATION: See Figure 1



BORING DEPTH: 15 ft

DATE: 10/24/24

COMMENTS:
GPS Coordinates
N 31° 19' 13.1"
W 89° 20' 43.4"

GROUNDWATER DATA: No free water encountered during auger drilling.

240634.GPJ

BURNS COOLEY DENNIS, INC.
GEOTECHNICAL AND MATERIALS ENGINEERING CONSULTANTS

FIGURE 5

LOG OF BORING NO. 4

PROPOSED EXPANSION
ASBURY HOSPICE HOUSE FACILITY
HATTIESBURG, MISSISSIPPI

TYPE: 4" Continuous-flight auger

LOCATION: See Figure 1

DEPTH, ft	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	FIELD SPT DATA	DRY DENSITY LBS/CU FT	○- UC, Cohesion, kips/sq ft, △- UU; SPT (N_{60}) ⊗; PLASTIC LIMIT; WATER CONTENT %; LIQUID LIMIT	% PASSING NO. 200 SIEVE
			SURFACE EL: 227.0 ±ft			1 2 3 4 / 20 40 60 80	
			Very stiff tan and light gray clay (CH) - slightly silty to 2'			14.0	
			- tan and red 2' - 4'			19 76 22.7	
5						24.8	
10							

BORING DEPTH: 6 ft

DATE: 10/24/24

COMMENTS:
GPS Coordinates
N 31° 19' 13.0"
W 89° 20' 44.0"

GROUNDWATER DATA: No free water encountered during auger drilling.

240634.GPJ

BURNS COOLEY DENNIS, INC.
GEOTECHNICAL AND MATERIALS ENGINEERING CONSULTANTS

FIGURE 6

LOG OF BORING NO. 5

PROPOSED EXPANSION
ASBURY HOSPICE HOUSE FACILITY
HATTIESBURG, MISSISSIPPI

TYPE: 4" Continuous-flight auger

LOCATION: See Figure 1

DEPTH, ft	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	FIELD SPT DATA	DRY DENSITY LBS/CU FT	○- UC Cohesion, kips/sq ft △- UU (1 2 3 4) SPT (N_{60}) ⊗ PLASTIC LIMIT + WATER CONTENT % ● LIQUID LIMIT + (20 40 60 80)	% PASSING NO. 200 SIEVE
			SURFACE EL: 228.5 ±ft				
			Very loose light gray silt (ML) (POSSIBLE FILL)			NP; 2.5	
			Very stiff light gray and tan clay (CH)			17.5	
5			- tan, light gray and red below 5'			20.4	
10							

BORING DEPTH: 6 ft

DATE: 10/24/24

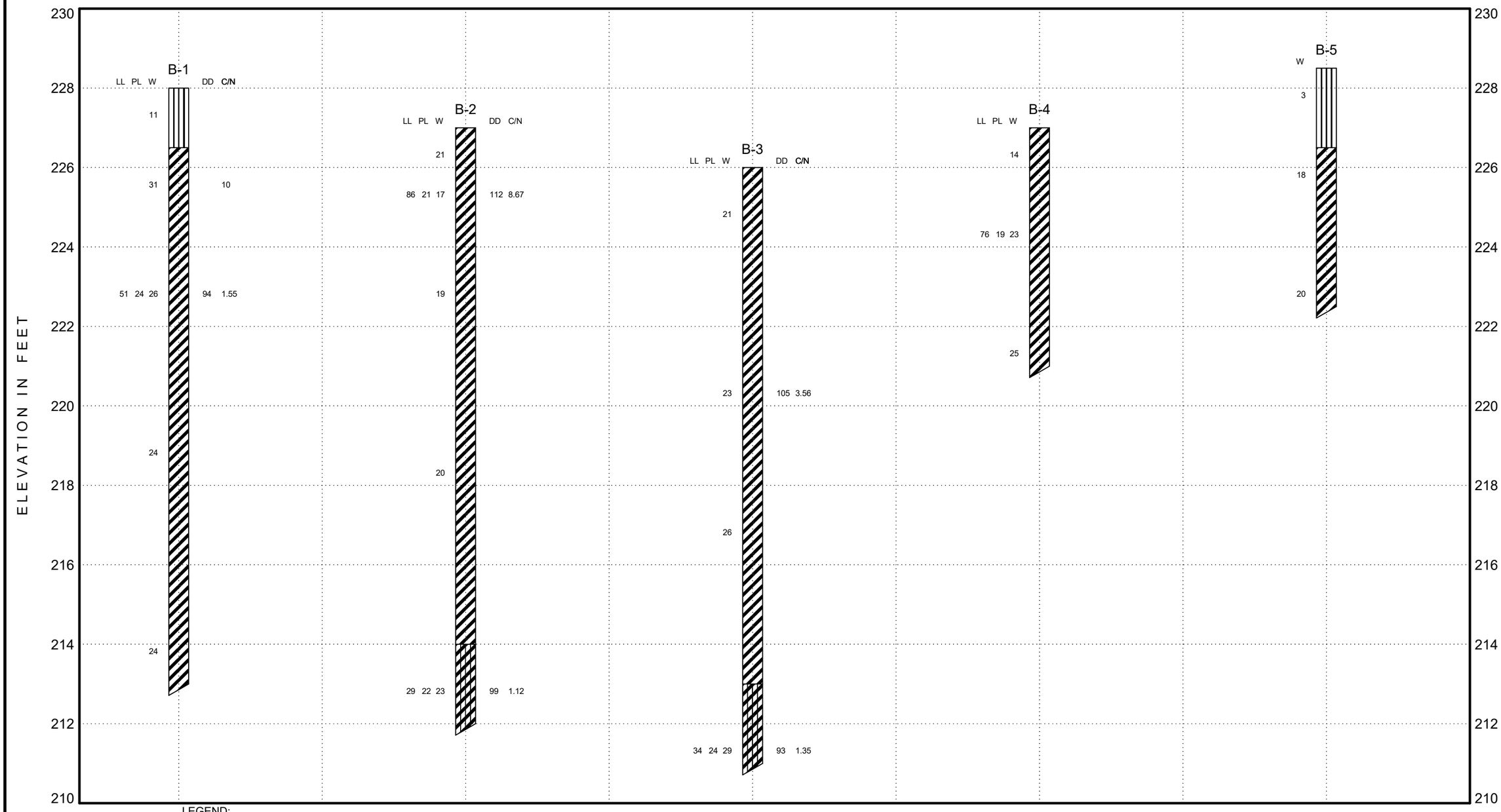
COMMENTS:
GPS Coordinates
N 31° 19' 12.7"
W 89° 20' 42.7"

GROUNDWATER DATA: No free water encountered during auger drilling.

240634.GPJ

BURNS COOLEY DENNIS, INC.
GEOTECHNICAL AND MATERIALS ENGINEERING CONSULTANTS

FIGURE 7



LEGEND:
LL = Liquid Limit
PL = Plastic Limit
W = Water Content
DD = Dry Density (pcf)
C/N = Cohesion (ksf)/Penetration Resistance, N (blows per ft) in the same column
% -200 = % Passing No. 200 Sieve

NOTE: See Figure 2 for boring log legend.

SUBSURFACE SOIL PROFILE

PROPOSED EXPANSION
ASBURY HOSPICE HOUSE FACILITY
HATTIESBURG, MISSISSIPPI

Job No.	240634	Date	10/24/2024	Figure	8

GENERIC FENCE ELEV FIG (NEW 02-6-21)

BURNS COOLEY DENNIS, INC.

SECTION 02 41 19- SELECTIVE DEMOLITION (RENOVATION)

PART 1 - 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 DESCRIPTION OF WORK:

A. Extent of selective demolition work is indicated on drawings.

B. Types of Selective Demolition Work: Demolition requires the selective removal and subsequent offsite disposal of the following:

1. Portions of building structure indicated on drawings and as required to accommodate new construction.

2. Removal of interior partitions as indicated on drawings.

3. Removal of doors and frames indicated.

4. Removal of built-in cabinets indicated.

5. Removal of existing windows.

6. Removal and protection of existing fixtures and equipment.

7. Removal work specified elsewhere.

8. Cutting non-structural concrete floors and masonry walls for underground piping and ducts, and for above grade piping, ducts, and conduit is included with the work of the respective mechanical and electrical Divisions 15 and 16 specification sections.

9. Cutting holes in roof deck and complete installation of new rooftop equipment is specified in Division 15 sections.

10. Related work specified elsewhere.

11. Remodeling construction work and patching is included within the respective sections of specifications, including removal of materials for reuse and incorporated into remodeling or new construction.

12. Relocation of pipes, conduits, ducts, other mechanical and electrical work are specified by respective trades.

1.3 SUBMITTALS:

A. Schedule: Submit schedule indicating proposed methods and sequence of operations for selective demolition work to Owner's representative for review prior to commencement of work, include coordination for shut-off, capping, and continuation of utility services as required, together with details for dust and noise control protection.

1. Provide detailed sequence of demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.

2. Coordinate with Owner's continuing occupation of portions of existing building with Owner's partial occupancy of completed new addition, and with Owner's reduced usage during summer months.

1.4 JOB CONDITIONS:

A. Occupancy: Owner will be continuously occupying areas of the building immediately adjacent to areas of selective demolition. Conduct selective demolition work in manner that will minimize need for disruption of Owner's normal operations. Provide minimum of seventy-two hours advance notice to Owner of demolition activities which will severely impact Owner's normal operations.

B. Condition of Structures: Owner assumes no responsibility for actual condition of items or structures to be demolished.

1. Conditions existing at time of commencement of contract will be maintained by Owner insofar as practicable; however, variations within structure may occur by Owner's removal and salvage operations prior to start of selective demolition work.

C. Partial Demolition and Removal: Items indicated to be removed but of salable value to contractor may be removed from structure as work progresses. Transport salvaged items from site as they are removed.

1. Storage or sale of removed items on site will not be permitted.

D. Protections: Provide temporary barricades and other forms of protection as required to protect Owner's personnel and general public from injury due to selective demolition work.

1. Provide protective measures as required to provide free and safe passage of Owner's personnel and general public to and from occupied portions of building.

2. Erect temporary covered passageways as required by authorities having jurisdiction.

3. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished, and adjacent facilities or work to remain.

4. Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations.

5. Protect floors with suitable coverings when necessary.

6. Construct temporary insulated solid dustproof partitions where required to separate areas where noisy and extensive dirt or dust operations are performed. Equip partitions with dustproof doors and security locks if required.

7. Provide temporary weather protection during interval between demolition and removal of existing construction to insure that no water leakage or damage occurs to structure or interior areas of existing building.

8. Remove protections at completion of work.

E. Damages: Promptly repair damages caused to adjacent facilities by demolition work at no cost to Owner.

F. Traffic: Conduct selective demolition operations and debris removal in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.

1. Do not close, block or otherwise obstruct streets, walks or other occupied or used facilities without written permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

G. Explosives: Use of explosives will not be permitted.

H. Utility Service: Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations.

1. Do not interrupt existing utilities serving 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.

I. Environmental Controls: Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.

1. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

PART 2 - PART 2 - PRODUCTS (Not Applicable)

PART 3 - PART 3 - EXECUTION

3.1 INSPECTION:

A. Prior to commencement of selective demolition work, inspect areas in which work will be performed. Photograph existing conditions to structure surfaces, equipment or to surrounding properties which could be misconstrued as damage resulting from selective demolition work; file with Owner's representative prior to starting work

3.2 PREPARATION:

A. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement or collapse of structures to be demolished and adjacent facilities to remain.

1. Cease operations and notify the Owner's representative immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations.

B. Cover and protect furniture, equipment and fixtures to remain from soiling or damage when demolition work is performed in rooms or areas from which such items have not been removed.

C. Erect and maintain dustproof partitions and closures as required to prevent spread of dust or fumes to occupied portions of the building.

1. Where selective demolition occurs immediately adjacent to occupied portions of the building, construct dustproof partitions of minimum 4" studs, 5/8" drywall (joints taped) on occupied side, 1/2" fire-retardant plywood on demolition side, and fill partition cavity with sound-deadening insulation.

2. Provide weatherproof closures for exterior openings resulting from demolition work.

3. Locate, identify, stub off and disconnect utility services that are not indicated to remain.

4. Provide by-pass connections as necessary to maintain continuity of service to occupied areas of building. Provide minimum of seventy-two hours advance notice to Owner if shut-down of service is necessary during change-over.

3.3 DEMOLITION:

A. Perform selective demolition work in a systematic manner. Use such methods as required to complete work indicated on drawings in accordance with demolition schedule and governing regulations.

B. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand tools; do not use power-driven impact tools.

C. Locate demolition equipment throughout structure and promptly remove debris to avoid imposing excessive loads on supporting walls, floors or framing.

D. Provide services for effective air and water pollution controls as required by local authorities having jurisdiction.

E. Demolish foundation walls to a depth of not less than 12" below existing ground surface. Demolish and remove below-grade wood or metal construction. Break-up below-grade concrete slabs.

F. For interior slabs on grade, use removal methods that will not crack or structurally disturb adjacent slabs or partitions. Use power saw where possible.

G. Completely fill below-grade areas and void resulting from demolition work. Provide fill consisting of approved earth, gravel or sand, free of trash and debris, stones over 6" diameter, roots or other organic matter.

H. If anticipated mechanical, electrical or structural elements which conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to Owner's representative in written, accurate detail. Pending receipt of directive from Owner's representative rearrange selective demolition schedule as necessary to continue overall job progress without delay.

3.4 DISPOSAL OF DEMOLISHED MATERIALS:

A. Remove debris, rubbish, and other materials resulting from demolition operations from building site. Transport and legally dispose of materials off-site.

B. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.

C. Burning of removed materials is not permitted on the project site.

D. Upon completion of demolition work, remove tools, equipment, and demolished materials from site. Remove protections and leave interior areas broom clean.

E. Repair demolition performed in excess of that required. Return structures and surfaces to remain to condition existing prior to commencement of selective demolition work. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

END OF SECTION

SECTION 031500 - CONCRETE ACCESSORIES

PART 1 – GEN ERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install concrete accessories.
   2. The types of concrete accessories required include the following:
      a. Construction joints.
      b. Expansion joints and fillers.
      c. Control joints.

B. General: All joints subject to hydrostatic pressure shall be provided with continuous water stop.

C. Related Work Specified Elsewhere:

   1. Section 033001 - Concrete Formwork.

1.2 QUALITY ASSURANCE

A. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified:
   1. ACI 301, Specifications for Structural Concrete for Buildings, Chapter 6, Joints and Embedded Items.
   2. ASTM A 36, Structural Steel.
   3. ASTM D 1752, Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.
   4. ASTM B 164, Nickel-Copper Alloy Rod and Bar.

B. All manufactured items shall be installed in accordance with manufacturer's instructions.

1.3 SUBMITTALS

A. Samples: Submit for approval the following samples:
   1. Cork expansion joint fillers.
   2. Multipolymer plastic bearing strips.

B. Shop Drawings: Submit for approval the following:
   1. Manufacturer's specifications and installation instructions for all materials required.
   2. Layout of all construction joint locations prior to the submittal of steel reinforcing drawings.

PART 2 - PRODUCTS

2.1 PREMOLDED EXPANSION JOINT FILLER

A. Premolded joint filler (PJF) for interior expansion joints shall be self-expanding cork consisting of preformed strips that have been formed from clean granulated cork particles securely bound together by a synthetic resin of an insoluble nature. The PJF shall be capable of expanding 140 percent of its original thickness, which shall be 3/4-inch unless shown otherwise on the Drawings. The PJF shall meet the specification requirements of the latest revision of Corps of Engineers' Specification CRD-C 509, Type III and ASTM D 1752 Type III. Manufacturers meeting the specification requirements are: Sealtight Products by W.R. Meadows, Inc., P.O. Box 543, Elgin, IL 60120, (312) 683-4500 and Tex-Mastic Products by J & P Petroleum Products, Inc., P.O. Box 4206, Dallas, TX 75208, (214) 331-5401. Other products shall not be used without prior review and acceptance by the Engineer.

B. Premolded joint filler (PJF) for exterior expansion joints between concrete slabs and structural walls, where specifically shown on the Drawings shall be asphalt impregnated fiber board conforming to the latest revision of ASTM D 1751. Thickness of the PJF shall be 3/4-inch unless otherwise shown on the Drawings. Manufacturers meeting the specification requirements are: Sealtight Products by W.R. Meadows, Inc., P.O. Box 543, Elgin, IL 60120, (312) 683-4500 and Tex-Mastic Products by J & P Petroleum Products, Inc., P.O. Box 4206, Dallas, TX 75208, (214) 331-5401. Other products shall not be used without prior review and acceptance by the Engineer.

2.2 CONCRETE CONSTRUCTION JOINT ROUGHENER

A. Provide a water-soluble non-flammable, surface-retardant roughener.

B. Product and Manufacturer: Provide one of the following:
1. Rugasol-S by Sika Chemical Corporation, for horizontal joints only.
2. EAC-S by Preco Industries, Ltd., for horizontal joints only.
3. Tuf-Cote (Deep Etch) by Preco Industries Ltd., for vertical joints.
4. Or equal.

2.4 EPOXY BONDING AGENT

A. Provide an epoxy-resin bonding agent, two component, polyamide type.

B. Product and Manufacturer: Provide one of the following:
1. Sikadur Hi-Mod by Sika Chemical Corporation
2. Epoxtite Binder (Code #2390) by A.C. Horn, Inc.
3. Or equal.

2.5 PREFORMED BEARING STRIPS

A. Provide a multipolymer plastic bearing strip with a coefficient of friction less than .01. Bearing strip to be 1/8 inch thick by nine inches wide.

B. Product and Manufacturer:
1. Korolath bearing strips by Koro Corporation.
2. Or equal.

ANCHOR BOLTS

A. Set all anchor bolts by template, rigidly secure the bolts in place to prevent their displacement, and verify all bolt locations before placing concrete, so that the bolt locations in the completed foundations will conform accurately to the bolt setting dimensions indicated on the foundation drawings.

2.7 Backer-rod shall be high-grade extruded closed-cell polyethylene foam that is completely compatible with polysulfide and urethane type sealants. Backer-rod shall also be ultraviolet stable, resistant to oils, chemicals, ozone and weathering. The size of the rod shall be 1 inch diameter for 3/4 inch wide joints. To the extent possible only full length rods shall be used; splices shall be minimized. Acceptable manufacturers are: Sonofoam by Sonneborn Building Products, 7711 Computer Avenue, Minneapolis, MN 55435, (612) 835-3434 and Tex-Mastic Products by J & P Petroleum Products, Inc., P.O. Box 4206, Dallas, TX 75208, (214) 331-5401. Other products shall not be used without prior review and acceptance by the Engineer.

2.8 Mastic used to prevent bond at joints indicated on the Drawings shall be Igas joint system by Sika Corporation, Box 297, Lyndurst, NJ 07071, (201) 933-8801 or approved equal. Primer shall be as recommended by the manufacturer.

2.9 Materials for forming joints and load transfer devices for installation in street and roadway pavement slabs shall be in accordance with MDOT Specifications, Section 707.

PART 3 - EXECUTION

3.1 INSPECTION

Examine conditions under which joints are to be installed, and notify ENGINEER in writing of unsatisfactory conditions existing. Do not proceed with the Work until unsatisfactory conditions or deficiencies have been corrected in a manner acceptable to ENGINEER.

3.2 CONSTRUCTION JOINTS

A. Comply with ACI 301, Chapter 6, and as specified below.

B. Locate and install construction joints as shown.

C. Horizontal Joints:

1. Roughen concrete at the interface of construction joints in accordance with instructions of the manufacturer of joint roughener. Immediately before placing fresh concrete, thoroughly clean the existing contact surface using a stiff brush or other tools and a stream of water under pressure. The surface shall be clean and wet, but free from pools of water at the moment the fresh concrete is placed.

2. Remove laitance, waste mortar or other substance which may prevent complete adhesion.

3. Place a 2-inch thick coat of mortar, of similar proportions to the mortar in the concrete, over the contact surface of the old con¬crete. Place fresh concrete before the mortar has attained its initial set.

D. Vertical Joints:

1. Apply roughener to the form in a thin, even film by brush, spray or roller in accordance with the manufacturer's instructions. After roughener is dry, concrete may be placed.

2. When concrete has been placed and the form removed, wash loosened material off with high pressure water spray to obtain roughened surface subject to approval by ENGINEER.

E. Place two layers of 1/8 inch thick bearing strips on concrete bearing surface prior to placing concrete slab to provide sliding bearing as shown.

3.3 EXPANSION JOINTS

A. Comply with ACI 301, Chapter 6, and as specified below.

B. Locate and install expansion joints as shown. Install cork filler in accordance with manufacturer's instructions.

3.4 BONDING WITH EPOXY ADHESIVE

A. Use adhesive for the following:
1. Bonding of fresh concrete to concrete cured at least 28 days or to existing concrete.

2. Bonding of horizontal construction joints where these are required by the Drawings or approved by ENGINEER for foundation mats that are five feet thick or greater.

B. Handle and store epoxy adhesive in compliance with the manufacturers printed instructions, including safety precautions.

C. Mix the epoxy adhesive in complete accordance with the instructions of the manufacturer.

D. Before placing fresh concrete, thoroughly roughen and clean hardened concrete surfaces and coat with epoxy grout not less than 1/16-inch thick. Place fresh concrete while the epoxy material is still tacky, without removing the in-place grout coat, and as directed by the epoxy manufacturer.

3.5 WATERSTOPS

A. Install waterstops for all joints indicated on the Drawings. Waterstops shall be continuous around all corners and intersections so that a continuous, water-tight seal is provided.

END OF SECTION

SECTION 03 30 00 - CAST IN PLACE CONCRETE

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 specified in this section.

B. Vapor Barriers are specified in SECTION 07 25 00

C. Concrete Reinforcement is specified in SECTION 03 30 02

D. Concrete Formwork is specified in SECTION 03 30 01

1.2 DESCRIPTION OF WORK:

A. The extent of concrete work shown on drawings.

B. Above Grade

C. Slabs on fill

D. Concrete foundations, walls, and footings.

1.3 QUALITY ASSURANCE:

A. Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified:

1. American Concrete Institute (ACI):

2. ACI 301 "Specifications for Structural Concrete for Buildings".

3. ACI 318 "Building Code Requirements for Reinforced Concrete".

4. ACI 315 "Manual of Standard Practice for Detaining Reinforced Concrete Structures".

5. ACI 347 "Recommended Practice for Concrete Formwork".

6. American Society for Testing & Materials (ASTM):

7. ASTM A 615 "Deformed and Plain Billet Steel Bar for Concrete Reinforcement".

8. ASTM A 185 "Welded Steel Wire Fabric for Concrete Reinforcement".

9. ASTM C 33 "Concrete Aggregates".

10. ASTM C 94 "Ready-Mixed Concrete".

11. ASTM C 150 "Portland Cement".

12. ASTM C 260 "Air-Entraining Admixtures".

13. ASTM C 309 "Liquid Membrane Forming Compounds for Curing Concrete".

14. ASTM C 494 "Chemical Admixture for Concrete".

1.4 CONCRETE TESTING:

A. Quality Control

1. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

2. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

3. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

4. Testing Agency Qualifications: An independent agency, acceptable to the Architect, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

5. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.

6. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

B. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

C. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

D. ACI 301, "Specification for Structural Concrete,"

E. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

F. Concrete Testing Service: Contractor shall employ at his expense a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

G. The contractor shall furnish all concrete mix designs to the Architect for review.

H. Test and Testing

1. Materials and installed work may require testing and retesting, as directed by the Architect at any time during progress of work. Allow free access to material during progress of work. Allow free access to material stockpiles and facilities. Tests, including retesting of rejected materials and installed work, shall be done at Contractor's expense.

2. The testing laboratory providing quality control has total authority and responsibility for the concrete exiting the truck. Any alteration of the concrete in the truck including addition of water, admixtures, or any other product will be allowed only at the discretion of the testing laboratory.

3. The quality control laboratory has total authority of rejection of concrete prior to placement for duration of time since departure from batch plant, or any inconsistency or deviation from standards set forth herein.

I. Required Test:

1. Compression Test Specimens: ASTM C31; one set is defined as 6 standard cylinders for each compressive strength test, unless otherwise indicated or directed. Mold and store cylinders for laboratory cured test specimens except field-cure one test specimen.

2. Compressive Strength Tests: ASTM C39; a minimum of one set as follows or fraction thereof, of each concrete class placed in any one day. 2 specimen tested at 7 days, 3 specimen tested at 28 days Test , 1 cylinder held as a test back up cylinder at 56 days or as directed by Architect.

Grade Beams:	1 set for each 100 cubic yards
Slabs on Grade:	1 set for each 100 cubic yards or any one pour for each 5000 sq. ft.
Concrete Masonry Units (Foundation walls, lintels, piers, bond beams):	1 set for each 25 cubic yards
Concrete Paving:	1 set for each 25 cubic yards
Concrete Walks:	Not Required
Concrete Curb Gutters:	Not Required
Manholes, Catch Basins, Junction Boxes, Fence Post, Light Pole Supports, Headwalls:	Not Required

3. Slump: ASTM C143; one test for each concrete load at point of discharge; and one test for each set of compressive strength test specimens.

4. Air Content: ASTM C173, volumetric method for normal weight for each concrete load at point of discharge; and one test for each set of compressive strength test specimens.

5. Concrete Temperature: Test hourly when air temperature is 40 degrees F and below; and when 80 degrees and above; and each time a set of compression test specimens made.

6. When strength of field-cured cylinders is less than 85% of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protection and curing in-place concrete.

7. Test results will be reported in writing to Architect and Contractor on same day that tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placements, name of concrete testing service, concrete type and class design mix identification, locations of concrete batch in structure shall be described so that it is easily determined where and to what extent it is in the project. Design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of test results shall be considered satisfactory if they equal 70% of the 28-day design requirements at a 7-day break.

8. Additional Tests: The testing service will make additional test of in-place concrete when test results indicate specified concrete strength and other characteristics have not been attained in the structure, as directed by Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods as directed. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

1.5 CEMENT MIXES

A. Ready-Mix Concrete: Comply with requirements of ANSI/ASTM C94, and as herein specified.

B. Concrete Design mix is to be established to provide concrete of ten percent (10%) higher strength than the specified job strength.

C. CONCRETE STRENGTHS FOR VARIOUS COMPONENTS AND LOCATIONS ARE INDICATED ON THE DRAWINGS.

D. Design mixes to provide required strengths concrete with the following properties for the:

1. 3500 psi 28-day compressive strength. For slabs on grade, – no entrained air. See notes on structural drawings.

2. 3000 psi 28-day compressive strength. For grade beams – no entrained air. See Notes on structural drawings.

E. Proportions shall be made by weight and shall be uniformly and accurately controlled and inspected by the testing laboratory.

F. During hot weather or under conditions contributing to rapid setting of concrete a shorter mixing time than specified in ANSI/ASTM C 94, may be required.

1.6 SUBMITTALS:

A. Product Data: Submit manufacturer's product data with application and installation instructions for proprietary materials and items, admixtures, patching compounds, curing compounds, and others as requested by Architect.

B. Submit for review sets of detailed shop drawings showing layout, sizes, arrangements, bar supports, etc., for reinforcing steel, all reinforcing for grade beams, walls, etc. shall be shown in elevations so as to indicate bar lengths, locations of splices, etc.

C. Submit layout of construction joints in site paving for Architect review.

D. Samples: Submit samples of materials as specified and as otherwise requested by Architect, including names, sources and descriptions.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS:

A. Portland Cement: ANSI/ASTM C 150, Type I.

1. Use one brand of cement throughout project, unless otherwise acceptable to Architect.

B. Aggregates: ANSI/ASTM C 33, maximum size one inch (1").

C. Water: Potable, clean free of oil, alkali, or other deleterious substances.

D. Air-Entraining Admixture: ANSI/ASTM C260.

E. Water-Reducing Admixture: ANSI/ASTM C494, Type A and contain not more than 1% chloride ions.

F. Water Reducing: Accelerator Admixture L ASTM C494, Type C or E

1. Subject to compliance with requirements, provide one of the following:
   a. Accelguard HE; Euclid Chemical Co.
   b. Pozzolith 122-HE; Master Builders
   c. Darex; W.R. Grace
   d. Sikacrete; Sika Chemical Co.

G. Superplasticizer:

1. Subject to compliance with requirements, provide one of the following:
   a. R. Grace
   b. Monex

2.2 RELATED MATERIALS:

A. Non-Shrink Grout: ASTM C1107, factory pre-mixed grout.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Type D, Non-metallic
      1) "Masterflow 713"; Master Builders.
      2) "Sonogrout"; Sonneborn-Contech.
      3) "Euco-NS"; Euclid Chemical Co.
      4) "Five-Star Grout"; U.S. Grout Co.
      5) "Duragrout"; L & M Const. Chemical Co.

B. Curing Hardener, Sealer: Acrylic base compound equal to Sonneborne's Gray Kure-N-Seal. Use this material for curing and sealing of exposed finished concrete floors as noted in Finish Schedule as "Concrete (Sealed)".

C. Moisture-Retaining Cover: One of the following, complying with ANSI/ASTM C 171.

1. Polyethylene film. 6 Mil

D. Bonding Compound: Polyvinyl acetate, rewettable type.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. "Weldcrete"; Larson Products.
   b. "Everbond"; L & M Construction Chemicals.
   c. "EucoWeld"; Euclid Chemical Co.
   d. "Daraweld C"; W.R. Grace.
   e. "Sonocrete"; Sonneborn-Contech.

E. Epoxy Adhesive: 100% solids, two component materials suitable for use on dry or damp surfaces.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. "Thiopoxy"; W.R. Grace.
   b. "Sikadur Hi-Mod"; Sika Chemical Corp.
   c. "Euco Epoxy"; Euclid Chemical Co.

F. Floor Leveling Compound: Ardex K-15 and primer Ardex P-51.

G. Waterstop: Performed plastic adhesive waterstop as per FS SS-S-00210A and shall have a cross sectional area of approximately one (1) square inch manufactured by SYNKO-FLEX PRODUCTS, INC.

H. Chemical Anchors: Adhesive anchor capsules and threaded anchor rods or reinforcing bars equal to "HILTI HVA Adhesive Anchors" or "RAWL CHEM - Stud Anchors" to be installed in accordance with manufacturer's recommendations.

I. Admixtures:

1. Use accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees F.

2. Use Air-entraining admixture in exterior exposed concrete, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate.

3. Use admixtures for water-reducing and set-control in strict compliance with manufacturer's directions.

J. Superplasticizer:

1. Use superplasticizer in concrete slabs at contractor’s option.

2. Foundations, columns, at contractors’ option.

3. Cement content shall not be reduced with use of superplasticizer.

4. Use manufacturer’s recommendations for quantity per cubic yard not to exceed a slump of 9”.

K. Slump Limit: Proportion and design mixes to result in concrete slum at point of placement as follows:

1. Ramp and Sloping Surfaces: Not more than 3".

2. Reinforced Foundation Systems: Not less than 3" and not more than 5".

3. Slab: Not less than 4" nor more than 5".

4. Other Concrete: Not less than 4" and not more than 5".

L. Fly ash shall be used, not more than 20% of the cement, by weight, may be replaced by fly ash. Fly ash shall be ASTM C-618, Class C or F. Class F shall be per MDOT specifications.

M. Calcium chloride shall not be used.

N. When air temperature is between 85 and 90 degrees F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 degrees F reduce mixing and delivery time to 60 minutes.

O. In cold weather, concrete operation may be assisted by using hot water or by preheating the aggregates prior to mixing operation or a combination thereof to insure that concrete is maintained at a temperature of 40 degrees or more.

P. All concrete design mixes shall have the mix number indicated on the submittal to the Architect. The delivery ticket left at the job site shall also bear the design mix number.

Q. Refer to drawings for compressive strength requirements.

PART 3 - EXECUTION

3.1 PREPARATION OF FORM SURFACES:

A. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.

B. Thin form-coating compounds only with thinning agent of type, and in amount, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

3.2 CONCRETE PLACEMENT:

A. Pre-placement Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used.

B. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.

C. General:

1. Comply with ACI 304, and as herein specified.

2. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.

D. Placing Concrete in Forms:

1. Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

2. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping.

3. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practices.

4. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

E. Placing Concrete Slabs:

1. Deposit and consolidate concrete slabs in a continuous operation within limits of construction joints until the placing of a panel or section is completed.

2. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

3. Bring slab surfaces to correct level with straightedge and strike off. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.

4. Maintain reinforcing in proper position during concrete placement operations.

F. Cold Weather Placing:

1. Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.
   a. When air temperature has fallen to or is expected to fall below 40 degrees F. (4 degrees C), do not place concrete.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.

G. Hot Weather Placing:

1. When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305.

2. Wet forms thoroughly before placing concrete.

3. Use water-reducing retarding admixture (Type D) when required by high temperatures,

4. If the testing laboratory technician, at the job site, determines that water is to be added to a load of concrete, the drum shall be turned 60 to 80 revolutions at 12 to 15 revolutions per minute after the water has been added. The slump is then to be rechecked.

3.3 FINISH OF FORMED SURFACES:

A. Rough Form Finish:

B. For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4" in height rubbed down or chipped off.

C. Smooth Form Finish:

1. For formed concrete surfaces exposed-to-view, or that are to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, painting or other similar system. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and

symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.

2. Moisten concrete surfaces and rub with Carborundum brick or other abrasive until a uniform color and texture is produced. Do not apply cement grout other than that created by the rubbing process.

D. Rubbed Concrete:

1. Provide rubbed finish to concrete surfaces which are in view in interior and exterior locations, or as indicated on the plans.

2. Combine one part Portland cement to 1-1/2 parts fine sand by volume, and mix with water to consistency of thick paint. Use of proprietary additives may be used at contractor's option. Blend standard Portland cement and white Portland cement, amounts determined by trial patches, so that final color of dry grout will closely match adjacent surfaces.

3. Thoroughly wet concrete surfaces and apply grout to coat surfaces and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least 36 hours after rubbing.

E. Related Uniformed Surfaces:

1. At tops of walls, horizontal offsets surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces.

2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.4 MONOLITHIC SLAB FINISHES:

A. Float Finish:

1. Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo, and as otherwise indicated.

2. After screening, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to a tolerance not exceeding 1/4" in 10' when tested with a 10' straightedge. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

B. Trowel Finish:

1. Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, paint or other thick film finish coating system.

2. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding 1/8" in 10' when tested with a 10' straightedge. Grind smooth surface defects which would telegraph through applied floor covering system.

C. Non-Slip Broom Finish:

1. Apply non-slip broom finish to exterior concrete platforms, steps and ramps, and elsewhere as indicated.

2. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

D. Curing Hardener Sealer:

1. Apply three (3) coats of chemical-hardener finish to interior concrete floors where indicated. Apply liquid chemical hardener for curing of the concrete surface. Evenly apply each coat, and allow 24 hours for drying between first two (2) coats. Apply 3rd coat just prior to occupancy.

2. Apply proprietary chemical hardeners in accordance with manufacturer's printed instructions.

3. After final coat of chemical hardener solution is applied and dried, remove surplus hardener by scrubbing and mopping with water.

3.5 CONCRETE CURING AND PROTECTION:

A. General:

1. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

2. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than seven days.

3. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least seven days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

B. Provide moisture-cover curing as follows:

1. Cover concrete surfaces with moisture-retaining cover for curing concrete placed in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

C. Curing Formed Surfaces:

1. Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by using curing compound.

3.6 MISCELLANEOUS CONCRETE ITEMS:

A. Filling-In:

1. Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as herein specified to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

2. All areas under concrete floor slab shall have moisture barrier with joints lapped at least 12". Take care to lay material smooth and even, and avoid tearing or puncturing. Seal tightly at all expansion joints and spaces around pipes, conduits and other penetrations using coal, tar, pitch, or asphalt mastic.

3. The general contractor is to VERIFY the sizes and locations of all required floor and roof openings, equipment supports, etc. with the various subcontractors. Any conditions which require revisions or additions to the structural framing are to be brought to the attention of the architect and structural engineer prior to any construction. Any cost for the required changes will be borne by the general contractor..

3.7 CONCRETE SURFACE REPAIRS:

A. Patching Defective Areas:

1. Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Architect.

2. Cut out honeycomb, rock pockets, voids over 1/4" in any dimension, and holes left by tie rods and bolts, down to solid concrete but, in no case to a depth of less than one inch (1"). Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water and brush-coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.

3. For exposed-to-view surfaces, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

B. Repair of Formed Surfaces:

1. Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.

2. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

C. Repair of Unformed Surfaces:

1. Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface planes to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having required slope.

2. Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01" wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.

3. Correct high areas in unformed surfaces by grinding, after concrete has cured at least fourteen days.

4. Correct low areas in unformed surfaces during, or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching and floor leveling compounds may be used when acceptable to Architect.

5. Repair defective areas, except random cracks and single holes not exceeding one-inch (1") diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

6. Repair isolated random cracks and single holes not over one inch (1") in diameter by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than seventy-two (72) hours.

7. Use epoxy-based mortar for structural repairs, where directed by Architect.

8. Repair methods not specified above may be used, subject to acceptance of Architect.

END OF SECTION

SECTION 03 30 02 - CONCRETE REINFORCEMENT

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 specified in this section.

1.2 DESCRIPTION OF WORK:

A. Reinforcing steel bars, welded steel wire fabric for cast-in-place concrete.

B. Support chairs, bolsters, bar supports, spacers, and other devices for supporting reinforcements.

1.3 QUALITY ASSURANCE:

A. Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified:

1. ACI 301 "Specifications for Structural Concrete for Buildings".

2. ACI 315 "Details and Detailing of Concrete for Reinforcing.

3. ANSI/ASTM A185 - "Welded Steel Wire Fabric for Concrete Reinforcement".

4. ASTM A615 - "Deformed and Plain Billet-Steel Bars for Concrete Reinforcement".

5. CRSI - "Manual of Practice".

6. CRSI 63 - "Recommended Practice for Placing Reinforcing Bars".

7. CRSI 65 - "Recommended Practice for Placing Bar Supports, Specifications and Nomenclature".

1.4 SUBMITTALS:

A. Shop Drawings; Reinforcement: Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, splicing, stirrup spacing, diagrams of bent bars, arrangement of concrete reinforcement include special reinforcement required and openings through concrete structures.

B. Submit shop drawings to the Architect that show approval of the Contractor. The Contractor and/or steel fabricator is urged to contact the Structural Engineer to resolve any questions that might arise during preparation of the shop drawings. If it is apparent to the Architect or Structural Engineer that the Contractor has not thoroughly checked the shop drawings prior to submittal, the Contractor will be notified to resubmit a set that has been properly checked and

the previous submittal will be abandoned. Only complete sets of shop drawings will be reviewed unless an agreement to check partial submittals is obtained prior to the first submittal. Do not fabricate any material until approval of the Architect has been obtained.

1.5 PRODUCT HANDLING

A. Deliver reinforcing to project site in bundles marked with metal gages indicating contents of bundle keyed to fabrication schedule.

B. Handle and store materials to prevent contamination and deterioration.

PART 2 - PRODUCTS

2.1 REINFORCING MATERIALS:

A. Reinforcing Steel: ASTM A615, Grade 60 billet-steel deformed bars, uncoated finish.

B. Steel Wire: ANSI/ASTM A 82, plain, cold-drawn, steel.

C. Welded Wire Fabric: ANSI/ASTM A 185, welded steel wire fabric.

D. Tie Wire: Minimum 18 gage annealed type.

E. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI recommendations, unless otherwise acceptable. All bolsters, chairs, etc. to be plastic tipped.

F. Other Supports: Concrete bricks may be used in bottom of earth formed grade beams to support reinforcing steel.

2.2 FABRICATION:

A. Fabricate in accordance with ACI 315, providing concrete cover specified in Section 03300.

B. Locate reinforcing Splices not indicated on Drawings at points of minimum stress. Indicate location of splices on shop drawings.

PART 3 - EXECUTION

3.1 PLACING REINFORCEMENT:

A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.

C. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.

D. Place reinforcement to obtain at least minimum coverage's for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

E. Install vertical dowel steel before placing concrete. Provide template to assure proper location and alignment.

F. Refer to Structural Drawings for additional requirements.

END OF SECTION

SECTION 03 54 13 - SELF-LEVELING CONCRETE FLOOR UNDERLAYMENT

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 specified in this section.

1.2 DESCRIPTION OF WORK:

A. The extent of floor leveling work as shown on drawings.

1. Slabs on fill
2. Above grade slabs

1.3 QUALITY ASSURANCE:

A. Installer’s Qualifications: Installation self-leveling concrete floor underlayment shall be by an applicator authorized by the manufacturer using manufacturers approved mixing and pumping equipment.

1.4 SUBMITTALS:

A. Product Data: Manufacturer's product specifications and installation instructions for each acoustical ceiling material required and for each suspension system including certified laboratory test reports and other data as required to show compliance with these specifications.

1.5 DELIVERY, STORAGE AND HANDLING:

A. General Requirements: Materials shall be delivered in their original, unopened packages, and protected from exposure to the elements. Damaged or deteriorated materials shall be removed from the premises.

1.6 JOB CONDITIONS:

A. Environmental Requirements: Before, during and after installation of self-leveling concrete floor underlayment, building interior shall be enclosed and maintained at a temperature above 40 degrees F (4.4 degrees C) and below 100 degrees F (37.7 degrees C) until structure and subfloor temperature are stabilized.

PART 2 PRODUCTS

2.1 MATERIALS:

A. Cementitious Self-Leveling Poured Floor Underlayment: Floor underlayment compound shall be Level-Right Self-Leveling Floor Underlayment as manufactured by Maxxon Corporation, Hamel, MN, or approved equal.

B. Sand Aggregate: Sand shall be silica aggregate meeting requirements of self-leveling concrete floor underlayment manufacturers requirements.

C. Mix Water: Potable, free from impurities.

D. Subfloor Primer: Maxxon Floor Primer

E. Sealer: Maxxon Overspray

2.2 MIX DESIGNS:

A. General Requirements: Self-leveling concrete floor underlayment mix proportions and methods shall be in strict accordance with product manufacturer recommendations.

PART 3 EXECUTION

3.1 PREPARATION:

A. Condition and Cleaning of Subfloor: Subfloor shall be structurally sound. General Contractor shall lean subfloor to remove mud, oil, grease, and other contaminating factors before arrival of the self-leveling concrete floor underlayment underlayment crew.

B. Leak Prevention: Fill cracks and voids with a quick setting patching or caulking material where leakage of self-leveling concrete floor underlayment could occur.

C. Priming Subfloor: Prime concrete subfloor using the sub-floor primer. Priming instructions vary according to the porosity of the concrete, multiple coats may be necessary.

D. Expansion Joints: Allow joints to continue through the self-leveling concrete floor underlayment at the same width.

3.2 APPLICATION OF SELF-LEVELING FLOORING:

A. Scheduling: Application of self-leveling concrete floor underlayment shall not begin until the building is enclosed, including roof, windows, doors, and other fenestration. Install after drywall installation unless tenant finish requirements identify partitioning after the pour.

B. Application: Place self-leveling concrete floor underlayment from 3" (76 mm) to featheredge. Spread and float self-leveling concrete floor underlayment to a smooth surface. Except at

authorized joints, place self-leveling concrete floor underlayment as continuously as possible until application is complete so that no self-leveling concrete floor underlayment slurry is placed against self-leveling concrete floor underlayment product that has obtained its initial set.

C. Drying: General Contractor shall provide continuous ventilation and adequate heat. With self-leveling concrete floor underlayment there's no extensive curing time. Ceramic tile can be thin set within 2 to 4 hours. Other floor goods can be installed once self-leveling concrete floor underlayment passes a moisture test.

3.3 PREPARATION FOR INSTALLATION OF GLUE DOWN FLOOR GOODS:

A. Sealing: Seal all areas that receive glue down floor goods according to the Manufacturer's specifications. Any floor areas where the surface has been damaged shall be cleaned and sealed regardless of floor covering to be used. Use sealer to seal the self-leveling concrete floor underlayment prior to installation of glue down floor goods. Where floor goods manufacturers require special adhesive or installation systems, their requirements supersede these recommendations.

B. Floor Goods Procedures: See the manufacturer's brochure for guidelines for installing finished floor goods. This procedure is not a warranty and is to be used as a guideline only.

3.4 FIELD QUALITY CONTROL

A. Slump Test: Self-leveling concrete floor underlayment mix shall be tested for slump as it's being pumped using a 2 inch by 4 inch (50 mm by 101 mm) cylinder resulting in a patty size of 9-1/2 inches (241 mm) plus or minus 1 inch (25 mm) diameter.

B. Field Samples: At least one set of 3 molded cube samples shall be taken from each day's pour during the self-leveling concrete floor underlayment application. Cubes shall be tested as recommended by the manufacturer in accordance with modified ASTM C 109. Test results shall be available to architect and/or contractor upon request from applicator.

3.5 PROTECTION

A. Protection From Heavy Loads: During construction, place temporary wood planking over self-leveling concrete floor underlayment wherever it will be subject to heavy wheeled or concentrated loads.

END OF SECTION

SECTION 05 44 13 – ENGINEERED LIGHT GAGE METAL TRUSS SYSTEM

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 SECTION INCLUDES

A. Engineered light gage metal truss system.

B. Cold-formed steel framing accessories.

1.3 RELATED SECTIONS

A. Section 05 40 00 – Cold Formed Steel Framing

B. Section 05 40 01 – Cold Formed Steel Framing and Sheathing

1.4 REFERENCES

A. AISI (American Iron and Steel Institute) – Specification for Design of Cold-Formed Steel Structural Members, August 1986 Edition with December 11, 1989 Addendum.

B. ASTM A 370 – Standard Test Methods and Definitions for Mechanical Testing of Steel Products.

C. ASTM A 570/A 570M – Standard Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality.

D. ASTM A 611 – Standard Specification for Steel, Sheet, Carbon, Cold-Rolled, Structural Quality

E. ASTM A 653/A 653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated by the Hot-Dip Process.

1.5 SYSTEM DESCRIPTION

A. Design Requirements:

1. Design system components in accordance with AISI referenced, provide for movement of components due to thermal variations without damage, or excessive stress on components.

2. Conform to requirements of IBC code.
3. Maximum Allowable Deflection: 1/300th of span, under total design loads.
4. Trusses are defined as being composed of interlocking triangular panels. See structural drawings for other restrictions. Truss geometry and lengths shall be as shown on the structural drawings.

B. Performance Requirements:

1. Truss system with framing components and accessories, to provide complete horizontal framing system, ready for deck installation, meeting specified Design Requirements.
2. Truss chord and web components shall be made from symmetrical components to create a balanced truss design.
3. Truss and chord components shall have rolled or closed edges to minimize the danger of cutting during handling. Components without rolled or hemmed edges shall not be acceptable.

1.6 SUBMITTALS

A. Submit under provision of Section 01300

B. Product Data: Manufacturer's descriptive literature for each item of cold-formed metal framing and each accessory specified this section.

C. Shop Drawings:

1. Indicate special components and installations not fully dimensioned or detailed in product data.
2. Indicate in placing drawings number, types, location, sizes, spacing, and gages of framing members.
3. Indicate details of supplemental strapping, bracing, splicing, bridging, and accessories required for installation of truss members and adjacent products/materials.

D. Quality Assurance Submittals:

1. Manufacturer's Instructions: Printed installation instructions for each item of cold-formed metal framing and each accessory specified in this sections.
2. Design Data: Calculations for loading and stresses, bearing seal and signature of professional engineer registered in the State in which project is located.
3. Mill Certificates for each type structural framing member, indicating the following Information:
   a. Bare metal thickness of steel, measured to 1/1000 inch.
   b. Yield strength of steel.
   c. Tenable strength of steel.
   d. Total elongation of steel in 2 inch gage length.
   e. Chemical analysis of steel.
   f. Thickness of galvanized coating, measured to 1/1000 inch.

1.7 QUALITY ASSURANCE

A. Confer at job site prior to scheduled beginning of construction activities of this to review requirements of this section.

B. Attendees: Representatives of the following:

1. Truss manufacturer, if requested by installer of products of this section.
2. Installer of this section.
3. Other entities directly affecting or affected by, construction activities of this section including but not limited to the following:
   a. Installer of door and window frames
   b. Installer of mechanical systems
   c. Installer of electrical systems

C. Review potential interface conflicts, coordinate layout of support provisions.

1.8 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:

1. Provide bracing for shop assembled units to prevent racking.
2. Handle and lift shop assembled units in accordance with manufacturer's recommendations to prevent damage or distortion. Use spreader beams that allow for 3 lifting slings to hang vertically supporting trusses during lifting operations.

B. Storage and Protection:

1. Store shop assembled unites in accordance with manufacturer's recommendations to prevent damage or distortion.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacture: Light Gage Steel Truss Members

1. TrusSteel trusses by Alpine Engineered Products, Inc.

B. Requested for substitutions will be considered in accordance with provisions of Section 01600.

C. Substitutions: Not Permitted

D. Supply all products in this section from a single manufacturer.

2.2 COMPONENTS

A. Load Bearing Members: Cold-formed to indicated sizes, profiles, and thicknesses of mill-certified steel conforming to ASTM A 653, minimum G60 coating and as follows:

1. Chord materials – Minimum yield strength 55,000 pounds per square inch.
2. Web materials – Minimum yield strength 45,000 pounds per square inch.
3. Shapes – Indicated on shop drawings.
4. Size – Indicated on shop drawings.
5. Gauge – Indicated on shop drawings.

B. Miscellaneous Framing Components: Foe each type framing indicated, supply required or indicated items, including, but not limited to the following:

1. Blocking
2. Clip Angles
3. Shoes
4. Reinforcements
5. Purlins
6. Fasteners
7. Anchors

C. Primer: Zinc-rich primer for galvanized surfaces conforming to FS TT-P-645.

2.3 FABRICATION

A. Substitutions:

1. Request for substitutions will be considered in accordance with provision of Section 01600.
2. Substitutions: Not Permitted

B. Trusses:

1. Shop fabricate from cold formed steel components in accordance with shop drawings using templates in ensure consistent component placement and alignment of components, and to maintain specified tolerances.

END OF SECTION

SECTION 05 44 13 – ENGINEERED LIGHT GAGE METAL TRUSS SYSTEM

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 SECTION INCLUDES

A. Engineered light gage metal truss system.

B. Cold-formed steel framing accessories.

1.3 RELATED SECTIONS

A. Section 05 40 00 – Cold Formed Steel Framing

B. Section 05 40 01 – Cold Formed Steel Framing and Sheathing

1.4 REFERENCES

A. AISI (American Iron and Steel Institute) – Specification for Design of Cold-Formed Steel Structural Members, August 1986 Edition with December 11, 1989 Addendum.

B. ASTM A 370 – Standard Test Methods and Definitions for Mechanical Testing of Steel Products.

C. ASTM A 570/A 570M – Standard Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality.

D. ASTM A 611 – Standard Specification for Steel, Sheet, Carbon, Cold-Rolled, Structural Quality

E. ASTM A 653/A 653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated by the Hot-Dip Process.

1.5 SYSTEM DESCRIPTION

A. Design Requirements:

1. Design system components in accordance with AISI referenced, provide for movement of components due to thermal variations without damage, or excessive stress on components.

2. Conform to requirements of IBC code.
3. Maximum Allowable Deflection: 1/300th of span, under total design loads.
4. Trusses are defined as being composed of interlocking triangular panels. See structural drawings for other restrictions. Truss geometry and lengths shall be as shown on the structural drawings.

B. Performance Requirements:

1. Truss system with framing components and accessories, to provide complete horizontal framing system, ready for deck installation, meeting specified Design Requirements.
2. Truss chord and web components shall be made from symmetrical components to create a balanced truss design.
3. Truss and chord components shall have rolled or closed edges to minimize the danger of cutting during handling. Components without rolled or hemmed edges shall not be acceptable.

1.6 SUBMITTALS

A. Submit under provision of Section 01300

B. Product Data: Manufacturer's descriptive literature for each item of cold-formed metal framing and each accessory specified this section.

C. Shop Drawings:

1. Indicate special components and installations not fully dimensioned or detailed in product data.
2. Indicate in placing drawings number, types, location, sizes, spacing, and gages of framing members.
3. Indicate details of supplemental strapping, bracing, splicing, bridging, and accessories required for installation of truss members and adjacent products/materials.

D. Quality Assurance Submittals:

1. Manufacturer's Instructions: Printed installation instructions for each item of cold-formed metal framing and each accessory specified in this sections.
2. Design Data: Calculations for loading and stresses, bearing seal and signature of professional engineer registered in the State in which project is located.
3. Mill Certificates for each type structural framing member, indicating the following Information:
   a. Bare metal thickness of steel, measured to 1/1000 inch.
   b. Yield strength of steel.
   c. Tenable strength of steel.
   d. Total elongation of steel in 2 inch gage length.
   e. Chemical analysis of steel.
   f. Thickness of galvanized coating, measured to 1/1000 inch.

1.7 QUALITY ASSURANCE

A. Confer at job site prior to scheduled beginning of construction activities of this to review requirements of this section.

B. Attendees: Representatives of the following:

1. Truss manufacturer, if requested by installer of products of this section.
2. Installer of this section.
3. Other entities directly affecting or affected by, construction activities of this section including but not limited to the following:
   a. Installer of door and window frames
   b. Installer of mechanical systems
   c. Installer of electrical systems

C. Review potential interface conflicts, coordinate layout of support provisions.

1.8 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:

1. Provide bracing for shop assembled units to prevent racking.
2. Handle and lift shop assembled units in accordance with manufacturer's recommendations to prevent damage or distortion. Use spreader beams that allow for 3 lifting slings to hang vertically supporting trusses during lifting operations.

B. Storage and Protection:

1. Store shop assembled unites in accordance with manufacturer's recommendations to prevent damage or distortion.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacture: Light Gage Steel Truss Members

1. TrusSteel trusses by Alpine Engineered Products, Inc.

B. Requested for substitutions will be considered in accordance with provisions of Section 01600.

C. Substitutions: Not Permitted

D. Supply all products in this section from a single manufacturer.

2.2 COMPONENTS

A. Load Bearing Members: Cold-formed to indicated sizes, profiles, and thicknesses of mill-certified steel conforming to ASTM A 653, minimum G60 coating and as follows:

1. Chord materials – Minimum yield strength 55,000 pounds per square inch.
2. Web materials – Minimum yield strength 45,000 pounds per square inch.
3. Shapes – Indicated on shop drawings.
4. Size – Indicated on shop drawings.
5. Gauge – Indicated on shop drawings.

B. Miscellaneous Framing Components: Foe each type framing indicated, supply required or indicated items, including, but not limited to the following:

1. Blocking
2. Clip Angles
3. Shoes
4. Reinforcements
5. Purlins
6. Fasteners
7. Anchors

C. Primer: Zinc-rich primer for galvanized surfaces conforming to FS TT-P-645.

2.3 FABRICATION

A. Substitutions:

1. Request for substitutions will be considered in accordance with provision of Section 01600.
2. Substitutions: Not Permitted

B. Trusses:

1. Shop fabricate from cold formed steel components in accordance with shop drawings using templates in ensure consistent component placement and alignment of components, and to maintain specified tolerances.

END OF SECTION

SECTION 05 50 00 - METAL FABRICATIONS

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 DESCRIPTION OF WORK:

A. Definition: Metal fabrications includes items made from iron and steel shapes, plates, bars, strips, tubes, pipes and castings which are not a part of structural steel or other metal systems specified elsewhere.

B. Types of work in this section include metal fabrications for:

1. Rough hardware.
2. Ladders.
3. Loose bearing and leveling plates.
4. Miscellaneous framing and supports.
5. Miscellaneous steel trim.
6. Exterior all alignment angles.
7. Steel gratings.
8. Steel Safety Grating
9. Steel pipe railings.
10. Metal stairs.
11. Structural steel is specified in another section within Division 5.

1.3 QUALITY ASSURANCE:

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.

B. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's specifications, anchor details and installation instructions for products used in miscellaneous metal fabrications, including paint products and grout.

B. Shop Drawings: Submit shop drawings for fabrication and erection of miscellaneous metal fabrications. Include plans, elevations and details of sections and connections. Show Anchorage and accessory items. Provide templates for anchor and bolt installation by others.

PART 2 - PRODUCTS:

2.1 MATERIALS:

A. Metals:

B. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.

1. Steel Plates, Shapes and Bars: ASTM A 36.

2. Steel Bar Grating: ASTM A 569 or ASTM A 36.

3. Steel Safety Grating: 12 Ga Hot Dipped Galvanized Steel

4. Steel Tubing: Cold formed, ASTM A 500; or hot rolled, ASTM A 501.

5. Structural Steel Sheet: Hot-rolled, ASTM A 57; or cold-rolled ASTM A 611, Class 1; of grade required for design loading.

6. Galvanized Steel: ASTM A 446, of grade required for design loading. Coating designation as indicated, or if not indicated, G90.

7. Steel Pipe: ASTM A 53; Type and grade (if applicable) as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight (schedule 40), unless otherwise indicated.

8. Gray Iron Castings: ASTM A 48, Class 30.

9. Malleable Iron Castings: ASTM A 47, grade as selected by fabricator.

10. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

11. Concrete Inserts: threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A 153.

C. Grout:

D. Non-Shrink Non-Metallic Grout: Pre-mixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with CE CRD-C588. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

E. Fasteners:

F. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.

1. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.

2. Lag Bolts: Square head type, FS FF-B-561.

3. Machine Screws: Cadmium plated steel, FS FF-S-92.

4. Wood Screws: Flat head carbon steel, FS FF-S-111.

5. Plain Washers: Round, carbon steel, FS FF-W-92.

6. Masonry/Concrete Anchorage Devices: Expansion shields, FS FF-S-325.

7. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and TYPE as required.

8. Lock Washers: Helical spring type carbon steel, FS FF-W-84.

G. Paint:

1. Metal Primer Paint: Red lead mixed pigment, alkyd varnish, linseed oil paint, FS TT-P-86, Type II; or red lead iron oxide, raw linseed oil, alkyd paint, Steel Structures Painting Council (SSPC) Paint 2-64; or basic lead silicon chromate base iron oxide, linseed oil, alkyd paint, FS TT-P-615, Type II.

2. Primer selected must be compatible with finish coats of paint. Coordinate selection of metal primer with finish paint requirements specified in Division 9.

3. Galvanizing Repair Paint: High zinc dust content paint for re-galvanizing welds in galvanized steel, complying the Military Specifications MIL-P-21035 (Ships).

2.2 FABRICATION, GENERAL:

A. Workmanship:

1. Use materials of size and thickness indicated or, if not indicated, as required to produce strength and durability in finished product for use intended. Work to dimensions shown

or accepted on shop drawings, using proven details of fabrication and support. Use type of materials shown or specified for various components of work.

2. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise shown. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

3. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.

4. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type shown or, if not shown, Phillips flat-head (countersunk) screws or bolts.

5. Provide for Anchorage of type shown, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

6. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware and similar items.

B. Galvanizing:

1. Provide a zinc coating for those items shown or specified to be galvanized, as follows:
   a. ASTM A 153 for galvanizing iron and steel hardware.
   b. ASTM A 123 for galvanizing rolled, pressed and forged steel shapes, plates, bars and strip 1/8" thick and heavier.
   c. ASTM A 386 for galvanizing assembled steel products.

2. Fabricate joints which will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.

C. Shop Painting:

1. Shop paint miscellaneous metal work, except members or portions of members to be embedded in concrete or masonry, surfaces and edges to be field welded, and galvanized surfaces, unless otherwise indicated.

2. Remove scale, rust and other deleterious materials before applying shop coat. Clean off heavy rust and loose mills scale in accordance with SSPC SP-2 "Hand Tool Cleaning", or SSPC SP-3 "Power Tool Cleaning", or SSPC SP-7 "Brush-Off Blast Cleaning".

3. Remove oil, grease and similar contaminants in accordance with SSC SP-1 "Solvent Cleaning".

4. Immediately after surface preparation, brush or spray on primer in accordance with manufacturer's instructions, and at a rate to provide uniform dry film thickness of 2.0 mils for each coat. Use painting methods which will result in full coverage of joints, corners, edges and exposed surfaces.

5. Apply one shop coat to fabricated metal items, except apply two coats of paint to surfaces inaccessible after assembly or erection. Change color of second coat to distinguish it from the first.

2.3 MISCELLANEOUS METAL FABRICATIONS:

A. Rough Hardware:

1. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 sections.

2. Fabricate items to sizes, shapes and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

B. Ladders:

1. Fabricate ladders for the locations shown, with dimensions, spacings, details and anchorages as indicated. Comply with the requirements of ANSI A14.3, except as otherwise indicated.

2. Unless otherwise shown, provide ½" x 2'1/2" continuous structural steel flat bar side rails with eased edges, spaced 18" apart.

3. Provide ¾" diameter solid structural steel bar rungs, spaced maximum 12" o.c. (equally spaced).

4. Fit rungs in centerline of side rails, plug weld and grind smooth on outer rail faces.

5. Support each ladder at top and bottom at intermediate points spaced not more than 5'0" o.c. Use welded or bolted steel brackets, designed for adequate support and anchorage, and to hold the ladder clear of the wall surface with a minimum of 7" clearance from wall to centerline of rungs. Extend rails 42" above top rung, or as shown on drawings, and return rails to wall or structure unless other secure handholds are provided. If the adjacent structure does not exceed above the top rung, goose-neck the extended rails back to the structure to provide secure ladder access.

6. Provide non-slip surface on the top of each rung, either by coating the run with aluminum oxide granules set in epoxy resin adhesive, or by using a type of manufactured rung which is filled with aluminum oxide grout.

C. Loose Bearing and Leveling Plates:

1. Provide loose bearing and leveling plates for steel items bearing masonry or concrete construction, made flat, free from warps or twists, and of required thickness in bearing area. Drill plates to receive anchor bolts and for grouting as required.

D. Miscellaneous Framing and Supports:

1. Provide miscellaneous steel framing and supports which are not a part of structural steel framework, as required to complete work.

2. Fabricate miscellaneous units to sizes, shapes and profiles shown or, if not shown, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise shown, fabricate from structural steel shapes and plates and steel bars, of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.

3. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.

4. Except as otherwise shown, space anchors 24" o.c., and provide minimum anchor units of 1-1/4" x 1/4" x 8" steel straps.

E. Miscellaneous Steel Trim:

1. Provide shapes and sizes for profiles shown. Except as otherwise indicated, fabricate units from structural steel shapes and plates and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings and anchorages as required for coordination of assembly and installation with other work.

2. Galvanize exterior miscellaneous steel trim.

F. Exterior Wall Alignment Angles:

1. Provide structural steel shelf angles of sizes shown for welded attachment to embedded steel members concrete framing. Provide 1-1/2” diameter holes for welding, spaced not more than 6” from ends and not more than 24” o.c., unless otherwise indicated.

G. Steel Grating:

1. Provide bar gratings using bars of type, material, sizes, spacing, and construction as herein specified. Comply with applicable requirements of NAAMM “Metal Bar Grating Manual”. Work to dimensions shown as accepted on shop drawings, using proven details of fabrication or support.
   a. Type: 2-1/2 x 3/16 aluminum
   b. Ohio Grating Inc. Number 11-SG-4.

2. Provide removable grating sections in 4’ sections with end-banding bars for each panel, four saddle clip anchors designed to fit over two bearing bars, and four stud bolts with washers and nuts, unless otherwise indicated.

3. Notching of bearing bars as supports to maintain elevations will not be permitted.

H. Steel Safety Grating:

1. Provide Grip Strut safety grating constructed of high strength lightweight galvanized steel grating designed for safety underfoot. Diamond-shaped punched to provide slip resistance in all directions. 12 Ga.

I. Steel Pipe Railings and Handrails:

1. Brackets, Flanges, Fittings and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings and anchors for interconnection of pipe and attachment of railings and handrails to other work. Furnish inserts and other Anchorage devices for connecting railings and handrails to concrete or masonry work.

2. For railing posts set in concrete provide sleeves of galvanized steel pipe not less than 6" long and with an inside diameter not less than 1/2" greater than the outside diameter of pipe. Provide steel plate closure welded to bottom of sleeve and of width and length not less than 1" greater than outside diameter of sleeve.

J. Steel Framed Stairs:

1. General: Construct stairs to conform to sizes and arrangements shown; joint pieces together by welding unless otherwise indicated. Provide complete stair assemblies including metal framing, hangers, columns, railings, newels, balusters, struts, clips, brackets, bearing plates and other components necessary for the support of stairs and platforms and as required to anchor and contain the stairs on the supporting structure.

2. Stair Framing: Fabricate stringers of structural steel channels, or plates, or a combination thereof, as shown. Provide closures for exposed ends of stringers. Construction platforms of structural steel channel headers and miscellaneous framing members as shown. Bolt or weld headers to strings and newels and framing members to strings and headers; fabricate and join so that bolts, if used, do not appear on finish surfaces.

3. Where masonry walls support steel stairs, provide temporary supporting struts designed for erection of steel stair components before installation of masonry.

4. Metal Plan Risers, Sub-treads, and Sub-platforms: Shape metal plans for risers and sub-treads to conform to configuration shown. Provide thickness of structural steel sheet for metal plans indicated but not less than that required to support total design loading.

5. Form metal pans of cold-rolled carbon steel sheet unless otherwise indicated.

6. Directly weld risers and sub-treads to stringers, located wields on side of metal pans to be concealed by concrete fill.

7. Provide sub-platforms for configuration and construction indicated, or if not indicated, of same metal as risers and sub-treads and in thickness required to support design loading. Attached sub-platform to platform framing members with wields.

8. Stair Railings and Handrails: Comply with applicable requirements specified elsewhere in this section for steel pip railings and handrails, and as follows:

9. Connect railing posts to stair framing by direct welding, unless otherwise indicated.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.2 INSTALLATION:

A. General:

1. Fastening to In-Place Construction: Provide Anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required.

2. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry or similar construction.

3. Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch-up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

4. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of wields made, and methods used in correcting welding work.

B. Setting Loose Plates:

1. Clean concrete and masonry bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

2. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut-off flush with the edge of the bearing plate before packing with grout. Use metallic non-shrink grout in concealed locations where not exposed to moisture; use non-metallic non-shrink grout in exposed locations, unless otherwise indicated.

3. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

C. Gratings:

1. Secure removable units to supporting members or framework with galvanized machine screws or manufacturer’s standard saddle or clip units.

D. Steel Pipe Railings and Handrails:

1. Adjust railings prior to anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated, or if not indicated, as required by design loadings. Plumb posts in each direction. Secure posts and railing ends to building construction as follows.
   a. Anchor posts in concrete by means of pipe sleeves preset and anchored into concrete. After posts have been inserted into sleeves, fill annular space between post and sleeve solid with non-shrink, non-metallic grout, mixed and placed to comply with grout manufacturer's directions.
   b. Leave Anchorage joint exposed; wipe off excess grout and leave 1/8" build-up, sloped away from post. For installation exposed on exterior or to flow of water, seal grout to comply with grout manufacturer's directions.
   c. Anchor posts to steel by means of welding all around and ground smooth.
   d. Anchor rail ends into concrete and masonry with steel round flanges welded to rail ends and anchored into wall construction with lead expansion shields and bolts.
   e. Anchor rail ends to steel with steel oval or round flanges welded to rail ends and bolted to structural steel members, unless otherwise indicated.

2. Provide removable railing sections as indicated. Furnish slip-fit metal socket and sleeve for casting into concrete. Accurately locate sleeves to match post spacing.

3. Secure handrails to wall with wall brackets and end fittings. Provide bracket with not less than 1-1/2" clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required for design loading. Secure wall brackets and wall return fittings to building construction as follows:
   a. Use type of bracket with pre-drilled hole for exposed bolt Anchorage.
   b. For concrete and solid masonry Anchorage, use drilled-in expansion shield and either concealed hanger bolt or exposed lag bolt, as applicable.
   c. For hollow masonry Anchorage, use toggle bolts having square heads.
   d. For stud partitions use lag bolts set into wood backing between studs. Coordinate with stud installation for accurate location of backing members.

3.3 ADJUST AND CLEAN:

A. Touch-Up Painting: Immediately after erection, clean field wields, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. For galvanized surfaces: Clean field wields, bolted connections and abraded areas and apply two coats of galvanizing repair paint.

END OF SECTION

SECTION 06 16 43 – GYPSUM SHEATHING

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes: Fiberglass-mat faced, moisture resistant gypsum sheathing.

1.2 RELATED SECTIONS

A. Section 05 40 00 - Cold-Formed Structural Wall Framing

B. Section 06 10 00 - Rough Carpentry

1.3 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 E72 Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
7. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.

1.4 SUBMITTALS

A. Product Data: Manufacturer’s specifications and installation instructions for each product specified.

1.5 WARRANTY

A. Provide products that offer twelve months of coverage against in-place exposure damage (delamination, deterioration and decay).

1.6 MANUFACTURER’S WARRANTY

A. Five years against manufacturing defects.

B. Ten years against manufacturing defects when used as a substrate in architecturally specified EIFS.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Georgia-Pacific Gypsum LLC:

1. Fiberglass-Mat Faced Gypsum Sheathing: DensGlass Gold.

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: 1900 pounds per M square feet.
5. Edges: Square.
6. Surfacing: Coated 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 1/4 inch.
10. Permeance (ASTM E96): 23 perms.
11. R-Value (ASTM C518): 0.56.
12. Acceptable Products:
    a. 5/8 inch Dens Glass Gold, Georgia-Pacific Gypsum.

2.3 ACCESSORIES

A. Screws: ASTM C1002, corrosion resistant treated.

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.

3.2 INSTALLATION

A. General: In accordance with ASTM C1280 and the manufacturer's recommendations.

B. Manufacturer's Recommendations: Current "Product Catalog", Georgia-Pacific Gypsum.

3.3 PROTECTION

A. Protect gypsum board installations from damage and deterioration until date of Substantial Completion.

END OF SECTION

SECTION 06 20 00 - FINISH CARPENTRY

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. SECTION 12 36 61 - SOLID SURFACE

1.2 DESCRIPTION OF WORK:

A. Extent of each type of architectural woodwork is indicated on drawings and in schedules. Types of architectural woodwork include the following:

1. Architectural cabinets including:
   a. Architectural wood cabinets laminate clad.

B. Wood doors are specified within Division 8.

1.3 QUALITY ASSURANCE:

A. AWI Quality Standard: Comply with applicable requirements of "Architectural Woodwork Quality Standards" published by the Architectural Woodwork Institute (AWI), except as otherwise indicated.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's product data for each product and process specified as work of this section and incorporated into items of architectural woodwork during fabrication, finishing, and installation.

B. Quality Certification: Submit woodwork Manufacturer's (Fabricator's) certification, stating that fabricated woodwork complies with quality grades and other requirements indicated.

C. Shop Drawings: Submit shop drawings showing location of each item, dimensioned plans and elevations, large scale details, attachment devices and other components.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Protect woodwork during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

B. Do not deliver woodwork, until painting, wet work, grinding and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, woodwork must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.

1.6 PROJECT CONDITIONS:

A. Conditioning: Woodwork Manufacturer and Installer shall advise Contractor of temperature and humidity requirements for woodwork installation and storage areas. Do not install woodwork until required temperature and relative humidity have been stabilized and will be maintained in installation areas. Woodwork shall not be delivered to job site until Heating and Air Conditioning Systems have been in operation 24 hours per day for seven (7) days.

B. Maintain temperature and humidity in installation area as required to maintain moisture content of installed woodwork within a 1.0 percent tolerance of optimum moisture content, from date of installation through remainder of construction period. Require Woodwork Manufacturer to establish optimum moisture content and required temperature and humidity conditions.

C. Grain Matching: Grain and color of surface veneers shall be similar in appearance and acceptable to the Architect.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide high pressure decorative laminates of one of the following:

1. Formica Corp.

2. Nevamar Corp.

3. Wilsonart LLC

2.2 FABRICATION, GENERAL:

A. Wood Moisture Content: Comply with requirements of referenced quality standard for moisture content of lumber at time of fabrication and for relative humidity conditions in the installation areas.

B. Fabricate woodwork to dimensions, profiles, and details indicated with openings and mortises precut, where possible, to receive hardware and other items and work.

C. Ease edges to a 1/16" radius, for corners of cabinets and edges of solid wood (lumber) members less than 1" in nominal thickness, 1/8" radius for edges of rails and similar members over 1" in nominal thickness.

D. Complete fabrication, assembly, finishing, hardware application, and other work before shipment to project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

E. Pre-Cut Openings: Fabricate architectural woodwork with pre-cut openings, where possible, to receive hardware, appliances, plumbing fixtures, electrical work and similar items. Locate openings accurately and use templates or roughing-in diagrams for proper size and shape. Smooth edges of cutoffs and, where located in countertops and similar exposures seal edges of cutouts with a water-resistant coating.

F. Measurements: Before proceeding with fabrication of woodwork required to be fitted to other construction, obtain field measurements and verify dimensions and shop drawing details as required for accurate fit.

2.3 STANDING AND RUNNING TRIM, AND RAILS:

A. Quality Standard: Comply with AWI Section 300.

B. Rout or groove backs of flat trim members, kerf backs of other wide flat members, except for members with ends exposed in finished work.

C. Assemble casings in plant except where limitations of access to place of installation require field assembly.

2.4 ARCHITECTURAL CABINETS, LAMINATE CLAD:

A. Quality Standard: Comply with AWI Section 400.

B. Laminate Clad Cabinets: Comply with the following requirements:

1. Grade: Custom

C. Type of Cabinet Construction: Flush overlay.

D. CABINET AND TOP COMPONENTS:

1. Cabinet Body: ¾” white melamine with 1/32” High Pressure Laminate on exposed faces and standard 1/32” PVC tape on exposed edges.
2. Cabinet Doors: ¾” Particle Core Plywood with 1/32” High Pressure Laminate on exposed faces and white cabinet liner on semi-exposed faces and standard 1/32” PVC tape on exposed edges.
3. Cabinet Drawer Fronts: ¾” Particle Core Plywood with 1/32” High Pressure Laminate on exposed faces and white cabinet liner on semi-exposed faces and standard 1/32” PVC tape on exposed edges
4. Cabinet Shelving: ¾” white melamine with standard 1/32” PVC tape on 2 semi-exposed edges
5. Cabinet Backs: ¼” white melamine.

6. Drawer Boxes: ½” white melamine sides, back and fronts with ¼” white melamine bottoms.
7. Dividers: ¼” Hardboard tempered 2 faces (Dark brown in color - sealed by painting sub-contractor.
8. Counter tops: Solid surface see SECTION 12 36 61
9. Splashes: ¾” exterior plywood at sink areas and P.C. plywood with 1/16” hpl on exposed face and edges, backing sheet on concealed face.

2.5 CABINET HARDWARE AND ACCESSORY MATERIALS:

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets for the following hardware types:

1. ADJUSTABLE SHELF STANDARDS
   a. Anti – Tip White for ¾" and 1" thick shelves.

2. DOOR AND DRAWER PULLS
   a. Stanley 4484 or equal US26D

3. DOOR HINGES
   a. Hafele 3D, 170 Degree Swing No. 335.06.606 with catch and mounting plate.

4. DRAWER GUIDES
   a. K and V No. 1284 Length to accommodate cabinets. (White)

5. GROMMETS
   a. Doug Mockett, color & Sill as selected.

6. LOCKS
   a. Menars - U9945
      1) Finish: Stainless Steel

7. COUNTER TOP SUPPORT BRACKETS
   a. Rakks - 6063-T6 extruded aluminum brackets.
      1) EH-1212 for counters tops up to 18” deep
      2) EH-1818 for counters tops up to 25” deep
      3) EH-1824 for counters tops up to 30” deep

2.6 FASTENERS AND ANCHORS:

A. Screws: Select material, type, size and finish required for each use. Comply with FS FF-S0111 for applicable requirements.

B. Nails: Select material, type, size and finish required for each use. Comply with FS FF-N-105 for applicable requirements.

C. Provide stainless steel or aluminum nails for exposed exterior woodwork which is to receive transparent finish (if any). Provide any type of non-corrosive nail for other exterior woodwork.

D. Anchors: Select material, type, size and finish required by each substrate for secure Anchorage. Provide non-ferrous metal or hot- dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion-resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts and anchors, as required, to be set into concrete or masonry work for subsequent woodwork Anchorage.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Condition woodwork to average prevailing humidity conditions in installation areas prior to installing.

B. Deliver concrete inserts and similar anchoring devices to be built into substrates, well in advance of time substrates are to be built.

C. Prior to installation of architectural woodwork, examine shop fabricated work for completion, and complete work as required, including back priming and removal of packing.

3.2 INSTALLATION:

A. Install woodwork plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level (including tops); and with no variations in flushness of adjoining surfaces.

B. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.

C. Anchor woodwork to anchors or blocking built-in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Except where prefinished matching fasteners heads are required, use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork, and matching final finish where transparent finish is indicated.

D. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns, miter at corners and comply with referenced Quality Standards for Joinery.

E. Cabinets: Install without distortion so that doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated. Maintain veneer sequence matching (if any) of cabinet with transparent finish.

F. Tops: Anchor securely to base units and other support systems as indicated.

G. Wood Storage Shelving: Complete the assembly of units and install in the areas indicated, including hardware and accessories as indicated.

3.3 ADJUSTMENT, CLEANING, FINISHING, AND PROTECTION:

A. Repair damaged and defective woodwork where possible to eliminate defects functionally and visually; where not possible to repair replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate and adjust hardware.

C. Clean woodwork on exposed and semi-exposed surfaces. Touch-up finishes to restore damaged or soiled areas.

D. Refer to the Division-9 sections for final finishing of installed architectural woodwork.

E. Provide final protection and maintain conditions, in a manner acceptable to Fabricator and Installer, which ensures architectural woodwork being without damage or deterioration at time of substantial completion.

END OF SECTION

SECTION 07 24 19 - FIBERGLASS PIPE INSULATION

PART 1.00 - GENERAL

1.01 SCOPE

A. The work covered by this specification consists of furnishing all labor, equipment, materials and accessories, and performing all operations required, for the correct fabrication and installation of thermal insulation applied to commercial piping systems, in accordance with applicable project specifications and drawings.

1.02 REFERENCES

A. Thermal insulation materials shall meet the property requirements of one or more of the following specifications as applicable to the specific product or end use:

1. American Society for Testing of Materials Specifications:

a. ASTM C 547, "Standard Specification for Mineral Fiber Pipe Insulation"
b. ASTM C 585, "Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System)"
c. ASTM C 1136, "Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation"

1.03 DEFINITIONS

A. The term "mineral fiber" as defined by the above specifications includes fibers manufactured of glass, rock, or slag processed from a molten state, with or without binder.

1.04 SYSTEM PERFORMANCE

A. Insulation materials furnished should meet the minimum thickness requirements of National Voluntary Consensus Standard 90.1 "Energy Efficient Design of New Buildings," of the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE). However, if other factors such as condensation control or personnel protection are to be considered, the selection of the thickness of insulation should satisfy the controlling factor.

B. Insulation materials furnished and installed hereunder shall meet the fire hazard requirements of applicable building codes when tested in composite form per one of the following nominally equivalent test methods:

1. American Society for Testing of Materials	ASTM E 84-14
2. Underwriters' Laboratories, Inc.	UL 723, CAN/ULC-S102-M88
3. National Fire Protection Association	NFPA 255

1.05 QUALITY ASSURANCE

A. Insulation materials and accessories furnished and installed hereunder shall, where required, be accompanied by manufacturers' current submittal or data sheets showing compliance with applicable specifications listed in Section 1.02 above.

B. Insulation materials, including all weather and vapor barrier materials, closures, hangers, supports, fitting covers, and other accessories, shall be furnished and installed in strict accordance with project drawings, plans, and specifications.

C. Insulation materials and accessories shall be installed in a workmanlike manner by skilled and experienced workers who are regularly engaged in commercial insulation work.

1.06 DELIVERY AND STORAGE OF MATERIALS

A. All of the insulation materials and accessories covered by this specification shall be delivered to the job site and stored in a safe, dry place with appropriate labels and/or other product identification.

B. The contractor shall use whatever means are necessary to protect the insulation materials and accessories before, during, and after installation. No insulation material shall be installed that has become damaged in any way. The contractor shall also use all means necessary to protect work and materials installed by other trades.

C. If any insulation material has become wet because of transit or job site exposure to moisture or water, the contractor shall not install such material, and shall remove it from the job site.

PART 2.00 - PRODUCTS

2.01 PIPE INSULATION

A. Molded pipe insulation shall be manufactured to meet ASTM C 585 for sizes required in the particular system. It shall be of a type suitable for installation on piping systems as defined in section 1.01 SCOPE above.

Molded fibrous glass pipe insulation shall comply with the requirements of ASTM C 547. The following types shall be used:

1. For piping less than 10” (250 mm) diameter operating at temperatures up to +850F (454C) the following may be used.

    a. **Fiberglas™ SSL II® Pipe Insulation**, Owens Corning Fiberglas Pipe Insulation (or approved equal) with factory applied all-service jacket (ASJ) and two-component adhesive closure system, rated for a maximum service temperature of 850F (454C). For large pipe sizes where SSL-II is not available, the single adhesive SSL closure may be substituted. Circumferential joints shall be sealed with butt strips that are compatible with ASJ facing. Stapling is not required to complete the closure. Sufficient thickness of insulation shall be used to maintain the outer surface temperature of the operating system below +150F (65C). Manufacturer's data regarding thickness constraints in relation to operating temperature shall be followed.

    When multiple layers are required, all inner layer(s) shall be No Wrap.

    The ASJ shall be protected with either a mastic coating or a suitable vapor retarding outer jacket. Mastic pipe section ends at every fourth pipe section joint and at each fitting to provide isolation of water incursion.

2. For piping equal to or larger than 10" (250 mm) diameter operating at temperatures up to +650F (343C) and where moderate abuse resistance is required, the following may be installed:

    a. **Owens Corning Fiberglas™ Pipe and Tank Insulation (or approved equal)**, fiber glass insulation, maximum operating temperature of 650F (343C), end-grain factory-adhered to an ASJ all-service jacket. All joints shall be stapled then (1) sealed with mastic or (2) closed with 3" (75 mm) pressure-sensitive tape matching the ASJ jacket.

B. Fittings and valves shall be insulated with pre-formed fiberglass fittings, fabricated sections of Owens Corning Fiberglas Pipe Insulation (or approved equal), Owens Corning Pipe and Tank Insulation (or approved equal), Owens Corning Fiberglas Flexwrap™ Insulation (or approved equal), Owens Corning TIW blanket insulation (or approved equal), or insulating cement. Thickness shall be equal to adjacent pipe insulation. Finish shall be with pre-formed PVC fitting covers or as otherwise specified on contract drawings.

Flanges, couplings and valve bonnets shall be covered with an oversized pipe insulation section sized to provide the same insulation thickness as on the main pipe section. An oversized insulation section shall be used to form a collar between the two insulation sections with low-density blanket insulation being used to fill gaps. Jacketing shall match that used on straight pipe sections. Rough cut ends shall be coated with suitable

weather or vapor resistant mastic as dictated by the system location and service. All valve stems shall be sealed with caulking to allow free movement of the stem but provide a seal against moisture incursion. Valve handle extensions are recommended.

C. Piping located outdoors and exposed to the weather shall be insulated as indicated above except the thickness shall be determined according to the worst weather extremes expected. The insulation shall then be protected with one of the following weatherproof finishes as indicated on contract drawings:

1. Metal jacketing shall be 0.016" (0.4 mm) minimum aluminum or stainless steel with moisture barrier, secured in accordance with the jacket manufacturer's recommendations. Joints shall be applied so they will shed water and shall be sealed completely.

2. Fittings shall be insulated as prescribed above, jacketed with preformed fitting covers matching outer jacketing used on straight pipe sections, with all joints weather sealed.

D. All piping shall be supported in such a manner that neither the insulation nor the vapor/weather barrier is compromised by the hanger or the effects of the hanger. In all cases, hanger spacing shall be such that the circumferential joint may be made outside the hanger.

1. Piping systems 3" (75 mm) in diameter or less, may be supported by placing saddles of the proper length and spacing under the insulation as per the manufacturer’s recommendation.

2. Where pipe shoes and roller supports are required, insulation shall be inserted in the pipe shoe to minimize pipe heat loss. Where possible, the pipe shoe shall be sized to be flush with the outer pipe insulation diameter.

3. Thermal expansion and contraction of the piping and insulation system can generally be taken care of by utilizing double layers of insulation and staggering both longitudinal and circumferential joints. Where long runs are encountered, expansion joints may be required.

4. On vertical runs, insulation support rings shall be used as per the manufacturer’s recommendations.

2.02 ACCESSORY MATERIALS

A. Accessory materials installed as part of insulation work under his section shall include (but not be limited to):

1. Closure Materials - Butt strips, bands, wires, staples, mastics, adhesives; pressure-sensitive tapes. Mold resistant mastics are recommended for chilled water applications.

2. Field-applied jacketing materials - Sheet metal, plastic, canvas, fiber glass cloth, insulating cement, PVC fitting covers

3. Support Materials - Hanger straps, hanger rods, saddles, support rings, high density inserts.

B. All accessory materials shall be installed in accordance with project drawings and specifications, manufacturer's instructions, and/or in conformance with the current edition of the Midwest Insulation Contractors Association (MICA) "Commercial & Industrial Insulation Standards."

PART 3.00 - EXECUTION

3.01 SITE INSPECTION

A. Before starting work under this section, the engineer shall carefully inspect the site and installed work and verify that such work is complete to the point where installation of materials and accessories under this section can begin.

B. The contractor shall verify that all materials and accessories can be installed in accordance with project drawings and specifications and material manufacturers' recommendations.

C. The contractor shall verify, by inspecting product labeling, submittal data, and/or certifications which may accompany the shipments, that all materials and accessories to be installed on the project comply with applicable specifications and standards and meet specified thermal and physical properties.

3.02 PREPARATION

A. Ensure that all pipe and fitting surfaces over which insulation is to be installed are clean and dry.

B. Ensure that insulation is clean, dry, and in good mechanical condition with all factory-applied vapor or weather barriers intact and undamaged. Wet, dirty, or damaged insulation shall not be acceptable for installation.

C. Ensure that pressure testing of piping and fittings has been completed prior to installing insulation.

3.03 INSTALLATION

A. General

1. Install all insulation materials and accessories in accordance with manufacturer's published instructions and recognized industry practices to ensure that it will serve its intended purpose.

2. Install insulation on piping subsequent to installation of heat tracing, painting, and acceptance tests.

3. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other. Butt insulation joints firmly to ensure complete, tight fit over all piping surfaces.

4. Maintain the integrity of factory-applied vapor barrier jacketing on all pipe insulation, protecting it against puncture, tears or other damage.

B. Fittings

1. Cover valves, fittings, and similar items in each piping system using one of the following:

   a. Mitered sections of insulation equivalent in thickness and composition to that installed on straight pipe runs.
   b. Insulation cement equal in thickness to the adjoining insulation.

C. Penetrations

1. Extend piping insulation without interruption through walls, floors, and similar piping penetrations, except where otherwise specified.

D. Joints

1. Seal jacketing according to type being used. Seal self-sealing laps by firmly rubbing down surface of tape and flap.

2. All pipe insulation ends shall be tapered and sealed, regardless of service.

E. Vertical Piping

1. All insulated, exposed vertical piping exposed to the outdoors shall be additionally jacketed with 0.016" thick (0.4 mm) (minimum) aluminum.

3.04 FIELD QUALITY ASSURANCE

A. Upon completion of all insulation work covered by this specification, visually inspect the work and verify that it has been correctly installed. This may be done while work is in progress, to assure compliance with requirements herein to cover and protect insulation materials during installation.

3.05 PROTECTION

A. Replace damaged insulation, which cannot be satisfactorily repaired, including insulation with vapor barrier damage and moisture-saturated insulation.

B. The insulation contractor shall advise the general and/or the mechanical contractor as to requirements for protection of the insulation work during the remainder of the construction period, to avoid damage and deterioration of the finished insulation work.

3.06 SAFETY PRECAUTIONS

A. Insulation contractor's employees shall be properly protected during installation of all insulation. Protection shall include proper attire when handling and applying insulation materials, and shall include (but not be limited to) disposable dust respirators, gloves, hard hats, and eye protection.

B. The insulation contractor shall conduct all job site operations in compliance with applicable provisions of the Occupational Safety and Health Act, as well as with all state and/or local safety and health codes and regulations that may apply to the work.

4.01 PAYMENT

A. Payment for all pipe insulating shall be included in the Lump Sum pay item.

END OF SECTION 01 24 19

SECTION 07 26 16 - UNDER-SLAB VAPOR BARRIER

PART 1 – GENERAL

1.1 SUMMARY

A. Products supplied under this section:

1. Vapor barrier, seam tape, and mastic for installation under concrete slabs.

B. Related sections:

1. Section 03 30 00 Cast in Place Concrete

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM E 1745-09 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
2. ASTM E 154-99 (2005) Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
3. ASTM E 96-05 Standard Test Methods for Water Vapor Transmission of Materials.
4. ASTM F 1249-06 Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.
5. ASTM E 1643-09 Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

B. American Concrete Institute (ACI):

1. ACI 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.

1.3 SUBMITTALS

A. Quality control/assurance:

1. Summary of test results as per paragraph 8.3 of ASTM E 1745.
2. Manufacturer’s samples, literature.
3. Manufacturer’s installation instructions for placement, seaming and penetration repair instructions.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Vapor barrier must have all of the following qualities:

1. Permeance of less than 0.01 Perms [grains/(ft2 · hr · inHg)] as tested in accordance with ASTM E 1745 Section 7.
2. Other performance criteria:
   a. Strength: ASTM E 1745 Class A.
   b. Thickness: 15 mils minimum

B. Vapor barrier products:

1. Vapor barriers shall be equal to Stego Wrap Vapor Barrier or prior approved equal.
2. Basis of Design: Stego Wrap Vapor Barrier (15-mil) by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.

2.2 ACCESSORIES

A. Seam tape:

1. Stego Tape by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.

B. Vapor-proofing mastic:

1. Stego Mastic by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.

PART 3 – EXECUTION

3.1 PREPARATION

A. Ensure that base material is approved by Architect and is level and compact material as specified elsewhere.

3.2 INSTALLATION

A. Install vapor barrier in accordance with manufacturer's instructions and ASTM E 1643.

1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement.
2. Lap vapor barrier over footings and/or seal to foundation walls.
3. Overlap joints 6 inches and seal with manufacturer's tape.
4. Seal all penetrations (including pipes) per manufacturer's instructions.
5. No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities.
6. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all sides with tape.

END OF SECTION

SECTION 07 28 00 - FLUID APPLIED MEMBRANE AIR AND WATER BARRIERS

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 vapor-permeable, fluid-applied air and water barriers.

B. Related Requirements:

1. Section 04 20 00 "Brick and Concrete Masonry Units" for masonry ties and flashing installation."
2. Section 06 16 00 "Sheathing" for wall sheathings and wall sheathing joint-and-penetration treatments."
3. Section 07 21 00 "Thermal Insulation" for installation of exterior insulation."
4. Section 09 24 25 "Cement Plastering" for installation of stucco."

1.3 DEFINITIONS

A. Weather Barrier: A combination of materials and accessories that do the following:

1. Prevent the accumulation of water as a water-resistive barrier.
2. Minimize the air leakage into or out of the building envelope as a continuous air barrier.
3. Provide sufficient water vapor transmission to enable drying as a vapor permeable membrane.

B. Water-Resistive Barrier: A combination of materials and accessories that prevent the accumulation of water within the wall assembly in accordance with IBC Section 1403.2.

a. Primary Layer: Water-resistive barrier (fluid-applied) installed closest to building interior with all flashings and terminations integrated to this layer.
b. Secondary Layer: Outermost part of a double-layer system and where drainage is required behind claddings such as stucco, adhered masonry, and installation methods utilizing a lath.

C. Continuous Air Barrier: The combination of interconnected materials, assemblies, and sealed joints and components of the building envelope that minimize air leakage into or out of building envelope in accordance with ASHRAE 90.1 Section 5.4.3.1.

D. Vapor-Permeable Membrane: The property of having a water-vapor permeance rating of 10 perms or greater, when tested in accordance with the desiccant method using Procedure A of ASTM E 96 in accordance with definition in International Building Code. Vapor-permeable material permits passage of moisture vapor through vapor diffusion.

E. Vapor Diffusion: A slow movement of individual water vapor molecules from regions of higher to lower water vapor concentration (higher to lower vapor pressure).

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at **Project site**.

1. Meet with Owner, Architect, Manufacturer's Certified Installer, **weather barrier manufacturer's designated field representative**, and installers of work that interfaces with or affects weather barrier.
2. Review methods and procedures related to weather barrier installation, including manufacturer's written instructions.
3. Review and finalize construction, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine substrate conditions and finishes for compliance with requirements.
5. Review flashings, special weather barrier details, weather barrier penetrations, and condition of other construction that affects weather barrier.
6. Review weather barrier manufacturer's Project registration and observation process.
7. Review Construction Indoor Air Quality Management Plan "Moisture Protection for Absorbent Materials."
8. Review temporary protection requirements for weather barrier during and after installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For weather barrier, include data on air and water-vapor permeance based on testing in accordance with referenced standards.

B. Sustainable Design Submittals:

1. Test Reports: Envelope testing and verification of the following:

a. Water-Spray Test.
b. Air Infiltration Test.
c. Water Penetration Test.

2. Product Data: Including the following information:

a. Provide Health Product Declarations (HPDs).
b. Provide Environmental Product Declarations (EPDs).

c. SDS (formerly MSDS), third-party certifications, or product technical data confirming systems that meet or exceed emissions guidelines for volatile organic compounds (VOCs) and hazardous air pollutants (HAPs), as follows:

1) Commercial weather barrier complies with California Department of Public Health (CDPH) Standard.
2) Adhesives and sealants wet-applied on-site that meet/exceed VOC content requirements for wet applied products comply with SCAQMD Rule 1168.
3) Flashing systems comply with SCAQMD Rule 1168 on VOC limits.

C. Preconstruction Laboratory Mockup Testing Submittals:

1. **Engage** in a third-party testing program: Develop[**ed**] specifically for Project.
2. Test Reports: Prepared by a qualified preconstruction testing agency for each mockup test.
3. Record Drawings: As-built drawings of preconstruction laboratory mockups showing changes made during preconstruction laboratory mockup testing.

D. Shop Drawings:

1. Show details of weather barrier at terminations, openings, and penetrations.
2. Show details of weather barrier applications.

1.6 INFORMATIONAL SUBMITTALS

A. Manufacturer's Instructions: For installation of each product specified.

B. Qualification Data: For Installer and field-testing agency.

C. Sample Warranty: For manufacturer's warranty.

D. Reports: Field test and inspection reports.

E. Installer’s weather barrier manufacturer training certificate.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is certified by weather barrier system manufacturer to install manufacturer’s product.

B. Laboratory Mockup Testing Agency Qualifications: Qualified in accordance with ASTM E 699 for testing indicated and accredited by IAS or ILAC Mutual Recognition.

C. Mockups: Build mockups to set quality standards for materials and execution.

1. Build integrated mockups of exterior wall assembly, incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.

a. Include building corner condition, foundation wall intersection, fenestration and wall surface.
b. If Architect determines that mockups do not comply with requirements, reconstruct mockups and apply weather barrier until mockups are approved.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Preconstruction Laboratory Mockups:

1. Preconstruction Testing Service: [**Owner will engage**] [**Engage**] a qualified testing agency to perform testing on preconstruction laboratory mockups.
2. Build preconstruction laboratory mockups at testing agency facility; use personnel, products, and methods of construction that will be used at Project site.

a. Size and Configuration: As indicated on Drawings.
b. Notify Architect in advance of the dates and times when preconstruction laboratory mockups will be constructed and tested.

3. Preconstruction Laboratory Mockup Testing Program: Test preconstruction laboratory mockups in accordance with requirements in "Performance Requirements" Article in Part 2. Perform the following tests on base wall to conform to ASTM E2357 Section A2.2.1.2 Specimen 2 for penetrated assemblies.

a. ASTM E 331 Test Parameters: 2.86 psf pressure for 15-minute duration.
b. AAMA 501.1 Test Parameters: 2.86 psf pressure for 15-minute duration.
c. ASTM E 330 Test Parameters: 2.86 psf pressure for 10-second duration.
d. AAMA 501.5 Test Parameters:

1) Cycle Temperature Range: 0 to 180 deg F
2) Number of Cycles: 3
3) Repeat test ASTM E 330 after thermal cycling.

e. Test Results: Laboratory mockup passes if the following results are achieved by the above tests individually:

1) No water penetration.
2) No structural failure.
3) No expansion or contraction failures.

E. Manufacturer's Field Service: Register Project with weather barrier manufacturer prior to installation of weather barrier and comply with weather barrier manufacturer's Project Registration and Observation process.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Remove and replace liquid materials that cannot be applied within their stated shelf life.

B. Protect stored materials from direct sunlight.

C. Store in a dry environment between 50 and 80 deg F.

1.9 WARRANTY

A. Manufacturer's Product Warranty: Manufacturer agrees to repair or replace weather barrier product that fails in materials within specified warranty period.

1. Warranty Period: 10 years from date of product purchase.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain weather barrier assembly components, including weather barrier, weather barrier flashing from same manufacturer as weather barrier or manufacturer approved by weather barrier manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Installed weather barrier and accessories shall withstand specified wind pressures, liquid water penetration, and water vapor pressures, without failure due to defective manufacture of products.

B. High-Performance Installations:

1. For installation with one of the following building envelope performance or structural characteristics:

a. Exceeding 65 mph equivalent structural load.
b. Exceeding 15 mph equivalent wind-driven rainwater infiltration.
c. Construction with gypsum or cement-based exterior sheathing.
d. Non-wood based primary structure such as steel, light-gauge steel, masonry, or concrete.

2.3 WEATHER BARRIER

A. Basis-of-Design Product: DuPont de Nemours Inc. DuPont™ Tyvek® Fluid Applied WB+™ or comparable product by one of the following:

1. Carlisle Coatings and Waterproofing.

2. Prosoco.

3. Sto Corp.

B. Fluid-Applied Membrane: ASTM E 2357 passed, Air Barrier Association of America (ABAA) evaluated air barrier assembly, and assembly water resistance in accordance with ASTM E 331; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested in accordance with ASTM E 84; UV stabilized for nine-month exposure; and acceptable to authorities having jurisdiction.

1. Air Permeance, Product: Not more than 0.001 cfm/sq. ft. at 1.57 lbf/sq. ft. tested in accordance with ASTM E 2178.
2. Air Permeance, Assembly: Not more than 0.04 cfm/sq. ft. at 1.57 lbf/sq. ft. tested in accordance with ASTM E 2357 and evaluated by the ABAA.
3. Water Penetration Resistance, Product: Hydrostatic-head resistance greater than 92.5 inches in accordance with AATTC 127.
4. Water Penetration Resistance, Assembly: Assembly wall specimen described in ASTM E 2357 to water resistance in accordance with ASTM E 331 to **2.86 lbf/sq. ft.**
5. Water-Vapor Permeance: Not less than 10 perms in accordance with ASTM E 96/E 96M, Desiccant Method Procedure A or not less than 20 perms in accordance with ASTM E 96/E 96M, Water Method Procedure B.
6. Allowable UV Exposure Time: Not less than nine months, when tested in accordance with ASTM G 155 (accelerated weathering).
7. Flame Propagation Test: Test materials and construction in accordance with NFPA 285.
8. Weather barrier system shall have a VOC content of 30 g/L or less.

2.4 WEATHER BARRIER FLASHING

A. Conformable Weather Barrier Flashing: Composite flashing material composed of micro-creped, polyethylene laminate with a 100 percent butyl-based adhesive layer; AAMA 711 Class A (no primer), Level 3 thermal exposure of 176 deg F for seven days.

1. Basis-of-Design Product: DuPont de Nemours Inc. DuPont™ FlexWrap™ NF or comparable product by one of the following:

   a. Carlisle Coatings and Waterproofing.

   b. Prosoco.

   c. Sto Corp.

2. Conformability: Able to create a seamless sill pan extending up the jambs without cuts, patches, or fasteners.
3. Water Penetration: No leakage at 15 psf in accordance with ASTM E 331.
4. Low Temperature Adhesion: Exceeds minimum value of 1.5 lb./in. at 25 deg F as Class A (without primer use).
5. Adhesion After Water Immersion: Exceeds minimum value of 1.5 lb./in., after AAMA 800, Sections 2.4.1.3.1/2.4.1.4.3 Test B.

B. Strip Flashing: Composite flashing material composed of spunbonded polyethylene laminate with a 100 percent butyl-based adhesive layer; AAMA 711, Class A no primer, Level 3 thermal exposure of 176 deg F for seven days.

1. Basis-of-Design Product: DuPont de Nemours Inc. DuPont™ Tyvek® StraightFlash™or comparable product by one of the following:

    a. Carlisle Coatings and Waterproofing.

    b. Prosoco.

    c. Sto Corp.

2. Water Penetration: No leakage at 15 psf in accordance with ASTM E 331.
3. Low Temperature Adhesion: Exceeds minimum value of 1.5 lb./in. at 25 deg F as Class A without primer use.
4. Adhesion After Water Immersion: Exceeds minimum value of 1.5 lb./in., after AAMA 800, Sections 2.4.1.3.1/2.4.1.4.3 Test B.

C. Primer for Flashings: Synthetic rubber-based product. Spray applied. Strengthen the adhesive bond at low temperature applications between weather products, such as self-adhered Flashing Products, Commercial Building Wraps, and common building sheathing materials.

1. Basis of Design Product: DuPont de Nemours Inc. DuPont™ Adhesive/Primer or comparable product by one of the following.

    a. Carlisle Coatings and Waterproofing.

    b. Prosoco.

    c. Sto Corp.

2. Peel Adhesion Test: Passes ASTM D 3330, Test Method F, for the following:

    a. Peel Angles: 0, 25, 72, and 180 degrees.
    b. Substrates: exterior gypsum sheathing

3. Chemical Compatibility per AAMA 713: Pass.
4. Flame Spread Index per ASTM E 84: 5.
5. Smoke Development Index per ASTM E 84: 0.

2.5 FLUID APPLIED FLASHING AND SEALANT

A. Fluid Applied Flashing: Trowel or brush applied, non-water soluble, single component, silyl terminated polyether technology (STPE), vapor permeable, flashing material.

1. Basis-of-Design Product: DuPont de Nemours Inc. DuPont™ Tyvek® Fluid Applied Flashing and Joint Compound+ or comparable product by one of the following:

    a. Carlisle Coatings and Waterproofing.

    b. Prosoco.

    c. Sto Corp.

2. VOC Content: ASTM C 1250, less than 2 percent by weight and less than 30 g/L.
3. Water Vapor Transmission: ASTM E 96, Method B, greater than 20 perms at 25 mils thick.
4. Minimum Tensile Strength: ASTM D 412, 165 psi.
5. Minimum Elongation at Break: ASTM D 412, 360 percent.

B. Fluid Applied Sealant: ASTM C 920

1. Extension-Recovery/Adhesion per ASTM C 736: 100 percent recovery.
2. Accelerated Weathering/Low Temperature Flexibility per ASTM C 793: Pass.
3. VOC Percentage by Weight per ASTM C 1250: Less than 2 percent.
4. VOC per ASTM C 1250: Less than 30 g/L.

2.6 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that substrates have cured and aged for minimum time recommended in writing by weather barrier manufacturer.
3. Verify that substrates are visibly dry and frost-free.

    a. Fluid-applied weather barrier may be applied to damp surfaces.
    b. Surfaces are considered damp if there is no visible water on the surface, and no transfer of water to the skin when touched.
    c. Apply accessory products only to clean and dry surfaces.

4. Verify that substrates are free of efflorescence and mold.
5. Verify that masonry joints are flush and filled with mortar.
6. Verify that top-of-wall system has been capped or covered to prevent water getting behind the facade and into wall cavity.
7. Verify continuous path for moisture drainage.

    a. Verify that continuous path for drainage is not blocked or disrupted, which results in excess moisture buildup in wall cavity.

8. Verify that surfaces to receive weather barrier are above grade.

B. Verify that substrate and surface conditions are in accordance with commercial weather barrier manufacturer recommendations prior to installation.

1. Verify that rough sill framing for doors and windows slopes downward towards the exterior and is level across width of opening.

C. Verify air and surface temperatures are above 25 deg F with a maximum surface temperature of 140 deg F. Do not install once ambient temperature exceeds 95 deg F, unless surface is shaded.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

2.7 PREPARATION

A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate in accordance with manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

C. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching material.

D. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

E. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

F. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

G. When spraying is method of application, taper ends of the joint treatment to assist maintaining a wall system free of pinholes and voids.

H. Treat all non-moving transition joints to beams, columns, and dissimilar materials by applying a 2-inch- wide by 60-mil thick coat of fluid-applied flashing across the joint.

I. Apply 25-mil-thick coat of fluid-applied flashing, extending a minimum 2 inches on each surface, and treat the following conditions:

1. Joints up to 1/4 inch
2. Joints 1/4- to 1/2-inch; reinforce with fiberglass-mesh tape.
3. Joints and transitions up to 1 inch; treat using strip flashing.

J. Bridge all joints types and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement in accordance with manufacturer's written instructions and details.

K. When spraying is method of application, taper ends of fluid applied corner treatment to wall substrate.

L. Treat inside and outside corners by applying a 25-mil- thick coat of fluid applied weather barrier a minimum 2 inches on each adjoining surface. Apply fillet bead of fluid-applied sealant to inside corners to ensure continuity. Alternatively, treat corners using strip flashing. Press strip flashing into inside corners; ensure that it is fully adhered to substrate.

M. Seal penetrations using fluid-applied flashing or sealant. Extend fillet bead 1/2 inch onto both surfaces.

N. Treat embedded masonry anchors by applying a coat of fluid-applied weather barrier or fluid-applied flashing around base of the anchor.

2.8 ACCESSORIES INSTALLATION

A. Install accessory materials in accordance with air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.

1. Coordinate installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
2. Install transition strip on roofing membrane or base flashing, for a minimum 3 inches coverage over each substrate.
3. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow to dry.
4. Use recommended primer when applying self-adhered flashing products on concrete, masonry, and fiber faced exterior gypsum board substrates. Priming is generally not required for adhering self-adhered flashing products to wood. However, adverse weather conditions or colder temperatures may require a primer to promote adhesion. Priming is not required when applying fluid-applied products, except on cut edges of exterior gypsum sheathing.
5. Apply pressure along entire surface of strip flashing for good bond using a J-roller or firm hand pressure. Remove all wrinkles and bubbles by smoothing surface and repositioning as necessary.

B. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

C. When applying self-adhered flashing products over a cured fluid-applied membrane, first apply a wet bed of fluid-applied product.

D. Seal fasteners of mechanically attached supports or furring strips in high-performance building envelope designs.

1. Apply double-sided butyl tape to back of support bracket at fastener location.
2. Embed support bracket into an additional wet bed of fluid applied product.
3. Adhere butyl-based flashing patch to wall at fastener location.
4. Use alternate method as approved by the manufacturer.

E. At end of each working day, seal top edge of strips and transition strips to substrate with manufacturer approved product.

F. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

G. Flashing Sill Area for Windows and Doors:

1. Use 9-inch-wide conformable flashing for wall framing. When rigid back dams are required or desired, one option to use is a 3/4-inch corner guard, cut to length of sill, and nailed into place on interior edge of sill prior to installation of 9-inch wide conformable flashing. Afterward, install 9-inch wide conformable flashing over sill and corner guard back dam.

2. Install without stretching conformable flashing when installing along sills or jambs. Conformable flashing is intended to be stretched when covering corners or curved sections.

H. Apply fluid-applied flashing products from head of opening down. Use a corner trowel to smooth corners.

I. Repairs:

1. Coat small damaged areas with layer of fluid-applied product.
2. Reinforce large damaged areas with fiberglass mesh or replace damaged substrate before reapplying fluid-applied product.

2.9 PRIMARY AIR-BARRIER MATERIAL INSTALLATION

A. Apply air-barrier material to form a seal with strips and transition strips, and to achieve a continuous air barrier in accordance with air-barrier manufacturer's written instructions and details. Apply air-barrier material within manufacturer's recommended application temperature ranges.

1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
2. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
3. Where multiple prime coats are needed to achieve required bond, allow adequate drying time between coats.
4. Fluid applied products may be overcoated once a touch-free skin has formed. Exterior insulation and cladding may be installed once the membrane has cured sufficiently to resist damage during installation.

B. Apply air barrier material in accordance with air-barrier manufacturer's written instructions and recommendations.

1. Roller Application:

a. Nap rolling: Use a roller cover with a 1/2- to 3/4-inch nap.

2. Spray Application:

a. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
b. Use spray guard.
c. Back Rolling: Use a roller cover with a 1-1/2- to 3/4-inch nap. Apply fluid-applied product in a single coat at 25 mils thick. Control thickness by applying appropriate volume over a marked area and spot checking with a wet-mil gauge.

C. Integrate fluid-applied product with through-wall flashing and window and door flashing by overlapping flashing with fluid-applied product a minimum 2 inches.

D. Inspect surfaces to ensure that fluid-applied products are continuous and free of any voids or pinholes.

E. Do not cover air barrier until it has been tested and inspected by the testing agency.

F. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

2.10 FIELD QUALITY CONTROL

A. ABAA Quality Assurance Program: Perform examinations, preparation, installation, testing, and inspections under ABAA's Quality Assurance Program.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements**:**

1. Continuity of air-barrier system has been achieved throughout the building envelope without gaps, holes, or pinholes.
2. Air-barrier dry film thickness.
3. Continuous structural support of air-barrier system provided.
4. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
5. Site conditions for application temperature, and dryness of substrates are maintained.
6. Maximum exposure time of materials to UV deterioration not exceeded.
7. Surfaces primed, where applicable.
8. Laps in strips and transition strips comply with minimum requirements, are shingled in correct direction (or mastic applied on exposed edges), and are without fishmouths.
9. Termination mastic applied on cut edges.
10. Strips and transition strips firmly adhered to substrate.
11. Compatible materials used.
12. Transitions at changes in direction and structural support at gaps provided.
13. Connections between assemblies comply with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
14. Each penetration sealed.

D. Field Quality Control Testing: Perform the following test on [**representative areas of structural sealant glazed curtain walls**] [**mockups**] <**Insert requirements**>.

1. Air Infiltration Whole Building: ASTM E 779 at not more than 0.40 cfm/sf at 1.57 lb/sq. ft.
2. Water Penetration: ASTM E 1105 at a minimum uniform and cyclic static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article in Part 2, but not less than 2.86 lbf/sq. ft. No water penetration shall occur as defined in ASTM E 1105.

    a. Perform a minimum of **three** tests in areas as directed by Architect.
    b. Perform tests in each test area as directed by Architect. Perform a minimum of three tests, prior to 75 percent completion.

3. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate in accordance with ASTM D 4541 for each 600 sq. ft.

E. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, in accordance with manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

F. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

G. Prepare test and inspection reports.

2.11 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, in accordance with manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials in accordance with air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION

SECTION 07 46 46 – CEMENT FIBER SIDING AND PLANKING**Error! Bookmark not defined.**

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 SCOPE:

A. Furnish and install fiber-cement siding and accessories where and as specified on the project drawings and in the contract documents.

B. Work performed under this section shall be coordinated with other sections to properly sequence the work. Other sections affecting this sections include but are not limited to:

1. Wood Framing and Bracing

2. Steel Framing and Bracing

3. Sheathing

4. Insulation

5. Painting

1.3 QUALITY ASSURANCE:

A. Submittals shall be provided within 60 days of owner's request. Materials presented as submittal shall include:

1. Three material samples representing the texture specified in the contract documents, each approximately 8" square.

2. Three copies of specifications, installation guidelines and any other pertinent manufacturer's literature.

1.4 SIDING STORAGE AND HANDLING:

A. Siding materials shall be stored on a flat and level surface. Store materials under cover and protected from the weather until installation. If siding should be wet allow it to dry thoroughly before installing to prevent damage.

B. Care should be taken to protect siding from shipping and site damage.

PART 2 - PRODUCTS:

2.1 SIDING PRODUCTS:

A. Approved Manufacturers:

1. Cemplank

2. James Hardie Building Products

3. CertainTeed, Inc.

B. Fiber-Cement Siding materials shall have factory applied fiber-cement primer.

1. Fiber-cement siding shall comply with ASTM C1186 as Grade II, Type A fiber cement sheet.

2. Additionally, plank siding shall exhibit the following physical and mechanical properties:
   a. Average Dry Density of 80 pcf.
   b. Average Moisture content of equilibrium of 5% of dry weight.
   c. Thermal Conductivity (k-factor) of 2.4 Btu-in/hr-square feet in degrees F.
   d. Average Modulus of Elasticity in bending of 750 kpsi.
   e. Non-Combustible in accordance with ASTM E-136.
   f. Flame Spread Index of "0" and Smoke Generation Number of "0" in
   g. accordance with ASTM E-84.

C. Fiber Cement Plank shall be Traditional (smooth) pattern, 12' long, and 9 ¼" wide to

1. Provide 8” inches exposure.

D. Fiber Cement Panels shall comply with ASTM C1186 and Grade II, Type A fiber-cement sheet.

1. Additionally, siding shall exhibit the following physical and mechanical properties:
   a. Average Dry Density of 80 pcf.
   b. Average Moisture content of equilibrium of 5% of dry weight.
   c. Thermal Conductivity (k-factor) of 2.4 Btu-in/hr-square feet in degrees F.
   d. Average Modulus of Elasticity in bending of 750 kpsi.
   e. Non-Combustible in accordance with ASTM E-136.
   f. Flame Spread Index of "0" and Smoke Generation Number of "0" in accordance with ASTM E-84.
   g. Fiber Cement Panels shall be smooth pattern 4' wide x 8, 9, or 10 feet long as required for minimum joints.

E. Fiber Cement soffit shall comply with ASTM C1186 as Grade II, Type A fiber-cement sheet.

1. Additionally, soffit shall exhibit the following physical and mechanical properties:
   a. Average Dry Density of 80 pcf.
   b. Average Moisture content at equilibrium of 5% of dry weight.
   c. Thermal Conductivity (k-factor) of 2.4 Bty-in/hr-square feet in degrees F.
   d. Average Modulus of Elasticity in bending of 750 kpsi.

e. Non-Combustible in accordance with ASTM E136.
f. Flame Spread Index of "0" and Smoke Generation Number of "0" in accordance with ASTM E-84.

2. Non-Vented Fiber Cement Soffit shall be
a. Smooth Pattern, 12 or 16 wide by 12 feet long or 24 or 48 inches wide by 96” long as required for minimum joints.
b. Wood Grain Pattern, 12 or 16 wide by 12 feet long or 24 or 48 inches wide by 96” long as required for minimum joints.

F. Fiber Cement trim shall comply with ASTM C1186 Grade I, Type A fiber-cement sheet.

1. Fiber Cement batten boards shall be ¾” thick Traditional Smooth Pattern (2 ½”).

2. Fiber Cement trim shall be 1” thick Traditional Smooth Pattern, (3 ½, 5 ½, 7 ½, or 11 ½) inches wide and 12 feet long.

3. Additionally, trim shall exhibit the following physical and mechanical properties:
a. Average Dry Density of 59 pcf.
b. Average Moisture content at equilibrium of 5% of dry weight.
c. Average Modulus of Elasticity in bending of 435 kpsi.
d. Non-Combustible in accordance with ASTM E136.
e. Flame Spread Index of "0" and Smoke Generation Number of "0" in accordance with ASTM E-84.

G. Fasteners:

1. For wood sub-wall, Blind fastening: Galvanized Roofing Nails with minimum 11 ga. shank and 0.390" head diameters, minimum 1 ¼" long.

2. For wood sub-wall, Face Fastening where required: Galvanized Siding Nails with minimum 0.090 shank and 0.219" head diameters, minimum 1 ½" long.

3. All fasteners to be corrosion resistant.

PART 3 - EXECUTION:

3.1 INSTALLATION

A. Preparation:

1. Ensure sub-wall is straight and flat within 1/8" in 10'.

2. Maximum space between structural members is 16" without sheathing, 24" with sheathing.

3. Ensure that a Building Code compliant weather-resistant barrier is present and in serviceable condition.

4. Ensure all required flashing is in place and in serviceable condition.

B. Install Soffit:

1. Fasten through soffit into building structure. All edges of soffit shall be supported by framing, ensure appropriate blocking is in place.

2. Maximum distance between structural members is 24", maximum distance between fasteners is 8". Fasteners shall be set-back 2" from corners and minimum 3/8" from edges.

3. Fasteners shall be flush, do not overdrive. Protect over-driven fasteners from the weather and compliment with a second fastener, properly installed.

C. Install Trim:

1. Ensure sub-wall is straight and flat within 1/8" in 10'.

2. Fasten through trim into building structure.

3. Maximum distance between fasteners is 12", staggered across trim width. Target fastener set-back is 1" from edges and ends of trim.

4. Fasteners shall be flush, do not over-drive. Protect over-driven fasteners from the weather and compliment with a second fastener, properly installed.

5. Seal all cut ends with masonry compatible sealer.

6. Maintain specified clearances to finished grade and other horizontal surfaces.

D. Install Plank:

1. Fasten through plank into building structure. Fasteners should be set-back minimum 3/8" from ends to planks, 1" down from the top edge for "blind fastening," and 7/8" up from the bottom for "face fastening."

2. Fasteners shall be flush, do not over-drive. Protect over-driven fasteners from the weather and compliment with a second fastener, properly installed.

3. Start by leveling and installing a 2" wide by ¼" thick starter-strip, fasten into mudsill.

4. Install the bottom course of plank overlapping the bottom of the starter-strip by 1/8". Allow a 1/8" gap wherever plank abuts trim, fill gap with caulk before painting. Plan all butt joints between two planks to fall on building structure (studs). Butt Joints between planks shall be caulked or back-flashed to divert water onto the "lower course" of plank. Always fasten from one end to the other, not from both ends toward the middle.

5. Install second course of plank overlapping the top of the first course by at least 1 ¼". Stagger butt joints from those in the lower course.

6. Continue in this manner to cover the wall.

7. Maintain specified clearances to finished grade and other horizontal surfaces.

E. Install Panel:

1. Fasten through panel into building structure. All edges of panel shall be supported by framing, ensure appropriate blocking is in place.

2. Maximum distance between fasteners is 8". Fasteners should be set-back minimum 3/8" from edges of panels, 2" from corners of panels.

3. Fasteners shall be flush, do not over-drive. Protect over-driven fasteners from the weather and compliment with a second fastener, properly installed.

4. Starting at a corner, place panel against the framing and fasten in place. For best results fasten from one edge to the opposite, or from the center out to the perimeter. Allow 1/8" gap where panel abuts trim, fill gap with caulk before painting.

5. Continue in this manner to cover the wall, cutting panels to fit as your go.

F. Joint Treatment:

1. Treat Vertical Joints either by gapping 1/8" and caulking or by lightly butting and covering with a nominal 1" thick by 2" wide batten strip at panels.

2. Horizontal joints should only occur where wall height exceeds 10' and should be appropriately flashed with z-shaped flashing.

3. Maintain specified clearances to finished grade and other horizontal surfaces.

G. Finishing:

1. Paint Cemprime (factory applied primer with top quality exterior grade 100% acrylic latex paints. Apply an amount sufficient to provide a minimum dry film thickness of 3.0 mils. Apply topcoats in accordance with the paint manufacturer's written instructions, either before or within 180 days of siding installation.

END OF SECTION

SECTION 07 62 03 – SEAMLESS GUTTERS AND DOWNSPOUTS

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. Roof-edge gutters
2. Exposed downspouts.

B. Related Sections:

1. Division 07 Section "Joint Sealers" for field-applied sealants between roof specialties and adjacent materials.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: gutters and downspouts shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For gutters and downspouts, include submittal attachments to other work and the following:

1. Details of profiles of gutters and downspouts.
2. Details of pre-made corners, joints, downspouts, and downspout gutter sections
3. Pattern of seams and layout of fasteners, cleats, clips, and other attachments.
4. Details of termination points and assemblies, including fixed points.
5. Details of special conditions.

C. Samples for selection of factory-applied color finishes.

D. Warranty: Sample of standard warranty.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store materials in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to the extent necessary for the period of roof specialty installation.

1.6 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer’s standard form in which the manufacturer agrees to repair the finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within the specified warranty period.

B. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

1. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
2. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
3. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

PART 2 - PRODUCTS

2.1 EXPOSED METALS

A. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.

B. The second option in the first subparagraph below may diminish the oil-canning effect. Verify availability with manufacturers.

C. Surface: Smooth finish.

1. Two-Coat Fluoropolymer: AAMA 620. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
2. Concealed Surface: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.2 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by the manufacturer for complete installation.

B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:
FFasteners for Aluminum: Aluminum or Series 300 stainless steel.

2.3 GUTTERS AND DOWNSPOUTS

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. Andreas Renner KG.
2. Architectural Products Company.
3. ATAS International, Inc.
4. Berger Building Products, Inc.
5. Castle Metal Products.
6. Cheney Flashing Company.
7. CopperCraft by FABRAL, a Euramax company.
8. Hickman Company, W. P.
9. Klauer Manufacturing Company.
10. Merchant & Evans, Inc.
11. Metal-Era, Inc.
12. Metal-Fab Manufacturing, LLC.
13. MM Systems Corporation.
14. National Sheet Metal Systems, Inc.
15. Perimeter Systems, a division of Southern Aluminum Finishing Company, Inc.

B. Gutters: Manufactured in continuous lengths using on-site extrusion machines. Provide matching corner units, ends, outlet tubes, and other accessories. Elevate the back edge at least 1 inch (25 mm) above the front edge. Furnish flat-stock gutter straps, gutter brackets.

C. Fabricate gutters from the following exposed metal:

1. Formed Aluminum: 0.027-inch-thick Gutter
2. Profile: Style K (Ogee) according to SMACNA's "Architectural Sheet Metal Manual."

D. Corners: Factory mitered and mechanically clinched, and sealed watertight.

E. Gutter Supports: Manufacturer’s standard supports as selected by the Architect with finish matching the gutters.

F. Downspouts: Plain rectangular complete with machine-crimped elbows, manufactured from the following exposed metal. Furnish with metal hangers, from the same material as downspouts, and anchors.

G. Formed Aluminum: 0.019 inch thick.

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Examine walls and roof edges for suitable conditions for gutter and downspout installation.

C. Verify that substrate is sound, dry, smooth, clean and securely anchored.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General: Install as per manufacturer's written instructions. Anchor items in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete roof-specialty systems.

B. Install items level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.

C. Provide uniform, neat seams with minimum exposure of solder or sealant.

D. Install roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.

E. Torch cutting of roof specialties is not permitted.

F. Fastener Sizes: Use fasteners of sizes that will penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

G. Seal joints with sealant as required by manufacturer.

H. Seal joints as required for watertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

3.3 GUTTER AND DOWNSPOUT INSTALLATION

A. General: Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of gutters and downspouts.

B. Retain last option in first paragraph below if soldering the joints and ends of copper gutters.

C. Gutters: Join and seal gutter joints at locations of corners and downspout fittings. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 24 inches apart. Attach ends with rivets and seal with sealant to make watertight. Slope to downspouts.

D. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c.

E. Retain one of two subparagraphs below.

F. Provide elbows at base of downspout to direct water away from building.

3.4 CLEANING AND PROTECTION

A. First paragraph below is not applicable to stainless steel or to painted or coated steel and aluminum.

B. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.

D. Replace items that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07 92 00 - JOINT SEALERS

PART 1 - GENERAL

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.

2. DESCRIPTION OF WORK:

A. The extent of each form and type of joint sealer is indicated on drawings and by provisions of this section.

B. The applications for joint sealers as work of this section include the following:

1. Wall joints (exterior and interior).
2. Horizontal Surfaces.
3. Flashing and coping joints.

C. Refer to Division 8 sections for glazing requirements not work of this section.

D. Refer to sections of Mechanical and Electrical Divisions for joint sealers in mechanical and electrical work not work of this section.

4. QUALITY ASSURANCE:

A. Applicator Qualifications: Contractor and job foreman must have a minimum of five (5) years experience installing sealant.

B. Compatibility and Adhesion Tests: Contractor shall be responsible for verifying with sealant manufacturer that all sealants to be used are compatible with and will satisfactorily adhere to all substrates. Tests may be conducted in the field or by submission of representative substrate samples to sealant manufacturer's laboratory.

C. Conduct the following Skin-Over Time/Elastomeric Test: For one-part sealant, a skin-over test and an elastomeric test should be performed once per week and on every new lot of sealant used. The purpose of this test is to check sealant working time and to ensure the sealant cures fully. Any great variation (excessively long times) in the skin-over time may indicate and out-of-life sealant. This test is performed as follows:

1. Spread a 1/16" film of sealant on a sheet of polyethylene (a garbage bag works well).
2. Every few minutes, touch the sealant film lightly with a tool.
3. When the sealant does not adhere to the tool, the sealant has skinned over. Note the time required to reach this point. If a skin has to formed within - 3 hours, do not use this material; contact your Dow Corning Construction Field Specialist or distributor representative.

4. Allow the sealant to cure for 24 hours. After 24 hours, peel the sealant off of the polyethylene sheet. Stretch the sealant slowly to see that it has cured. If the sealant has not cured, contact your Sealant Manufacturer Field Specialist or distributor representative.
5. Record the results in the Product Quality Control Log book. This testing must be completed and results recorded, retained and available for review upon request. (See "Project Specifications, Documentation and Warranties" for a sample log form and additional information.)

D. Standard Field Adhesion Hand Pull Test: A field adhesion test is a simple screening procedure that may help detect application problems such as improper cleaning, use of improper primer, poor primer application or improper joint configuration. As a check for adhesion, a simple hand pull test is required at the job site after the sealant is fully cured (usually within 7 to 21 days). Field adhesion testing should be documented using the filed Adhesion Testing Log (see "Project Specifications, Documentation and Warranties"). It is suggested that 10 tests for the first 1000 feet and one test per thousand feet thereafter be submitted or one test per floor per elevation. The hand pull test procedure is as follows:

1. Make a knife cut horizontally form one side of the joint to the other.
2. Make two vertical cuts (from the horizontal cut) approximately 3" long, at both sides of the joint.
3. Place a 1" mark on the sealant tab.
4. Grasp the 2" piece of sealant firmly just beyond the 1" make and pull at a 90-degree angle.
5. If dissimilar substrates are being sealed, check the adhesion of sealant to each substrate separately. This is accomplished by extending the vertical cut alone one side of the joint, checking adhesion to the opposite side, and then repeating for the other surface.
6. Pass / fail criteria for each sealant are as follows: If the sealant does not pass according to the guidelines provided, consult your local Field Specialist or distributor representative.
7. Record the test results in a field adhesion test log.

E. Repair of Sealant in Adhesion Test Area: Repair the sealant pulled from the test area by applying new sealant to the test area. Assuming good adhesion was obtained, use the same application procedure to repair the areas as was used to originally seal it. Care should be taken to ensure that the original sealant surfaces are clean and that the new sealant is in contact with the original sealant.

F. Manufacturer: Sealant manufacturer shall have been in the business of producing the specified sealant types for a minimum of ten (10) years.

8. SUBMITTALS:

A. Literature: Submit one copy of manufacturer's data sheets, standard color charts, installation instructions and field quality control test procedures for each sealant and primer to be used.

B. Warranty: Submit one copy of manufacturer's standard twenty (20) year product warranty and contractor's three-year workmanship warranty.

9. WARRANTY:

A. Upon job completion, provide manufacturer's standard twenty (20) year product weather seal warranty.

B. Upon job completion, provide contractor's three (3) year workmanship warranty.

10. DELIVERY, STORAGE, AND HANDLING:

A. Deliver products in original factory packaging bearing identification of product, manufacturer, batch number, and expiration date as applicable. Provide Material Safety Data Sheets for each product.

B. Store product in a location protected from freezing, damage, construction activity, precipitation and direct sunlight in strict accordance with manufacturer's recommendations.

C. Condition products to approximately 60 to 70 degrees F for use in accordance with manufacturer's recommendations.

11. PROJECT CONDITIONS:

A. Do not use products under conditions of precipitation or freezing weather. Use appropriate measures for protection and supplementary heating to ensure proper drying and curing conditions in accordance with manufacturer's recommendations if application during inclement weather occurs.

B. Ensure substrate is dry.

C. Protect all adjacent work from contamination due to mixing, handling, and application of sealants.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Manufacturer's: Provide products by one of the following:

1. Dow Corning
2. General Electric
3. Sonneborn

B. Sealant #1: Dow Corning - 790 Silicone Building Sealant, for brickwork, ceramic, concrete, mill finished and anodized aluminum, glass, granite, stone, limestone, marble, masonry, paint, silicone and wood Color to be selected by Architect.

C. Sealant #2: Dow Corning - 786 Mildew Resistant Sealant, for porcelain, glazed ceramic tile, mosaic floor tile, cultured marble. (e.g. bath, shower and other high moisture interior applications). Color to be selected by Architect.

D. Sealant #3: Caulking Compound (for general applications) 1 part Architectural Acrylic Latex.

E. Primer: Dow Corning - 1200 Prime Coat, primer to be applied to all exterior porous surfaces (i.e. brick). EIFS priming to be recommended by sealant manufacturer.

F. Sealant #4: Sonneborn Sonolastic NP 1: Single component, non-sag polyurethane with plus or minus 25 percent movement capability for vertical joints.

G. Sealant #5: Sonneborn Sonolastic SL 1: Single component, self-leveling polyurethane with plus or minus 25 percent movement capability for horizontal joints.

H. Sealant #6: DAP Dynaflex 230 Premimum Elastomeric Sealant ASTM C920 Class 25.

I. Backer Rod: EIFS requires closed cell polyethylene or Sof-Rod.

J. Bond Breaker Tape: Pressure sensitive adhesive polyethylene, Teflon, or polyurethane foam tape where required.

PART 3 - EXECUTION

3.1 SEALANTS:

A. Inspection:

1. Installer must examine substrates, (joint surfaces) and conditions under which joint sealer work is to be performed, and verify that all joint surfaces are clean, sound, free of defects and that dimensions are within sealant manufacturer's size requirements. Commencement of sealant installation shall be evidence that contractor has verified compliance of existing conditions. Do not proceed with joint sealer work until unsatisfactory conditions have been corrected in a manner acceptable to installer.
2. Protect all surroundings from primers and sealant to include, but not be limited to, windows, roofs, walkways, drives, and landscaping.

B. Joint Preparation:

1. Clean all joint surfaces of contaminants and impurities to the depth at which the new silicone sealant and backer materials are to be installed. This may be accomplished by several methods: Abrading with a wire brush (hand or power), grinding, saw cutting, or solvent cleaning. Follow solvent manufacturer's safe handling recommendations and local, state and federal regulations regarding solvent usage.
2. Blow out all dust, loose particles and other debris using oil free compressed air.

C. Installation:

1. Solvent clean aluminum and any other non-porous surfaces with recommended solvent using the "Two Cloth Cleaning Method."

2. Apply primer according to manufacturer's instructions.
3. Install backer rod using blunt or rounded tools to assure uniform depth without puncturing or twisting. Closed cell rod shall be a minimum 20% oversized. Install bond breaker tape in shallow joints.
4. Mask or protect adjacent areas that are not to receive sealant.
5. Apply sealant in joints using a pressure gun with nozzle cut to appropriate size. Deposit sealant in a uniform and continuous bead with no gaps or air pockets.
6. Tool joint to required configuration with a blunt instrument as soon as possible after installation, but before sealant begins to skin over. Remove all masking materials immediately after tooling.

D. Locations:

1. These are the general purpose sealants for use of interior and exterior up to 1" in width. One of these sealants shall be used unless otherwise specified herein. The following list is not intended to be inclusive of every condition.
2. At both exterior and interior joints, and recesses formed where frames and subsills of windows, doors, louvers, vents and the like adjoin other materials.
3. Joints or recesses on exterior of building (including locations not specifically shown or specified) where sealing is required to prevent infiltration of water, moisture, insects, and wind through building exterior.
    a. Masonry joints in which shelf angles occur.
    b. Exterior face of expansion and control joints in exterior concrete or masonry walls.
    c. Interior face of expansion joints in exterior masonry walls.
    d. Interior face of control joints in exterior masonry walls.
    e. Openings where pipes, conduits and similar items pass through exterior walls.
4. Metal reglets where required and lead caulking rope is not used, and elsewhere where flashing is penetrated by coping dowels.
    a. Metal-to-metal joints where sealing or caulking is shown or necessary.
    b. Metal to masonry where sealing or caulking is shown, specified, or necessary.
    c. Joints occurring between ends of gravel stops, fascias and/or copings and adjacent walls.
    d. Bottoms of exterior doorway frames.
5. Where sealant is shown on drawings except where sealing compounds for joints in horizontal surfaces and high temperature applications are specifically required.
    a. Seats of metal thresholds for exterior doors.
    b. All precast concrete joints.
6. Use Sealant #1 at all exterior vertical surfaces locations.
7. Use Sealant #2 at all interior wet areas.
8. Use Sealant #3 for the following interior applications:
    a. Opening 1/8" and less between walls and partitions and adjacent shelving, built-in or surface mounted equipment, plumbing, and lighting fixtures.
    b. Interior locations where small voids between materials require filling for first class workmanship and painting.
9. Use Sealant #4 at all interior conditions not listed for sealants #2 and #3.
10. Use Sealant #5 for all interior horizontal surfaces.
11. Use Sealant #6 for all exterior wood for painted finish.

E. Workmanship:

1. Surface Preparation: Surfaces of joint to receive caulking or sealants shall be clean, dry to the touch, free from frost, moisture, grease, oil, wax, lacquer, paint, or other foreign matter that would tend to destroy or impair adhesion.
2. Application: Apply caulking and sealing compounds in strict accordance with manufacturer's printed instructions. Avoid dropping or smearing compound on adjacent surfaces. Fill joints solidly with compound and tool. Finish compound smooth and flush, unless joint is otherwise detailed.
3. Cleaning: After filling and finishing joints, remove masking tape. Fresh compound that has accidentally been smeared on masonry shall be scrapped off immediately and rubbed clean with a solvent as recommended by the sealant manufacturer. Upon completion of application of compound, all remaining smears, stains, and other soiling resulting therefrom shall be removed with solvent or other means recommended by manufacturer of compound and the work left in a clean and neat condition.

F. Cure and Protection:

1. Cure sealants and caulking compounds in compliance with manufacturer's instructions and recommendations to obtain high early bond strength, internal cohesive strength and surface durability. Advise contractor of procedures required for cure and protection of joint sealers during construction period, so that they will be without deterioration or damage (other than normal wear and weathering) at time of substantial completion. Cure and protect sealants in a manner which will minimize increased in modules of elasticity and other accelerated aging effects. Replace or restore sealants which are damaged or deteriorated during construction period.

END OF SECTION

SECTION 08 11 13 – STEEL DOORS AND FRAMES

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 DESCRIPTION OF WORK

A. Extent of steel doors and frames is indicated and scheduled on drawings.

B. Finish hardware is specified elsewhere in Division 8.

C. Building in of anchors and grouting of frames in masonry construction is specified in Division 4.

1.3 QUALITY ASSURANCE

A. Provide doors and frames complying with Steel Door Institute "Recommended Specifications: Standard Steel Doors and Frames" (SDI 100) and as herein specified.

B. Fire-Rated Door Assemblies: Where fire rated door assemblies are indicated or required, provide fire rated door and frame assemblies that comply with NFPA 80 "Standard for Fire Doors and Windows", and have been tested, listed, and labeled in accordance with ASTM E 152 "Standard Methods of Fire Tests of Door Assemblies" by a nationally recognized independent testing and inspection agency acceptable to authorities having jurisdiction.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data substantiating that products comply with requirements.

B. Shop Drawings: Submit for fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at opening, details of construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections. Show Anchorage and accessory items.

1. Provide schedule of doors and frames using same reference numbers for details and openings as those on contract drawings. Indicate coordinate of glazing frames and stops with glass an glazing requirements.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver hollow metal work cartoned or crated to provide protection during transit and job storage.

B. Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.

C. Store doors and frames at building site under cover. Place units on minimum 4" high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4" spaces between stacked doors to promote air circulation.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering steel doors and frames which may be incorporated in the work include; but are not limited to, the following:

B. Steel doors and frames:

1. Amweld/Div. American Welding & Mfg. Co.

2. Ceco Corp.

3. Curries Mfg., Inc.

4. Dittco Products, Inc.

5. Fenestra Corp.

6. Mesket Industries, Inc.

7. Steelcraft/Div. American Standard Co.

8. Republic Builders Products Corp.

9. Subs. Republic Steel.

10. Amertex Inc.

2.2 MATERIALS

A. Hot-Rolled Steel Sheets and Strip: Commercial quality carbon steel, pickled and oiled, complying with ASTM A 569 and ASTM A 568.

B. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A 366 and ASTM A 568.

C. Galvanized Steel Sheets: Zinc coated carbon steel sheets of commercial quality, complying with ASTM A 526, with ASTM A 525, G60 zinc coating, mill phosphatized.

D. Supports and Anchors: Fabricate of not less than 18 gage galvanized sheet steel.

E. Inserts, Bolts and Fasteners: Manufacturer's standard units, except hot dip galvanized items to be built into exterior walls, complying with ASTM A 153, Class C or D as applicable.

F. Primer: Rust inhibitive enamel or paint, either air drying or baking, suitable as a base for specified finish paints.

2.3 FABRICATION, GENERAL

A. Fabricate steel door and frame units to be rigid, neat in appearance and free from defects, warp or buckle. Wherever practicable, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at project site. Comply with SDI 100 requirements as follows:

1. Interior Doors: SDI 100, Grade II, standard, Style 4, 16 gage,
   a. Kraft honeycomb core.

2. Exterior Doors: SDI 100, Grade III, extra heavy duty, Style 4, 16 gage,
   a. Polystyrene or Polyisocyanurate core.

B. Fabricate exposed faces of doors and panels, including stiles and rails of non-flush units from only cold rolled steel.

C. Fabricate frames, concealed stiffeners, reinforcement, edge channels louvers and moldings from either cold rolled or hot rolled steel (at fabricator's option).

D. Fabricate exterior doors, panels, and frames from galvanized sheet steel. Close top and bottom edges of exterior doors as integral part of door construction or by addition of minimum 16 gage inverted steel channels.

E. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat Phillips heads for exposed screws and bolts.

F. Sound Rating: Unless otherwise indicated, provide acoustical assemblies with sound ratings of STC 33 or better.

G. Finish Hardware Preparation: Prepare doors and frames to receive mortised and concealed finish hardware in accordance with final Finish Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A 115 series specifications for door and frame preparation for hardware.

1. For concealed overhead door closers, provide space, cutouts, reinforcing and provisions for fastening in top rail of doors or head of frames, as applicable.

H. Reinforce doors and frames to receive surface applied hardware. Drilling and tapping for surface applied finish hardware may be done at project site.

I. Locate finish hardware as shown on final shop drawings or, if not shown, in accordance with "Recommended Locations for Builder's Hardware," published by Door and Hardware Institute.

2.4 SHOP PAINTING

A. Clean, treat, and paint exposed surfaces of steel door and frame units, including galvanized surfaces.

B. Clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign materials before application of paint.

C. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive finish paint.

2.5 STANDARD STEEL DOORS

A. Provide metal doors of types and styles as specified herein and indicated on drawings or schedules.

B. Door Louvers: Provide sight proof galvanized stationary louvers for interior doors where indicated, constructed of inverted V shaped or Y shaped blades formed of 24 gage cold rolled steel set into 20 gage steel frame.

2.6 STEEL FRAMES

A. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, of types and styles as shown on drawings and schedules. Conceal fastenings, unless otherwise indicated. Fabricate frames of minimum 16-gage cold-rolled furniture steel.

1. Fabricate frames with mitered and continuous welded corners.

2. Form exterior frames of hot dip galvanized steel.

B. Door Silencers: Except on weather-stripped frames, drill stops to receive three silencers on strike jambs of single swing frames and two silencers on heads of double swing frames.

C. Plaster Guards: Provide 26 gage steel plaster guards or mortar boxes, welded to frame, at back of finish hardware cutouts at all locations.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install steel doors, frames, and accessories in accordance with final shop drawings, manufacturer's data, and as herein specified.

B. Placing Frames: Comply with provisions of SDI 105 "Recommended Erection Instructions for Steel Frames", unless otherwise indicated.

1. Except for frames located at in place concrete or masonry and at drywall installations, place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.

2. In masonry construction, locate three wall anchors per jamb at hinge and strike levels.

3. In wood stud construction, locate three wall anchors per each jamb.

4. Install fire-rated frames in accordance with NFPA Std. No. 80.

5. In metal stud partitions, install at least three wall anchors per jamb at hinge and strike levels. Enclosed steel stud partitions, attach wall anchors to studs with tapping screws.

C. Door Installation: Fit hollow metal doors accurately in frames, within clearances specified in SDI 100. Place fire rated doors with clearances as specified in NFPA Standard No. 80.

3.2 ADJUST AND CLEAN

A. Prime Coat Touch-Up: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch up of compatible air drying primer.

B. Final Adjustments: Check and readjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

END OF SECTION

SECTION 08 14 16 - FLUSH WOOD DOORS

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 specified in this section.

1.2 DESCRIPTION OF WORK:

A. Extent and location of each type of wood door is shown on drawings and in schedules.

B. Types of doors required include the following:

C. Solid core flush wood doors with veneer faces.

D. Shop priming of wood doors is included in this section.

E. Shop finishing of wood doors is included in this section.

F. Factory fitting to frames (pre-fitting) and factory preparation for hardware (pre-machining) for wood doors is included in this section.

1.3 QUALITY ASSURANCE:

A. Fire-Rated Wood Doors: Provide wood doors with fire resistance ratings indicated or required to comply with governing regulations and which are identical in materials and type of construction to those used in assemblies which have been tested in compliance with ASTM E 152 and are labeled and listed by a testing and inspection organization acceptable to authority having jurisdiction.

B. Manufacturer: Obtain doors from a single manufacturer to ensure uniformity in quality of appearance and construction, unless otherwise indicated.

1.4 REFERENCES:

A. Comply with the applicable requirements of the following standards unless otherwise indicated:

B. NWWDA - National Wood Window and Door Association". Designations for grade and core construction under types of doors refer to this standard.

C. SUBMITTALS:

D. Product Data: Submit door manufacturer's product data, specifications and installation instructions for each type of wood door.

E. Include details of core and edge construction, trim for openings and louvers (if any) and similar components.

F. Include finishing specifications for doors to receive factory applied shop finish.

G. Include certifications as may be required to show compliance with specifications.

H. Shop Drawings: Submit shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for factory finishing and other pertinent data.

I. Samples: Submit samples for the following:

1. Transparent Finished Doors: Submit veneer sheet from each available flitch to be used for face veneers. Also submit strips of solid wood 3" x 1'0" of species to be used for exposed edges, trim and other solid wood components.
2. Shop-Finished Doors: Submit samples, 1'0" square, showing fully completed shop finish on same veneer and edge construction which will be used on shop finished doors.

J. Specific Product Warranty: Submit written agreement in door manufacturer's standard form signed by manufacturer, installer and contractor, agreeing to repair or replace defective doors which have warped (bow, cup or twist) or which show telegraphing of core construction below in face veneers, or do not conform to tolerance limitations of NWMA.

K. Warranty shall be in effect during following period of time after date of substantial completion.
1. Solid Core Flush Doors:
a. Lifetime.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Protect wood doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with the "On Site Care" recommendations of NWMA pamphlet "Care and Finishing of Wood Doors" and with manufacturer's instructions, and as otherwise indicated.

B. Package doors at factory prior to shipping using method indicated below:
1. Cartoning.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:
1. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
2. Algoma Hardwoods Inc.
3. Eggers Hardwood Products Corp.
4. Chappell Door Company.
5. Weyerhauser Company.
6. Buell Door Company
7. Graham Manufacturing Company

2.2 MATERIALS AND COMPONENTS:

A. General: Provide wood doors complying with applicable requirements of referenced standards for kinds and types of doors indicated and as specified.

B. Door Construction: Manufacturer’s standard five ply bonded core.

C. Exposed Surfaces: Provide kind shown or scheduled and as further specified. Provide same exposed surface material on both faces of each door, unless otherwise indicated.

2.3 GENERAL FABRICATION REQUIREMENTS:

A. Openings: Cut and trim openings through doors and panels as shown. Comply with applicable requirements of referenced standards for kind(s) of doors required.

B. Light Openings: Factory cut openings. Trim openings for non-fire rated doors with solid wood moldings and fire rated doors with steel frame.

2.4 INTERIOR FLUSH WOOD DOORS:

A. Solid Core Doors for Transparent Finish:
1. Faces: Plain Sliced Red Oak.
2. Veneer Face Assembly - Book
3. Grade: Premium.
4. Core Construction: PC (Particleboard core).

B. Fire-Rated Solid Core Doors:
1. Faces and NWWDA Grade: Provide faces and grade to match non rated doors in same area of building, unless otherwise indicated.
2. Core Construction: Manufacturer's standard core construction as required to provide fire resistance rating indicated.
3. Edge Construction: Provide manufacturer's standard laminated edge construction for improved screw holding capability and split resistance over edges composed of a single layer of treated lumber.

2.5 SHOP-PRIMING:

A. Before delivery of doors to project site, shop prime as follows:

B. Paint Finish: Prime exposed portion of wood doors shown or scheduled for paint finish with one coat of wood primer specified in Division 9 "Painting" sections of these specifications.

2.6 PREFITTING AND PREPARATION FOR HARDWARE:

A. Pre-fit and pre-machine wood doors at factory.

B. Comply with tolerance requirements of AWI for pre-fitting. Machine doors for hardware requiring cutting of doors. Comply with final hardware schedules and door frame shop drawings and with hardware templates and other essential information required to ensure proper fit of doors and hardware.

C. Take accurate field measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with machining in factory.

PART 3 - EXECUTION

3.1 INSPECTION:

A. Installer must examine door frames and verify that frames are correct type and have been installed as required for proper hanging of corresponding doors and notify contractor in writing of conditions detrimental to proper and timely installation of wood doors. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to installer.

B. INSTALLATION:
1. Condition doors to average prevailing humidity in installation area prior to hanging.
2. Hardware: For installation see Division 8 "Builders Hardware" section of these specifications.
3. Manufacturer's Instructions: Install wood doors in accordance with manufacturer's instructions and as shown.
    a. Install fire rated doors in corresponding fire rated frames in accordance with requirements of NFPA No. 80.
4. Pre-fit Doors: Fit to frames and machine for hardware as required for proper fit and uniform clearance at each edge.
5. Prepare Doors: Fit to frames and prepare for hardware as required for proper fit and uniform clearance at each edge.
6. Clearance:
    a. For non-rated doors provide clearances of 1/8" at jambs and heads; 1/16" at meeting stiles for pairs of doors; and 1/2" from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4" clearance from bottom of door to top of threshold.
    b. For fire rated doors, provide clearances complying with NFPA 80.
7. Shop-Finished Doors: Restore finish on edges of shop finished doors before installation, if fitting or machining is required at the job site.
8. Job Site Finished Doors: See painting sections in Division 9 of these specifications for requirements for finishing wood doors.

3.2 ADJUST AND CLEAN:

A. Operation: Rehang or replace doors which do not swing or operate freely as directed by Architect.

B. Finished Doors: Refinish or replace doors damaged during installation as directed by Architect.

C. Protection and Completed Work: Advise contractor of proper procedures required for protection of installed wood doors from damage or deterioration until acceptance of work.

END OF SECTION

SECTION 08 41 13 - ALUMINUM ENTRANCES AND STOREFRONTS

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 DESCRIPTION OF WORK:

A. Extent of aluminum entrances and storefronts is shown on drawings and schedules.

B. Types of aluminum entrances and storefronts required include the following:

1. Exterior entrance doors.

2. Frames for exterior entrances.

3. Storefront type framing system.

C. Glazing: Refer to "Glass and Glazing" section of Division 8 for glazing requirements for aluminum entrances and storefronts, including doors specified herein to be factory pre-glazed.

D. Automatic operators are specified elsewhere in Division 8.

E. Mortise lock cylinders are specified in Division 8 hardware section.

1.3 SYSTEM DESCRIPTION:

A. Performance and Testing:

1. Thermal Movement: Fabricate exterior components from manufacturer's stock systems which have been designed to provide for expansion and contraction resulting from ambient temperature range of 120 degrees F (49 degrees C).

2. Wind Loading: Fabricate exterior components from manufacturer's stock systems which have been tested in accordance with ASTM E 330 to withstand at least the following loadings:
   a. Uniform pressure of 20 psf inward and 20 psf outward.

3. Weather Resistance: Fabricate exterior storefront components from manufacturer's stock systems which have been tested to demonstrate permanent resistance to leakage’s as follows with test pressure differential of 10% of design loading (excluding operable door edges).
   a. Air infiltration not more than 0.06 cfm per square foot tested in accordance with ASTM E 283.

b. Water infiltration no uncontrolled water penetration tested in accordance with ASTM E 331.

1.4 QUALITY ASSURANCE:

A. Windows, Storefront, and Entrances shall be by one manufacturer.

B. Drawings are based on one manufacturer's standard aluminum entrance and storefront system. Another standard system of a similar and equivalent nature will be acceptable when differences do not materially detract from design concept or intended performances, as judged solely by Architect.

C. Field Measurement: Wherever possible, take field measurements prior to preparation of shop drawings and fabrication, to ensure proper fitting of work; however, proceed with fabrication and coordinate installation tolerances as necessary when field measurements might delay work.

1.5 REFERENCES:

A. Standards: Comply with applicable provisions of "Metal Curtain Wall, Window, Storefront, and Entrance Guide Specifications Manual" by AAMA.

1.6 SUBMITTALS:

A. Product Data: Submit manufacturer's specifications, standard details, and installation recommendations for components of aluminum entrances and storefronts required for project, including data that products have been tested and comply with performance requirements.

B. Shop Drawings: Submit shop drawings for fabrication and installation of aluminum entrances and storefronts, including elevations, detail sections of typical composite members, anchorages, reinforcement, expansion provisions, and glazing.

1.7 SPECIAL PROJECT WARRANTY:

A. Provide written warranty signed by manufacturer, installer, and contractor, agreeing to replace aluminum entrance doors and storefront which fail in materials or workmanship within two years of acceptance. Failure of materials or workmanship includes excessive leakage or air infiltration, excessive deflections, faulty operation of entrances, deterioration of finish or construction in excess of normal weathering, and defects in hardware, weather-stripping, and other components of the work.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

1. Kawneer

2. Oldcastle

3. EFCO

2.2 MATERIALS AND ACCESSORIES:

A. Aluminum Members: Alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish; ASTM B 221 for extrusions, ASTM B 209 for sheet/plate. Major storefront and door extrusions are to be at least 0.125" in thickness.

B. Fasteners: Aluminum, non-magnetic stainless steel, or other materials warranted by manufacturer to be non-corrosive and compatible with aluminum components.

1. Do not use exposed fasteners except where unavoidable for application of hardware. Match finish of adjoining metal.

2. Provide Phillips flat-head machine screws for exposed fasteners.

C. Brackets and Reinforcements: Manufacturer's high-strength aluminum units where feasible; otherwise, non-magnetic stainless steel or hot-dip galvanized steel complying with ASTM A 386.

D. Concrete/Masonry Inserts: Cast iron, malleable iron, or hot-dip galvanized steel complying with ASTM A 386.

E. Bituminous Coatings: Cold-applied asphalt mastic complying with SSPC-PS 12, compounded for 30-mil thickness per coat.

F. Compression Weather-stripping: Manufacturer's standard replaceable stripping of molded neoprene gaskets complying with ASTM D 200.

G. Sliding Weather-stripping: Manufacturer's standard replaceable stripping of wool, polypropylene, or nylon woven pile, with nylon fabric and aluminum strip backing, complying with AAMA 701.2.

H. Glass and Glazing Materials: Provide glass and glazing materials which comply with requirements of "Glass and Glazing" section of these specifications.

2.3 HARDWARE:

A. References to Styles, Series, Model, References Kawneer.

B. General: Refer to hardware section of Division 8 for requirements for hardware items other than those indicated herein to be provided by manufacturer of aluminum entrances.

C. Provide door manufacturer's standard heavy-duty hardware units as shown, scheduled, or required for operation of each door, including the following items (for each door) of sizes, number, and type recommended by manufacturer for service required, finished to match door, unless otherwise indicated.

D. Offset Pivots: Top and Bottom, intermediate required for doors over 7'-6".

E. Overhead Closers: Units complying with ANSI A 156.4 of the following type, grade, functions and features.

1. Type: Concealed Mount, single acting – LCN 2030
   a. Adjustable hold-open points, with bumper.
   b. Arm Function: 95 Degrees – With Offset Pivot Hinges and Bumper
   c. Finish: Plated
   d. Concealed Mounting: In 1 3./4" Tube.

F. Pull Handles: Aluminum units Kawneer Classic push/pull 9" center to center anodized to match storefront.

1. Style C09 - Pulls at Panic Doors.

G. Panic Device: Manufacturers Standard Concealed Rod at double doors, rim Latch at single doors, color to match door color.

H. Sweep: Provide adjustable bottom rails sweeps at all exterior doors.

I. Weather stripping: Manufacturers standard polymeric bulb material at single doors and Pile Cloth in the door and frame on double doors.

J. Thresholds: Extruded aluminum in mill finish complete with anchors and clips.

2.4 FABRICATION:

A. General:

B. Sizes and Profiles: Required sizes for door and frame units, are shown on drawings. Any variable dimensions are indicated, together with maximum and minimum dimensions required to achieve design requirements and coordination with other work.

1. Frame dimensions shall be ¾" less than the rough opening both vertically and horizontally to allow a 3/8" caulked joint around the perimeter opening between the aluminum frame and the adjacent material.

C. Prefabrication: To greatest extent possible, complete fabrication, assembly, finishing, hardware application, and other work before shipment to project site. Disassemble components only as necessary for shipment and installation.

D. Pre-glaze the door and units to greatest extent possible in coordination with installation and hardware requirements.

E. Do not drill and tap for surface-mounted hardware items until time of installation at project site.

F. Sequence: Complete cutting, fitting, forming, drilling, and grinding of metal work prior to cleaning, finishing, surface treatment, and application of finishes. Remove arises from cut edges and ease edges and corners to radius of approximately 1/64".

G. Welding: Comply with AWS recommendations to avoid discoloration; grind exposed welds smooth and restore mechanical finish.

H. Reinforcing: Structurally reinforce framing system to withstand 120 mph wind zone requirements; separate dissimilar metals with bituminous paint or other separator which will prevent corrosion.

I. Continuity: Maintain accurate relation of planes and angles with hairline fit of contacting members.

J. Fasteners: Conceal fasteners wherever possible.

K. Weather-stripping: For exterior doors, provide compression weather-stripping against fixed stops; at other edges and bottom, provide sliding weather-stripping retained in adjustable strip mortised into door edge.

L. Storefront Framing System:

M. General: Inside-outside matched resilient flush-glazed system, with provision for glass replacement.

N. System Construction: The system shall be a Screw Spline Assembly.

1. Frame Type: System shall be of Thermal Broken extruded aluminum construction.

2. Glazing Construction: System shall be front-glazed, inside-glazed.

3. Exterior system to be equal to the following Kawneer framing system:
   a. Trifab 451T 4" X 4.5" for up to 1" infill – exterior.
   b. Subsill - Provide an extruded aluminum thermally broken. High-performance sub-sill for all sill conditions.
   c. Provide break metal sill in addition to extruded sills where indicated on the drawings

O. Stile-and-Rail Type Aluminum Doors:

1. Frame: Provide 1 piece tubular frame members, fabricated with mechanical joints using heavy inserted reinforcing plates and concealed tie-rods or j-bolts, or fabricate with structurally welded joints, at the manufacturer's option.

2. Style: Except as otherwise shown or scheduled, provide doors 1-3/4" thick and of the indicated style, as described in AAMA publications.
   a. 500 wide style (5 nominal width).

3. Glazing: Fabricate doors to facilitate the replacement of glass or panels, without disassembly of door stiles and rails. Provide Snap-On extruded aluminum glazing stops, with exterior stops anchored for non-removal.

2.5 FINISHES:

A. Anodized Aluminum Finishes for interior and exterior:

B. Class I Color Anodized Finish: AA-M12C22A42 (non-specular as fabricated mechanical finish; chemical etch, medium matte; 0.7 mil min. thick integrally colored anodic coating).

1. Kawneer Permafluor Architectural Coatings Finish: AAMA 2605, 1.2 mil dry film thickness, 10-year warranty on finish

2. Color as selected by Architect from manufacturer’s standard color selections.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Comply with manufacturer's instructions and recommendations for installation of aluminum entrances and storefronts.

B. Set units plumb, level, and true to line, without warp or rack of framing members, doors, or panels. Anchor securely in place, separating aluminum and other corrodible metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

C. Drill and tap frames and doors and apply surface-mounted hardware items, complying with hardware manufacturer's instructions and template requirements. Use concealed fasteners wherever possible.

D. Sub-sill: Sub-sill shall extend the entire length of the storefront section. Provide end dams at ends of sub-sill to produce a closed water dam. Caulk dam with silicone joints to totally prevent water escaping at ends.

E. Set sill members and other members in bed of compound, or with joint fillers or gaskets as shown to provide weathertight construction. Comply with requirements of Division 7 for compounds, fillers, and gaskets.

3.2 ADJUST AND CLEAN:

A. Adjust operating hardware to function properly without binding, and to provide tight fit at contact points and weather-stripping.

B. Clean the completed system, inside and out, promptly after erection and installation of glass and sealants. Remove excess glazing and sealant compounds, dirt, and other substances from aluminum surfaces.

END OF SECTION

SECTION 08 55 13 – IMPACT RESISTANT WINDOWS AND GLASS

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 WORK INCLUDED

A. Furnish and install Impact Resistant Aluminum Windows complete with all required hardware and related components as shown on drawings and as specified in this section.

B. All windows shall be United States Bullet Proofing USAW400 Series. Other manufacturers requesting approval to bid alternate products as equal must submit information as required by Section 01600 of these specifications, establishing the alternate product as an equal to the specified product, in respect to the performance, testing and all other criteria as noted in this specification and associated drawings and plans.

C. Windows shall be shipped factory assembled to the maximum extent possible given size, shipping, and installation restrictions.

1.3 RELATED WORK

A. Items Furnished But Not Installed

1. Bolts and anchors necessary to comply with blast analysis performed in Section 1.05.B.
2. Gasket Material and Blast/Ballistic Glazing noted in Section 2.01.

1.4 TESTING AND PERFORMANCE REQUIREMENTS

A. Manufacturer shall provide written documentation that the product system has been tested and passed the FEMA 361, Section 6 Performance Criteria for Debris. Federal Emergency Management Agency. First Addition, July 2000.

B. Complete product system shall meet ASTM E 330-02, Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.

C. Proof of compliance shall be provided with submittal of Shop Drawings.

D. Environmental Requirements:

1. Air filtration shall not exceed .09 cfm per square foot with a pressure differential of 6.24 psf, equal to 50 mph wind (ASTM E283-99).

2. No uncontrolled water penetration shall occur when subjected to both a static and dynamic water penetration test with a pressure differential of 8 psf, equal to 56 mph wind (ASTM E331-00, ASTM E 547-00, and AAMA 501.1).

E. Deflection during a Uniform Load Structural Test shall not exceed 0.01" when tested at 60.0 psf (positive) and 60.0 psf (negative) when held in test for 10 seconds (ASTM 330-97).

1.5 QUALITY ASSURANCE

A. Provide test reports from nationally recognized testing laboratories, as required, certifying the performance requirements specified in Section 1.4 when requested.

B. Drawings and specifications are based on United States Bullet Proofing Model USAW400 bullet/blast window system. Whenever substitute products are to be considered, supporting technical literature, samples, drawings and performance data must be submitted ten days prior to bid in order to make a valid comparison of products involved.

C. During production of these windows, the manufacturer shall make his facilities available for inspection by representatives of the owner to verify compliance with drawings and specifications.

D. The manufacturer shall maintain on staff, a professional engineer, licensed by at least one of the fifty states.

1.6 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Shop Drawings:

1. The manufacturer shall provide complete shop drawings for owner/architect review and approval prior to fabrication. Dimensions, glazing, color and quantity shall be indicated.
2. Provide testing reports and certification the system meets the FEMA 361, Section 6 Performance Criteria for Debris. Federal Emergency Management Agency. First Addition, July 2000 requirements.

1.7 DELIVERY, STORAGE AND HANDLING

A. Each Impact Resistant Aluminum Window or Windows shall be securely crated to prevent damage during shipment. Each box shall be marked with the identification of the unit and the shipping address. The weight and cubes shall be indicated. Each box is shall be marked with "Up" arrows, indicating how the box it to be transported and stored.

B. Crated Windows shall not be stored for long periods of time. If long storage is unavoidable due to delay in construction schedules, the crated windows shall be placed in a dry warehouse with moderate temperatures. (High temperatures and humidity can cause formation of vapor inside the wrapping, resulting in oxidation or corrosion of parts).

C. All boxes shall be placed in the upright position as indicated by the up arrows. They shall not lean against a wall. The boxes shall not be placed in close proximity of new cement or plaster walls. In the event that water penetrates the storage space, the units shall be unboxed to prevent internal damage.

1.8 WARRANTY

A. Impact Resistant Aluminum Windows:

1. All necessary replacement of parts and adjustments not occasioned by accident or misuse shall be made at the vendor's expense when notified within 30 days after customer receipt of product.

2. All products are warranted for a period of one year from the date of customer receipt. During warranty period, all defects not caused by attack, accident or misuse through fault or negligence by the customer shall be adjusted or replaced at the vendor's expense (excluding transportation costs).
3. Total Window System: The contractor shall assume full responsibility and warrant for one year the satisfactory performance of the total window installation which includes that of the windows, hardware, glass, glazing, anchorage and setting system, sealing, flashing, etc, as it relates to air, water and structural adequacy as called for in the specifications and approved shop drawings. Any deficiencies due to such elements not meeting the specifications shall be corrected by the contractor at his expense during the warranty period

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum extrusion shall be 6063T5 alloy and temper or equal or with a minimum tensile strength of 22.0 ksi and a yield strength of 16.0 ksi.

B. All fasteners shall be zinc coated. There shall be no exposed fasteners.

C. The glazing gasket material shall be a composition of Thermoplastic Elastomer (TPE 65AB) and Polyolefin Foam Concentrate. (Resulting in a 55 to 65 Shore "A" durometer).

D. Thermal Barrier - A thermal barrier shall be utilized to separate exterior and interior framing. The glazing shall be 1 ¼” thick USBP 361 glass and polycarbonate glazing or thickness required to meet FEMA 361, Section 6 Performance Criteria for Debris requirements.

2.2 FABRICATION

A. All aluminum frames shall have minimum wall thickness of 0.125 inches. All fasteners shall be concealed on the unexposed sides of the frame. The visible front and back portions of the frame shall have a smooth appearance.

B. Frame size shall be 2 ½" W x 4 ½" D standard. All joints and connections shall be tight providing hairline joints and true alignment of adjacent members.

C. Units shall be field glazed utilizing the Gasket Material noted in 2.01.C. Glazing or retrofit shall be performed from the exterior.

D. Finish: Anodic. Finish all exposed areas of Impact Resistant Aluminum Windows and components with electrolytically deposited color in accordance with Aluminum Association designation: Bronze Anodized - AA-M12-C22

PART 3 - EXECUTION

3.1 INSTALLATION

A. Impact Resistant Aluminum Windows shall be installed, glazed and adjusted by experienced personnel in accordance with approved shop drawings, specifications and manufacturer's instructions.

B. All items in this section shall be set in their correct location and shall be set level, square, plumb and at proper elevations and in alignment with other work.

C. Special care shall be taken by the installer to ensure that impact side of the impact resistant glazing faces the threat axis.

END OF SECTION

SECTION 08 81 00 - GLASS AND GLAZING**Error! Bookmark not defined.**

PART 1 - 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 DESCRIPTION OF WORK:

A. Definitions: "Glass" includes prime glass, processed glass, and fabricated glass products. "Glazing" includes glass installation and materials use to install glass. Types of work in this section include glass and glazing for:

1. Window units, not indicated as "pre-glazed."

2. Window wall/store front construction.

3. Entrances and other doors, not indicated as "pre-glazed".

4. Fixed glass in hollow metal frames.

5. "Glass products" is hereby defined to include glazing plastics.

1.3 REFERENCES;

A. ANSI Z97.1 - American National Standard for Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.

B. ASCE 7 - "Minimum Design Loads for Buildings and Other Structures".

C. ASTM International (ASTM):
1. ASTM C 162 - Standard Terminology of Glass and Glass Products.
2. ASTM C 1036 - Standard Specification for Flat Glass.
3. ASTM C 1048 - Standard Specification for Heat-Treated Flat Glass -- Kind HS, Kind FT Coated and Uncoated Glass.
4. ASTM C 1172 - Standard Specification for Laminated Architectural Flat Glass.
5. ASTM C 1376 - Standard Specification for Pyrolitic and Vacuum Deposition Coatings on Flat Glass.
6. ASTM E 2188 - Standard Test Method for Insulating Glass Unit Performance.
7. ASTM E 2189 - Standard Test Method for Testing Resistance to Fogging in Insulating Glass Units.
8. ASTM E 2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.

1.4 DEFINITIONS:

A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or other specified gas.

D. Sealed Insulating Glass Unit Surface Designations:
1. Surface 1 - Exterior surface of the outer glass lite.
2. Surface 2 - Interspace surface of the outer glass lite.
3. Surface 3 - Interspace surface of the inner glass lite.
4. Surface 4 - Interior surface of the inner glass lite.

1.5 PERFORMANCE REQUIREMENTS:

A. General: Provide glass capable of withstanding thermal movement and wind and impact loads (where applicable) as specified in paragraph B following.

B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
a. Design Wind Loads: Determine design wind loads applicable to the Project according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.
1) Basic Wind Speed: Refer to structural drawings.
2) Importance Factor: Refer to structural drawings.

C. Thermal Movements: Provide glazing that allows thermal movements resulting from ambient and surface temperatures changes acting on glass framing members and glazing components.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites 1/4 inch (6.0 mm) thick.
2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
3. Center-of-Glass Values: Based on using LBL-44789 WINDOW 5.0 computer program for the following methodologies:
a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. per h per degree F.
b. Solar Heat Gain Coefficient: NFRC 200.

c. Solar Optical Properties: NFRC 300

1.6 SUMBITTALS:

A. Submit under provisions of Section 01 33 00.

B. Product Data: For each glass product and glazing material indicated.

C. Verification Samples: For the following products, in the form of 12 inch (305 mm) square samples for insulating glass units.

D. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

E. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
1. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer.

F. Qualification Data: For installers.

G. Product Test Reports: For each of the following types of glazing products.
1. Tinted float glass.
2. Coated float glass.
3. Insulating glass.

H. Warranties: Special warranties specified in this Section.

1.7 QUALITY ASSURANCE:

A. Fabricator Qualifications: Vitro Certified Fabricator Network, as acceptable to the manufacturer.

B. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association Glazier Certification Program as Level-2 (Senior Glaziers) or Level-3 (Master Glaziers).

C. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type: Clear float glass, coated float glass and insulating glass.

D. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

E. Glazing Publications: Comply with published recommendations of glass product manufacturers and industry organizations, including but not limited to those below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. FGIA Publication for Insulating Glass: SFGIA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."
2. NGA Publications: “Laminated Glazing Reference Manual”; “Glazing Manual.”
3. AAMA: “Sloped Glazing Guidelines.”
4. FGIA: “Guidelines for Sloped Glazing.”

F. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following testing and inspecting agency:
1. Insulating Glass Certification Council.
2. Associated Laboratories, Inc.
3. Fenestration and Glazing Industry Alliance.

G. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201 and, Fenestration and Glazing Industry Alliance ANSI Z97.1.
1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
2. Lites more than 9 sq ft (0.84 sq m) in area are required to be Category II materials.
3. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sf (0.84 sq m) in area, provide glazing products that comply with Category II materials, and for lites 9 sf (0.84 sq m) or less in area, provide glazing products that comply with Category I or II materials.

1.8 DELIVERY, STORAGE, AND HANDLING:

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.9 WARRANTY:

A. Manufacturer's Warranty for Coated-Glass Products: Manufacturer's standard form, made out to the glass fabricator in which the coated glass manufacturer agrees to replace coated glass units that deteriorates during normal use within the specified warranty period. Deterioration of the coated glass is defined as peeling and/or cracking, or discoloration that is not attributed to glass breakage, seal failure, improper installation, or cleaning and maintenance that is contrary to the manufacturer’s written instructions.
1. Warranty Period: 10 years from date of manufacture.

B. Manufacturer's Warranty on Insulating Glass: Manufacturer's standard form in which the insulating glass unit manufacturer agrees to replace insulating-glass units that deteriorate during normal use within the specified warranty period. Deterioration of insulating glass units is defined as an obstruction of vision by dust, moisture, or a film on the interior surfaces of the glass caused by a failure of the hermetic seal that is not attributed to glass breakage, improper

installation, or cleaning and maintenance that is contrary to the manufacturer's written instructions.

1. Warranty Period: 10 years from date of manufacture.

C. Manufacturer's Warranty on Laminated Glass: Manufacturer's standard form in which the laminated glass manufacturer agrees to replace laminated glass units that deteriorate during normal use within the specified warranty period. Deterioration of laminated glass is defined as defects, such as discoloration, edge separation, or blemishes exceeding those allowed by ASTM C 1172 that are not attributed to glass breakage, improper installation, or cleaning and maintenance that is contrary to the manufacturer's written instructions.

1. Warranty Period: 10 years from date of manufacture

PART 2 - PRODUCTS

2.1 MANUFACTURER:

A. Acceptable Manufacturer: Vitro Architectural Glass; Glass Technology Center, 400 Guys Run Rd., Cheswick, PA 15024. ASD. Toll Free Tel: (855) 887-6457. Fax: (800) 367-2986. Web: http://www.vitroglazings.com.

B. Equal products of other manufacturers are acceptable.

2.2 GLASS PRODUCTS:

A. Annealed Float Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; of class indicated.

B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
2. Provide Kind HS (heat-strengthened) float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
3. For uncoated glass, comply with requirements for Condition A.
4. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
5. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat-strengthened) float glass where safety glass is indicated or required.

C. Sputter-Coated Float Glass: ASTM C 1376, float glass with metallic-oxide or -nitride coating deposited by vacuum deposition process after manufacture and complying with other requirements specified.

D. Tempered Patterned Glass: ASTM C 1048, Kind FT (fully tempered), Type II (patterned flat glass), Class 1 (clear), Form 3 (patterned); and of quality, finish, and pattern specified.

E. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 2188 / E 2189 for and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.
   1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
   2. Provide Kind FT (fully tempered) glass lites where safety glass is indicated or required.
   3. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
   4. Sealing System: Comply with requirements in Section 07 92 00 - Joint Sealants. Dual seal, with primary and secondary sealants of polyisobutylene and silicone.
   5. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:
      a. Spacer Material: Aluminum with mill or clear anodic finish.
      b. Desiccant: Molecular sieve or silica gel, or blend of both.
      c. Corner Construction: Manufacturer's standard corner construction.

F. Plexiglass: ¼” clear

G. Obscure Glass: Basis of Design equal to Florentine

H. Spandrel Panel: Where located in the drawings, provide insulated spandrel panel, color as selected by architect.

2.3 FABRICATION OF GLAZING UNITS:

A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements

2.4 GLASS SCHEDULE, INSULATING GLASS:

A. Type: Low-E Tinted Insulating Glass - Bronze, low-reflective exterior appearance.
   1. Solarban 60 (2) Solarbronze + Clear by Vitro Architectural Glass.
   2. Performance Values: VLT 42 percent exterior; SHGC 0.28; exterior reflectance 7 percent; U-value winter 0.29; 1.50 LSG.
   3. Insulating Glass Unit Construction: 1/4 inch (6 mm) Solarban 60 (2)Solarbronze + 1/2 inch (13 mm) air space + 1/4 inch (6 mm) Clear glass coated on third surface (3).
      a. Furnish Spandrel glass interior lite where indicated on the drawings.

2.5 GLASS SCHEDULE, MONOLITHIC GLASS:

A. Type: Uncoated Ultra-Clear Float Glass. Outdoor Appearance: Ultra-clear.
   1. Clear Color: Starphire by Vitro Architectural Glass.
   2. Performance Values for 1/4 inch (6 mm) Glass:

a. VLT: 91 percent. U-Value Winter: 1.02. U-Value Summer: 0.93. SHGC: 0.90 Shading Coefficient: 1.03 Outdoor Visible Light reflectance: 8 percent.

PART 3 - EXECUTION

3.1 STANDARDS AND PERFORMANCE:

A. Watertight and airtight installation of each glass product is required, except as otherwise shown. Each exterior installation must withstand normal temperature changes, 25-lb. wind loading, impact loading (for operating sash and doors), without failure including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glazing materials and other defects in the work.

B. Protect glass from edge damage during handling and installation, and subsequent operation of glazed components of the work. During installation, discard units with significant edge damage or other imperfections.

C. Install insulating glass units to comply with recommendations by Sealed Insulating Glass Manufacturers Association, except as otherwise specifically indicated or recommended by glass and sealant manufacturers.

3.2 PREPARATION FOR GLAZING:

A. Clean glazing channel and other framing members to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to substrate. Remove lacquer from metal surfaces where elastomeric sealants are used.

3.3 GLAZING:

A. Install setting blocks of proper size in sill rabbet located 1/4th of glass width from each corner. Set blocks in thin course of heel-bead compound, if any.

B. Gasket Glazing: Miter cut and bond ends together at corners where gaskets are used for channel glazing, so that gaskets will not pull away from corners and result in voids or leaks in glazing system.

3.4 CURE, PROTECTION AND CLEANING:

A. Protect exterior glass from breakage immediately upon installation, by use of crossed streamers attached to framing and held away from glass. Do not apply markers to surfaces of glass. Remove non-permanent labels and clean surfaces. Cure sealants for high early strength and durability.

B. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.

C. Wash and polish glass on both faces not more than four days prior to date scheduled for inspections intended to establish date of substantial completion in each area of project. Comply with glass product manufacturer's recommendations for final cleaning.

END OF SECTION

SECTION 09 21 16 – GYPSUM DRYWALL ASSEMBLIES

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 WORK INCLUDED

A. Gypsum drywall applied to metal stud framing and furring support system.

B. Drywall finishing (joint tape and compound treatment).

1.3 QUALITY ASSURANCE

A. Fire-Resistance Rating: Where gypsum drywall systems with fire resistance ratings are indicated, provide materials and installations which are identical with those of applicable assemblies tested per ASTM E 119 by fire testing laboratories acceptable to authorities having jurisdiction.

B. Provide fire resistance rated assemblies identical to those indicated by reference to GA File No's. in GA "Fire Resistance Design Manual" or to design designations in UL "Fire Resistance Directory" or in listing of other testing and agencies acceptable to authorities having jurisdiction.

C. Gypsum Board Terminology Standard: GA 505 by Gypsum Association.

D. Single-Source Responsibility: Obtain gypsum board products from a single manufacturer, or from manufacturers recommended by the prime manufacturer of gypsum boards.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's product specifications and installation instructions for each gypsum drywall component, including other data as may be required to show compliance with these specifications.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and in manner to keep them dry, protected from weather, direct sunlight, surface contamination, corrosion and damage from construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.

C. Handle gypsum boards to prevent damage to edges, ends or surfaces. Protect metal corner beads and trim from being bent or damaged.

1.6 PROJECT CONDITIONS

A. Environmental Requirements, General: Comply with requirements of referenced gypsum board application standards and recommendations of gypsum board manufacturer, for environmental conditions before, during and after application of gypsum board.

B. Cold Weather Protection: When ambient outdoor temperatures are below 55 deg F (13 deg C) maintain continuous, uniform, comfortable building working temperatures of not less than 55 deg F (13 deg C) for a minimum period of 48 hours prior to, during and following application of gypsum board and joint treatment materials or bonding adhesives.

C. Ventilation: Ventilate building spaces as required to remove water in excess of that required for drying of joint treatment material immediately after its application. Avoid drafts during dry, hot weather to prevent too rapid drying.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

B. Metal Support Materials:

1. Super Stud Building Products, Inc.

2. ClarkDietrich Building Systems

3. Marino\Ware

C. Gypsum Boards and Related Products

1. American Gypsum Co.

2. Flintkote Products,

3. Genstar Building Materials Co.

4. Georgia Pacific Corp.

5. National Gypsum Co./Gold Bond Building Products Div.,

6. United States Gypsum Co.

2.2 WALL/PARTITION SUPPORT MATERIALS:

A. Studs: Meeting requirements of ASTM C645; C-channel, roll-formed from hot-dipped galvanized steel; complying with ASTM A1003 and ASTM A653 G40 or equivalent corrosion resistant coating. (A40 Galvannealed products are unacceptable per ASTM C 645). 20 ga. thickness of base metal unless otherwise indicated. Each door and window frame jamb reinforced with two 20 ga. studs.

1. Subject to compliance with requirements, provide ClarkDietrich ProStud Framing [20 gauge-equivalent]. ProStud Fire rated partitions to be installed in accordance with UL V450 or UL V438 or UL U419.

2. Depth of Section: 3-5/8", except 6” or 8” where indicated.

3. Runners: Match studs; type recommended by stud manufacturer for floor and ceiling support of studs and for vertical abutment of drywall work at other work.

B. Headers and Jambs: Manufacturer’s proprietary shape used to form header beams and jambs, columns or posts, of web depths indicated, unpunched, with stiffened flanges and as follows:

1. Subject to compliance with requirements, provide one of the following:

2. ClarkDietrich Metal Framing: Heavy Duty Studs - HDS and Header Bracket - HDSC

3. Brady Innovations ProX Header®

C. Channel Bridging and Bracing: U-Channel Assembly; Base metal thickness of .0538 inch (1.37mm) and minimum ½ inch (12.7mm) wide flanges. Subject to compliance with requirements, provide one of the following:

1. ClarkDietrich Metal Framing: Spazzer® 9200 Bridging and Bracing Bar

2. U-Channel Assembly: [3/4 inches] [1-1/2 inches] [2 inches]

3. ClarkDietrich Metal Framing; EasyClip™ U-Series™ Clip Angle or equivalent.

D. Furring Members: ASTM C 645; 0.0179" min. thickness of base metal, hat-shaped.

1. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch or 1 ½” deep as shown on plan.
   a. Minimum Base Metal Thickness: 20 gauge.

E. Fasteners for Furring Members: Type and size recommended by furring manufacturer for the substrate and application indicated.

2.3 GYPSUM BOARD

A. Gypsum Wallboard ASTM C 36, of types, edge configuration, and thickness indicated below in maximum lengths available to minimize end-to-end butt joints.

1. Type: Type X panels with abuse, moisture, and mold resistance throughout unless otherwise noted.

2. Edges: Tapered and featured (rounded or beveled) for prefilling.

3. Thickness: 5/8", unless otherwise indicated.

B. Water-Resistant: ASTM C1278, with tapered edges and of the type and thickness indicated below in maximum lengths available to minimize end-to-end butt joints.

1. Type: Type X panels with abuse, moisture, and resistance to moisture and mold resistance.

2. Thickness: 5/8", unless otherwise indicated.

3. Location: Where ceramic tiles are specified on walls.

C. Acoustically Enhanced Gypsum Board: Basis of design Product: Gold Bond Building Products, LLC provided by National Gypsum Company, Gold Bond SoundBreak XP.

1. Type: Type X panels with sound-damping, abuse, moisture, and mold resistance.

2. Thickness: 5/8", unless otherwise indicated. Inner Layer: viscoelastic damping polymer. Outer layer: enhanced high-density mold-resistant gypsum board.

3. Edges: Tapered

4. Mold resistance: ASTM D 3273, score of 10. ASTM G21, score of 0.

5. Location: Where indicated on drawings.

2.4 TRIM ACCESSORIES

A. General: Provide manufacturer's standard trim accessories of types indicated for drywall work, formed of galvanized steel unless otherwise indicated, with either knurled and perforated or expanded flanges for nailing or stapling, and beaded for concealment of flanges in joint compound. Provide corner beads, L type edge trim beads, U type edge trim beads, special L kerf type edge trim beads, and one-piece control joint beads.

2.5 JOINT TREATMENT MATERIALS

A. General: ASTM C 475; type recommended by the manufacturer for the application indicated, except as otherwise indicated. Include molding at locations where gypsum board abuts dissimilar materials.

B. Exterior Joint Compound: Special chemical hardening type for exterior application.

C. Joint Tape: Paper reinforcing tape.

D. Joint Compound: Ready mixed vinyl type for interior use.

E. Grade: Two separate grades; one specifically for bedding tapes and filling depressions and one for topping and sanding.

F. Water-Resistant Joint Compound: Special water resistant type for treatment of joints, fastener heads and cut edges of water resistant backing board.

G. Product: Subject to compliance with requirements, provide Sheetrock Brand W/R Compound; United States Gypsum Co.

2.6 MISCELLANEOUS MATERIALS

A. General: Provide auxiliary materials for gypsum drywall work of the type and grade recommended by the manufacturer of the gypsum board.

B. Laminating Adhesive: Special adhesive or joint compound specifically recommended for laminating gypsum boards.

C. Gypsum Board Screws: Comply with ASTM C 646.

D. Gypsum Board Nails: Comply with ASTM C 514.

E. Sound Attenuation Blankets: FS HH I 251, Type I; semi rigid mineral fiber blanket without membrane, Class 25 flame spread, and thickness as indicated.

PART 3 - EXECUTION

3.1 GENERAL: Metal Support Installation Standard: Comply with ASTM C 754. Ultra Steel Fire Rated Partitions to be installed in accordance with UL V450 or UL V438 or UL U419.

1. Do not bridge building expansion joints with support system, frame both sides of joints with furring and other support as indicated.

3.2 WALL/PARTITION SUPPORT SYSTEMS

A. Install supplementary framing, blocking and bracing at terminations in the work and for support of fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, and similar work to comply with details indicated or if not otherwise indicated, to comply with applicable published recommendations of gypsum board manufacturer, or if not available, of "Gypsum Construction Handbook" published by United States Gypsum Co.

B. Extend partition stud system through ceilings and elsewhere as indicated to the structural support or substrate above the ceiling.

C. Frame door openings to comply with details indicated or if not otherwise indicated, to comply with applicable published recommendations of gypsum board manufacturer, or if not available, of "Gypsum Construction Handbook" published by United States Gypsum Co. Attach vertical studs at jambs with screws either directly to frames or to jambs anchor clips on door frames. Install runner track section at head and secure to jamb studs.

D. Extend vertical jamb studs through ceilings and attach to underside of floor or roof structure above, unless otherwise indicated.

E. Frame openings other than door openings in same manner as required for door openings. Install framing below sills of openings to match framing required above door heads.

F. Erect sound attenuation blanket vertically between studs and hold in place until gypsum board is installed.

G. Erect fiberglass batt insulation vertically between studs and hold in place until gypsum board is installed.

3.3 HAT SHAPED, RIGID FURRING CHANNELS:

A. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (600 mm) o.c.

B. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches (300 mm) from corner and cut insulation to fit.

C. Space wall furring members 16" o.c., unless otherwise indicated.

3.4 GYPSUM BOARD APPLICATION AND FINISHING STANDARDS

A. ASTM C 840 and GA 216

B. Locate exposed end butt joints as far from center of walls and ceilings as possible, and stagger not less than 1'-4” in alternate courses of board.

C. Install ceiling boards in the direction and manner which will minimize the number of end butt joints, and which will avoid end joints in the central area of each ceiling. Stagger end joints at least 1'0", screws at 12" o.c.

D. Install wall/partition boards vertically to avoid end butt joints wherever possible.

E. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16" open space between boards. Do not force into place.

F. Locate edge joints over supports or where intermediate supports or gypsum board back blocking is provided behind end joints. Position boards so that like edges abut, tapered edges against tapered edges and mill cut or field cut ends against mill cut or field cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.

G. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cutouts.

H. Form control joints and expansion joints with space between edges of boards, prepared to receive trim accessories.

I. Space fasteners in gypsum boards in accordance with referenced standards and manufacturer's recommendations, except as otherwise indicated.

J. Cover both faces of steel stud partition framing with gypsum board in concealed spaces (above ceiling, etc.), where partitions are to extend to deck above.

3.5 CEILINGS:

A. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 1'0" in alternate courses of board.

B. Install ceiling boards in the direction and manner which will minimize the number of end-butt joints, and which will avoid end joints in the central area of each ceiling. Stagger end joints at least 1'0", screws at 12" o.c.

C. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16" open space between boards. Do not force into place.

D. Locate edge joints over supports or where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so that like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field-cut ends. Do not place tapered edges against cut edges or ends.

E. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cutouts.

F. Form control joints and expansion joints with space between edges of boards, prepared to receive trim accessories.

G. Space fasteners in gypsum boards in accordance with referenced standards and manufacturer's recommendations, except as otherwise indicated.

3.6 METHODS OF GYPSUM DRYWALL APPLICATION

A. On partitions/walls apply gypsum board vertically (parallel), unless otherwise indicated, and provide sheet lengths which will minimize end joints.

B. Single-Layer Application:

1. Install gypsum wallboard:
   a. On ceiling apply gypsum board prior to wall/partition board application to the greatest extent possible.
   b. On partitions/walls apply gypsum board vertically (parallel), unless otherwise indicated, and provide sheet lengths which will minimize end joints.

C. Double-Layer Application:

1. Install gypsum wallboard for base layer and exposed gypsum board for face layer.

2. On partitions/walls apply base layer and face layers vertically (parallel) with joints of base layer over supports and face layer joints offset at least 10" with base layer joints.

D. Single-Layer Fastening Methods:

1. Apply gypsum boards to supports as follows: Fasten at 16" o.c., in field and 16" o.c. on edges.

E. Double-Layer Fastening Methods:

1. Fasten both base layers and face layers separately to supports as follows: Base layer at 16" o.c. in field and on edges.

3.7 INSTALLATION OF DRYWALL TRIM ACCESSORIES

A. Use screws to anchor trim accessory flanges trim to the studs.

B. Install metal corner beads at external corners of drywall work.

C. Attach corner beads at 16" o.c. with screws on both legs.

D. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi exposed. Provide type with face flange to receive joint compound. Install L type trim where work is tightly abutted to other work. Install U type trim where edge is exposed, revealed, gasketed, or sealant filled (including expansion joints).

3.8 FINISHING OF DRYWALL

A. General: Apply treatment at all gypsum board joints (both directions), flanges of trim accessories, penetrations, fasteners heads, surface defects and elsewhere as required to prepare work for decoration whether decoration is specified or not. Prefill open joints and rounded or beveled edges, if any, using type of compound recommended by manufacturer.

B. Apply joint tape at joints between gypsum boards, except where trim accessories are indicated.

C. Apply joint compound in three coats (not including prefill of openings in base) and sand between last two coats and after last coat.

D. Water-Resistant Gypsum Board Base: Treat joints and fasteners to comply with directions of water resistant joint compound manufacturer.

E. In areas to be tiled, treat fastener heads with water resistant joint compound. Fill tapered edges in gypsum panels with water resistant joint compound, embed joint tape firmly and wipe off excess compound; follow immediately with a second coat of water resistant joint compound over taping coat, being careful not to crown the joint. Fold and embed tape in all interior angles to form true angles.

F. In areas not to be tiled, treat fastener heads and embed tape as indicated above using water resistant joint compound but finish with two coats of joint compound used for regular gypsum board work.

G. Partial Finishing: Omit third coat (if specified) and sanding on concealed drywall work which is indicated for drywall finishing or which requires finishing to achieve fire resistance rating, sound rating or to act as smoke barrier.

H. Refer to sections on painting, coatings and wall coverings in Division 9 for decorative finishes to be applied to drywall work.

3.9 PROTECTION OF WORK

A. Provide final protection and maintain conditions, in a manner suitable to Installer, which ensures gypsum drywall work being without damage or deterioration at time of substantial completion.

END OF SECTION

SECTION 09 51 23- ACOUSTICAL CEILINGS

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 DESCRIPTION OF WORK:

A. Extent of each type of acoustical ceiling is shown and scheduled on drawings. Types of acoustical ceilings specified in this section include the following: Acoustical panel ceilings, exposed suspension.

1.3 QUALITY ASSURANCE:

A. Installer: Firm with not less than three years of successful experience in installation of acoustical ceilings similar to requirements for this project and which is acceptable to manufacturer of acoustical units as shown by current written statement from manufacturer.

B. Fire Performance Characteristics: Provide acoustical ceiling components that are identical to those tested for the following fire performance characteristics according to ASTM test method indicated by UL or other testing and inspecting agency acceptable to authorities having jurisdiction. Identify acoustical ceiling components with appropriate marking of applicable testing and inspecting agency.

C. Surface Burning Characteristics: As follows, tested per ASTM E 84.

D. Flame Spread: 25 or less.

E. Smoke Developed: 50 or less.

F. Coordination of Work: Coordinate layout and installation of acoustical ceiling units and suspension system components with other work supported by or penetrating through, ceilings, including light fixtures, HVAC equipment.

1.4 SUBMITTALS:

A. Product Data: Manufacturer's product specifications and installation instructions for each acoustical ceiling material required and for each suspension system including certified laboratory test reports and other data as required to show compliance with these specifications.

B. Samples: Set of 6" x 4" square samples for each acoustical unit required showing full range of exposed color and texture to be expected in completed work and one set of 12" long samples of each exposed runner and molding.

1.5 DELIVERY, STORAGE AND HANDLING:

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination or other causes.

B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

1.6 JOB CONDITIONS:

A. Space Enclosure: Do not install interior acoustical ceilings until space enclosed and weatherproof, and until wet-work in space completed and nominally dry, and until work above ceilings completed, and until ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

PART 2 - PRODUCTS

2.1 ACOUSTICAL CEILING UNITS, GENERAL:

A. Standard for Acoustical Ceiling Units: Provide manufacturer's standard units of configuration indicated which are prepared for mounting method designated and which comply with FS SS-S-118 requirements including those indicated by reference to type, form, pattern, grade (NRC or NIC' as applicable), light reflectance coefficient (LR), edge detail, and joint detail (if any).

B. Colors, Textures, and Patterns: Provide products as selected by Architect from manufacturer's standard colors, surface textures, and patterns available for acoustical ceiling units and exposed metal suspension system members of quality designated.

2.2 ACOUSTICAL PANELS:

A. Non-Fire Rated Mineral Composition with Standard Washable Painted Finish:

1. Armstrong Fine Fissured #1728: Square edge, white, 24" x 24" x 5/8". (LAT-2 On Drawings)

2. Armstrong Clean Room VL #868 Tiles: Square Edge, white 24 x 24 x 5/8” (LAT-1 On Drawings) Use in all clean room areas. **Used with Armstrong Gasketed Clean Room Suspension System 15/16**”. **Provide hold down clips and boarder clips at areas with positive pressure.**

3. Available Products: Subject to compliance with requirements, products which may be incorporated in the work are limited to the following manufacturers:
   a. Armstrong World Industries, Inc.
   b. United States Gypsum Co.

c. Celotex

2.3 EXPOSED METAL DIRECT-HUNG SUSPENSION SYSTEMS:

A. Standard for Metal Suspension Systems: Provide metal suspension systems of type, structural classification and finish indicated which comply with applicable ASTM C 635 requirements.

B. Non-Fire Rated Double Web Steel Suspension System:

1. Structural Classification: Intermediate duty system. ASTM C 635.

2. Available Products: Subject to compliance with requirements, products which may be incorporated in the work are limited to the following manufacturers:
   a. Armstrong World Industries
   b. Chicago Metallic Corp.
   c. Celotex
   d. Donn Corp.

3. Finish:
   a. Painted, white.

2.4 METAL SUSPENSION SYSTEMS, GENERAL:

A. Finishes and Colors: Provide manufacturer's standard finish for type of system indicated, unless otherwise required. For exposed suspension members and accessories with painted finish, white.

B. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table I, Direct Hung.

C. Concrete Inserts: Inserts formed from hot-dipped galvanized sheet steel and designed for attachment to concrete forms and for embedment in concrete with holes or loops for attachment at hanger wires.

D. Hanger Wire: Galvanized carbon steel wire, ASTM A 641, soft temper, prestretched, Class 1 coating, sized so that stress at three times hanger design load (ASTM C 635, Table I, Direct Hung), will be less than yield stress of wire, but provide not less than 12 gauge.

E. Edge Moldings and Trim: Metal manufacturer's standard molding for edges and penetrations of ceiling which fits with type of edge detail and suspension system indicated.

F. Edge Molding Trim: Metal or extruded plastic provide manufacturer's standard molding for edges, external corners and penetrations of ceiling which fits with type of edge detail and suspension system specified herein.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half width units at borders, and comply with reflected ceiling plans wherever possible.

3.2 INSTALLATION:

A. General: Install materials in accordance with manufacturer's printed instructions, and to comply with governing regulations, fire resistance rating requirements as indicated, and industry standards applicable to work.

B. Install suspension systems to comply with ASTM C 636 with hangers supported only from building structural members. Locate hangers near each end and spaced 4'-0" along each carrying channel or direct-hung runner, unless otherwise indicated, leveling to tolerance of 1/8" in 12'0". Provide hanger at each corner of lay-in light fixtures when light fixtures exceed normal design weight.

C. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye-screws, or other devices which are secure and appropriate for substrate, and which will not deteriorate or fail with age or elevated temperatures.

D. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum which are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal force by bracing, countersplaying or other equally effective means.

E. Install edge moldings at perimeter of acoustical ceiling area and at locations where necessary to conceal edges of acoustical units.

F. Screw-attach moldings to substrate at intervals not over 16" o.c. and not more than 3" from ends, leveling with ceiling suspension system to tolerance of 1/8" in 12'-0". Miter corners accurately and connect securely.

G. Miter external corners at all exterior corners of wall mold.

H. Install acoustical panels in coordination with suspension system, with edges concealed by support of suspension members. Scribe and cut panels to fit accurately at borders and at penetrations.

3.3 ADJUST AND CLEAN:

A. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members; comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work which cannot be successfully cleaned and repair to permanently eliminate evidence of damage.

3.4 EXTRA STOCK:

A. Deliver stock of maintenance material to Owner. Furnish maintenance material matching products installed, packaged with protective covering for storage and identified with appropriate labels.

B. Acoustical Ceiling Units: Furnish quantity of full size units equal to 2.0% of amount installed.

END OF SECTION

SECTION 09 90 00 - PAINTING

PART 1 - 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 the work specified in this section.

1.2 DESCRIPTION OF WORK:

A. Extent of painting work is shown on drawings and schedules, and as herein specified.

B. The work includes the painting or finishing of materials at both the interior and exterior of the building.

C. Examine other sections of these specifications, as well as the mechanical and electrical specifications for the various other trades, and become familiar with all their provisions regarding painting. All surfaces that are left unpainted by the requirements of other sections or other specifications shall be painted or finished as a part of this section.

D. "Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.

E. Paint exposed surfaces whether or not colors are designated in "schedules", except where natural finish of material is specifically noted as a surface not to be painted. Where items or surfaces are not specifically mentioned, paint same as adjacent similar materials or areas. If color or finish is not designated, Architect will select these from standard colors available for materials systems specified.

F. Following categories of work are not included as part of field-applied finish work, or are included in other sections of these specifications:

1. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, miscellaneous metal, hollow metal work, and similar items.

2. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer finishing is specified for such items as (but not limited to) metal toilet enclosures, prefinished partition systems, acoustic materials, architectural woodwork and casework, finished mechanical and electrical equipment including light fixtures, switchgear and distribution cabinets, entrance frames, doors and equipment.

3. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, foundation spaces, furred areas, pipe spaces, duct shafts and above ceilings.

4. Finished Metal Surfaces: Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting, unless otherwise indicated.

5. Operating Parts and Labels: Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts will not require finish painting, unless otherwise indicated.

6. Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name,or nomenclature plates.

1.3 SUBMITTALS:

A. Product Data: Submit manufacturer's technical information including paint label analysis and application instructions for each material proposed for use. If paint is to be other than Sherwin Williams, submit a schedule of paint equivalent to that specified.

B. Samples: Submit samples for Architect's review of color and texture only. Provide a listing of material and application for each coat of each finish sample.

C. On actual wall surfaces and other interior building components, duplicate painted finishes of prepared samples. On at least 100 sq. ft. of surface as directed, provide full-coat finish samples until required sheen, color and texture is obtained; simulate finished lighting conditions for review of in-place work.

D. Coating Maintenance Manual: Upon conclusion of the project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual, such as Sherwin-Williams “Custodian Project Color and Product Information” report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.4 DELIVERY AND STORAGE:

A. Deliver materials to job site in original, new and unopened packages and containers bearing manufacturer's name and label, and following information:
1. Name or title of material.
2. Manufacturer's name.
3. Thinning instructions.
4. Application instructions.
5. Color name and number.

1.5 JOB CONDITIONS:

A. Do not apply paint in snow, rain, fog or mist; or when relative humidity exceeds 85%; or to damp or wet surfaces; unless otherwise permitted by paint manufacturer's printed instructions.

B. Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated within temperature limits specified by the paint manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.1 COLORS AND FINISHES:

A. Prior to beginning work, the Architect will furnish color chips for surfaces to be painted.

1. Use representative colors when preparing samples for review.

2. Final acceptance of colors will be from samples applied on the job.

B. Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.

1. Lead content in pigment, if any, is limited to not more than 0.5% lead, as lead metal based on the total non-volatile (dry-film) of paint by weight.

2. This limitation is extended to interior surfaces and those exterior surfaces, such as stairs, decks, porches, railings, windows, and doors, which are readily accessible to children under seven years of age.

C. Paint Coordination: Provide finish coats that are compatible with the prime paints used. Review other sections of these specifications in which prime paints are to be provided to ensure compatibility with the total coatings system for various substrates. Upon request from other trades, furnish information on characteristics of finish materials proposed for use to ensure compatible prime coats are used. Provide barrier coats over incompatible primers or remove and reprime as required. Notify the Architect in writing of any anticipated problems using specified coating systems with substrates primed by others.

2.2 MATERIAL QUALITY:

A. Proprietary names used to designate colors or materials are not intended to imply that products of named manufacturers are required to the exclusion of equivalent products of other manufacturers, except paint for existing buildings.

B. Provide undercoat paint produced by same manufacturer as finish coats. Use only thinners approved by paint manufacturer, and use only within recommended limits.

C. Manufacturers:

D. Provide products from one of the following companies:
1. Sherwin Williams
2. PPG Industries
3. Farrell-Calhoun Paint
4. Benjamin Moore

E. Mixing required shall be done with a mechanical mixer and materials shall be thoroughly mixed. No materials shall be reduced or changed in any way except as specified. Any material that has partially set will be discarded.

F. Colors will be selected by the Architect.

2.3 INTERIOR FINISHES:

A. GYPSUM BOARD AND PLASTER:
1. All areas except ceilings noted on Finish Schedule as “PAINT shall be given:
a. One (1) coat Pro-Mar 200 0 VOC Latex Wall Primer B28W2600.
b. Two (2) coats Pro-Mar 200 0 VOC Latex Eg-Shell B20-2600 Series

B. INTERIOR METAL:
1. All pipe, rails, electrical panels, access panels, ladders, and all other ferrous metal shall be given:
a. One (1) coat Kem Kromik Rust Inhibitive Primer B50Z Series.
b. Two (2) coats Pro Industrial Water Based Urethane Alkyd B53 Series
1) B53-1250 Low Sheen

2. All interior hollow metal doors and frames shall be given:
a. One (1) coat Kem Kromik Rust Inhibitive Primer B50Z Series.
b. Two (2) coats Pro Industrial Water Based Urethane Alkyd B53 Series
1) B53-1150 Semi Gloss

C. CONCRETE FLOORS:
1. Floors indicated to be painted shall be prepped as recommended by product manufacturer’s recommendations. They shall be given:
a. Two (2) coats H & C Colortop Solvent Based Solid Color Concrete Sealer.

PART 3 - PART 3 - EXECUTION

3.1 INSPECTION:

A. Applicator must examine areas and conditions under which painting work is to be applied and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to applicator.

B. Starting of painting work will be construed as applicator's acceptance of surfaces and conditions within any particular area.

C. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.

3.2 SURFACE PREPARATION:

A. General: Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as herein specified, for each particular substrate condition.

B. All caulking shall have a suitable primer applied and two coats of paint to match adjoining surfaces to which caulking is applied.

C. Where item has been previously shop primed, all surface imperfections and rust spots will be sanded and all abrasions and scratches shall be touched-up with rust-inhibitive primer.

D. All undercoats of paint and enamel shall be tinted to the approximate shade of the final coat.

E. CEMENTITIOUS MATERIALS

1. Prepare cementitious surfaces of concrete and cement plaster to be painted by removing efflorescence, chalk, dust, dirt, grease, oils, and by roughing as required to remove glaze.

2. Determine alkalinity and moisture content of surfaces to be painted by performing appropriate tests. If surfaces are found to be sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application of paint. Do not paint over surfaces where moisture content exceeds that permitted in manufacturer's printed directions.

3. Suction spots or "hot spots" in cement shall be touched-up before applying the finish coat.

4. Voids and air holes in concrete to be painted shall be spackled or filled with plastic patch.

5. Clean concrete floor surfaces scheduled to be painted with a commercial solution of muriatic acid, or other etching cleaner. Flush floor with clean water to neutralize acid, and allow to dry before painting.

F. WOOD

1. Clean wood surfaces to be painted of dirt, oil, or other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sandpaper smooth those finished surfaces exposed to view, and dust off. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer, before application of priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dried.

2. Prime, stain, or seal wood required to be job-painted immediately upon delivery to job. Both sides of all cabinet doors shall be finished to match the face of the cabinet. Interior of cabinet and inside of wood drawers shall be given one coat of sealer. Prime edges, ends, faces, undersides, and backsides of such wood, including cabinets, counters, cases, paneling.

3. BACK PRIME all wood trim, casings, molding, etc., interior and exterior.
   a. When transparent finish is required, use spar varnish for backpriming.

4. Tops, bottoms, and cutouts of all doors shall be finished to match the door.

5. Hardwood to be finished shall be sanded smooth and surface cleaned before first coat and between coats with fine sandpaper and shall be wiped with a tack rage after each sanding.

G. FERROUS METALS:

1. Clean ferrous surfaces, which are not galvanized or shop-coated, of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning.

2. Touch-up shop-applied prime coats wherever damaged or bare where required by other sections of these specifications. Clean and touch-up with same type shop primer.

H. GALVANIZED SURFACES

1. Clean free of oil and surface contaminants with non-petroleum based solvent.

3.3 PREPARATION OF EXISTING SURFACES:

A. TO BE REPAINTED OR REFINISHED – GENERAL REQUIREMENTS

1. Remove all loose, blistered, scaled or crazed finish to bare base material surface. Wash surfaces with T.S.P. and water or other solution as required.

2. Prevent impaired bond or bleed through by removing any accumulated film of wax, oil grease, smoke or other foreign matter.

3. After washing, rinse with potable water and allow to thoroughly dry.

4. On existing high gloss or semi-gloss interior work receiving gloss finishes, wash and rinse as noted above, then wipe with liquid de-glosser or other acceptable preparation material.

5. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted, or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary, for complete painting of items and adjacent surfaces. Following completion of painting of each space or area, reinstall removed items.

6. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly-painted surfaces.

7. When recommended by paint manufacturer for surface being painted, provide primer or undercoat whether specified or not.

8. All necessary puttying of nail holes, cracks, etc., shall be done after the first coat with putty of color to match that of the finish.

B. EXISTING INTERIOR WOOD

1. Sandpaper smooth or use liquid de-glosser to remove gloss and provide a “tooth” for finish boding. Prime bare spots with specified primer for new work. Putty, glaze or spackle cracks and other Irregularities; color filler material to match stain or transparent finishes.

C. EXISTING GYPSUM WALLBOARD, CONCRETE AND MASONRY:

1. Fill minor isolated defects and damaged areas in previously painted surfaces with vinyl base spackle. Apply texture on minor work repaired under this Section as required to match existing adjacent surfaces. Using specified primer-sealer, prime all bare and newly textured surfaces scheduled to receive paint.

D. EXISTING PAINTED FERROUS METAL:

1. Sand rough edges of bare areas to Featheredge to adjacent sound paint. Remove rust and loose paint to bare metal; solvent wash, then apply prime paint.

3.4 MATERIALS PREPARATION:

A. Mix and prepare painting materials in accordance with manufacturer's directions.

B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing and application of paint in a clean condition, free of foreign materials and residue.

C. Stir materials before application to produce a mixture of uniform density, and stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

3.5 APPLICATION:

A. General: Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied and as follows:

1. Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance. Give special attention to insure that surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

B. Scheduling Painting: Apply first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

C. Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

D. MINIMUM COATING THICKNESS:

1. Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as indicated or, if not indicated, as recommended by coating manufacturer.

E. MECHANICAL AND ELECTRICAL WORK:

1. Painting of mechanical and electrical work is limited to those items exposed in mechanical equipment rooms and in occupied spaces.

2. Mechanical items to be painted include, but are not limited to, the following in finished areas:
   a. Mechanical equipment and supports.
   b. Accessory items.

3. Electrical items to be painted include, but are not limited to, the following:
   a. Panels in finished areas.

F. PRIME COATS

1. Apply prime coat of material which is required to be painted or finished, and which has not been prime coated by others.

2. Recoat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat to assure a finish coat with no burn-through or other defects due to insufficient sealing.

G. PIGMENTED (OPAQUE PAINTED) FINISHES:

1. Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.

H. TRANSPARENT FINISHES:

1. Apply stain using a blending method to achieve an even and uniform color across varying grains and natural color changes in the wood. Use multiple coats to produce glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections.

I. COMPLETED WORK:

1. Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

3.6 CLEAN-UP AND PROTECTION:

A. Clean-Up: During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each work day.

B. Protection: Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and repainting as acceptable to Architect.

C. 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.

D. At the completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

END OF SECTION

SECTION 10 14 23 – SPECIALTY SIGNS

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 DESCRIPTION OF WORK

A. Extent of specialty signs is to provide one (1) three digit number and one (1) nameplate for each new door.

B. Forms of specialty signs required include the following: Panel signs.

1.3 QUALITY ASSURANCE

A. Uniformity of Manufacturer: For each sign form and graphic image process indicated furnish products of a single manufacturer.

1.4 SUBMITTALS

A. Samples: Submit samples of each sign form and material showing finishes, colors, surface textures and qualities of manufacture and design of each sign component including graphics.

B. Shop Drawings: Submit shop drawings for fabrication and erection of specialty signs include sign wording and lettering layout.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers of Panel Signs:

1. Andco Industries Corp.
2. ASI Sign Systems Inc.
3. Best Manufacturing Co.
4. Mohawk Engraving Co., Inc.
5. Spanjer Brothers Inc.

B. Products, Numbers, and Names reference Mohawk Sign Systems, Inc. P. O. Box 966, Schenectady, NY 12301-0966. (518) 370-3433 or FAX (518) 370-3332 or approved equal.

2.3 RESTROOM SIGNS

A. Pictograph

B. The Gender and Access Symbols shall be used where indicated and be accompanied by the verbal description placed directly below the symbols. The border dimension shall be 6” minimum in height.

C. Color: As selected by Architect from manufacturer’s standard color selections.

D. Plaque Size: 8” x 8”.

E. Symbol Size: 4” access and gender with ¾” Gill Sans upper case letters and Grade 2 braille.

F. Designated on plans:

	Type	Mohawk No.	Copy
Men	Type A	MS-1	Men
Women	Type B	MS-2	Women

2.4 MODULAR ROOM SIGNS

A. Design: M-1000-M310-B, Size 6” x 6” with one 1¾” x 6” window.

B. Header Panel: Size 3” x 6”.

C. Insert Panel: Size 3” x 6” with two ¾” x 6” windows.

D. Room Number 1 ½” Gill Sans letterstyle.

E. Room name and text finish as selected by the Architect from manufacturer’s standard color selections.

F. Corners rounded.

PART 3 – EXECUTION

3.2 MOUNTING

A. Irregular and masonry surfaces: Vinyl tape and Shim plate. 1/8” thick aluminum shim plate under-cut 1” from sign size. Mount shim plate with two oval head screws. Use vinyl adhesive tape to mount sign to shim plate.

B. Smooth Surface: Use vinyl adhesive tape.

C. The signs shall be mounted 60” from the floor to the center of the sign on the latch side. The distance between the door frame and the sign should be 2”.

3.3 CLEANING AND PROTECTION

A. At completion of installation, clean soiled sign surfaces in accordance with manufacturer's instructions. Protect units from damage until acceptance by Owner.

END OF SECTION 10 14 23

SECTION 10 28 00 - TOILET ACCESSORIES

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 QUALITY ASSURANCE:

A. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete, built into masonry, or built into stud partitions; coordinate delivery with other work to avoid delay.

B. Accessory Locations: Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units.

1.3 SUBMITTALS:

A. Product Data: Submit manufacturer's technical data and installation instructions for each toilet accessory.

B. Setting Drawings: Provide setting drawings, templates, instructions, and directions for installation of anchorage devices in other work.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURES:

A. Manufacturer: Subject to compliance with requirements, provide toilet accessories by one of the following:

1. Bobrick Washroom Equip., Inc.
2. Bradley Corp.
3. A.S.I.

2.2 MATERIALS, GENERAL:

A. Stainless Steel: AISI Type 302/304 with polished No. 4 finish, 22 gauge minimum, unless otherwise indicated.

B. Galvanized Steel Mounting Devices: ASTM A 386, hot-dip galvanized after fabrication.

C. Fasteners: Screws, bolts, and other devices of same material as accessory unit or of galvanized steel where concealed.

2.3 FABRICATION:

A. General: Stamped names or labels on exposed faces of toilet accessory units are not permitted, except where otherwise indicated; inobtrusive labels on surfaces not exposed to view are acceptable.

B. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Provide concealed anchorage wherever possible.

2.4 TOILET ACCESSORIES:

Toilet accessories models and numbers listed herein are Bradley unless otherwise noted.

A. Grab Bars

1. Provide as indicated on drawings as "GB" - (Type).
2. Provide in wall anchor plate 899-015 with appropriate mounting kit at stud walls.
3. Provide front and back anchor plates with appropriate mounting kit at toilet partitions and block walls.
    a. (42) Straight Type 832-001-2 x 42"
    b. (36) Straight Type 832-001-2 x 36"
    c. (18) Straight type 832-001-2 x 18” Vertical

B. Framed Mirrors:

1. Indicated on drawings as "FM".
2. Provide Mirror at each lavatory and as noted or indicated on the drawings.
    a. 780-2436

PART 3 - EXECUTION

3.1 GENERAL:

A. Provide framing members at anchor locations of all surface mounted accessory units.

B. Provide framing members (studs) at all sides of rough opening dimension for all recessed accessory units.

3.2 INSTALLATION:

A. Install toilet accessory units in accordance with manufacturer's instructions using fasteners which are appropriate to substrate and recommended by manufacturer of unit. Install units plumb and level firmly anchored in locations and at heights indicated.

3.3 ADJUSTING AND CLEANING:

A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Clean and polish all exposed surfaces after removing labels and protective coatings.

END OF SECTION

SECTION 12 35 25 – MEDICAL FACILITIES CASEWORK

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 DESCRIPTION OF WORK

A. Extent of casework and fixtures is shown on drawings.

B. Work includes the fabrication and installation of standard casework components of base cabinets, wall cabinets, storage cabinets, tables, cabinet understructures, shelf units, counter tops, and other units as indicated.

C. Sinks, accessories and mechanical and electrical service fixtures common to medical facilities casework are included as work of this Division 23 and 26 except sinks in stainless steel counters which are included in this section.

D. Service fixtures are supplied and installed under mechanical work of Division 23 and electrical work of Division 26

1.3 QUALITY ASSURANCE

A. Single Source Responsibility: Provide casework with tops, sinks, and service fixtures, manufactured or furnished by same company for single responsibility.

B. Catalog Standards: Manufacturer’s catalog numbers are shown on drawings for convenience in identifying certain cabinet work. Unless modified by notation on drawings or otherwise specified, catalog description for indicated number constitutes requirements for each such cabinet.

C. The use of catalog numbers and specific requirements set forth in drawings and specifications are not intended to preclude the use of any other acceptable manufacturer's product or procedures which may be equivalent but are given for purposes of establishing standard of design and quality for materials, construction and workmanship.

D. Chemical and Physical Resistance of Finish: Submit an independent testing laboratory report certifying that the exterior finish of casework is capable of withstanding following tests, with no change, or slight change of gloss, slight discoloration, or slight temporary softening of film with no loss of adhesion and no loss of film protection.

E. Acids: Not less than five drops (0.25 cc) applied to finish surface, covered with watch glass for 60 minutes, then washed and dried.

1. 37% Hydrochloric Acid
2. 20% Hydrochloric Acid
3. 10% Hydrochloric Acid
4. 70% Sulfuric Acid
5. 25% Sulfuric Acid
6. 30% Nitric Acid
7. 10% Nitric Acid
8. 75% Phosphoric Acid
9. 25% Phosphoric Acid
10. 98% Acetic Acid
11. 50% Acetic Acid

F. Solvent: Not less than five drops (0.25 cc) applied to finish surface, covered with watch glass for 60 minutes, then washed and dried.

1. Ethyl Alcohol
2. Butyl Alcohol
3. Methyl Alcohol
4. Ethyl Acetate
5. Ethyl Ether
6. Methyl Ethyl Ketone
7. Toluene
8. Acetone
9. Benzene
10. Carbon Tetrachloride
11. Chloroform
12. 37% Formaldehyde
13. Gasoline
14. Naptha
15. Kerosene
16. Zylene
17. Glycerin
18. Furfural

G. Bases and Salts: not less than five drops (0.25 cc) applied to finish surface, covered with watch glass for 60 minutes, then washed and dried.

1. 40% Sodium Hydroxide
2. 10% Sodium Hydroxide
3. 28% Ammonium Hydroxide
4. 40% Potassium Hydroxide
5. 10% Potassium Hydroxide
6. Saturated Zinc Chloride
7. Saturated Sodium Chloride
8. Saturated Sodium Sulfide
9. Saturated Sodium Carbonate

H. Moisture Resistance: No visible effect when finish surface exposed to the following: Hot water at a temperature of 190 deg. F (91 deg. C) to 205 deg. F (96 deg. C), trickled down surface at 45 deg. angle for five minutes.

I. Constant Moisture using a 2" x 3" x 1" cellulose sponge soaked with water in contact with surface for 100 hours.

J. Cold Crack: No effect when subjected to ten cycles of temperature change from 20 deg. F (14 deg. C) for 60 minutes to 125 deg. F (52 deg. C) for 60 minutes.

K. Adhesion and Flexibility: No peeling or cracking or exposure of metal when metal is bent 180 degrees over a 1/4" diameter mandrel.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's data and installation instructions for each type of casework unit.

1. Include independent laboratory certification that applied finish complies with specified chemical and physical resistance requirements.

B. Samples: Submit 6" x 6" samples of specified finishes, including top material. Samples will be reviewed by Architect for color, texture, and pattern only. Compliance with other specified requirements is exclusive responsibility of Contractor.

1. Submit one full size sample of finished base cabinet unit complete with hardware, doors and drawers with finish top.
2. Submit one full size sample of finished wall mounted cabinet unit complete with hardware, doors, and adjustable shelves.
3. Furnish both hinged and sliding door samples if in project.
4. Acceptable sample units will be used for comparison inspections at project.
5. Unless otherwise directed, acceptable sample units may be incorporated in work.
6. Notify Architect of their exact locations. If not incorporated in work, retain acceptable sample units in building until completion of work. Remove sample units from premises when directed by Architect.

C. Shop Drawings: Submit shop drawings for casework showing plans, elevations, ends, cross sections, service run spaces, location and type of service fixtures with lines thereto. Show details and location of anchorages and fitting to floors, walls, and base include layout of units with relation to surrounding walls, doors, windows, and other building components.

1. Coordinate shop drawings with other work involved.

1.5 PRODUCT HANDLING

A. Protect finished surfaces from soiling and damage during handling and installation. Keep covered with polyethylene film or other protective covering.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide casework produced by one of the following:
   1. Mott Manufacturing

2.2 METAL CASING

A. Metal: Prime furniture steel, stretcher or roller leveled, free of scales, buckles, or other defects; ASTM A 366, Class 1 (matte) finish.

B. Minimum Metal Gage: Provide steel laboratory furniture components of following minimum U.S. Standard gages:

   1. 20 Gage: Back panels, inner door panels, drawer outer pan, inner pan and body, and shelves. Add reinforcement or use 18 gage material for shelves over 36" long.
   2. 18 Gage: Sides, ends, fixed backs, bottoms, tops, soffits, and outer door pans. Bottoms may be 20 gage if reinforced. Other items not otherwise noted.
   3. 16 Gage: Intermediate horizontal rails, table frame aprons and cross rails, center posts, and top gussets.
   4. 14 Gage: Drawer runners, sink supports.
   5. 12 Gage: Leveling and corner gussets.

2.3 FABRICATION

A. General: Complete assembly and finish work at point of manufacture. Perform unit assembly on precision jigs, to provide units which are square, fully reinforced with angles, gussets, and channels, integrally framed and welded to form a dirt and vermin retardant enclosure. Where applicable, reinforce base cabinets for heavy sink support. Maintain uniform clearance around door and drawer fronts, not exceeding 3/32".

B. Fabricate units on precision dies to provide field interchangeability of drawers, hinged doors, and similar pieces.

C. Flush Doors: Outer pan and inner pan formed and telescoped into box formation with channel reinforcements full height on center of each pan. Fill doors solid with fire resistant, sound deadening material.

D. Glazed Doors: Hollow metal stiles and rails of similar construction as flush doors with glass held in resilient channel or gasket material.

E. Hinged Doors: Mortise at flanges for hinges and reinforce with minimum 16 gage angle welded inside inner pan at hinge edge. Provide nylon roller catches and stainless steel strike welded to door assembly.

F. Drawers: Assemble fronts from telescoping inner and outer pans designed to eliminate raw edge of steel at top. Fabricate sides, back, and bottom of one piece with rolled or formed top of sides for stiffening and comfortable grasp for drawer removal. Weld drawer front to sides, back, and

bottom to form a single, integral unit. Provide drawers with rubber bumpers, runners and positive stops to prevent metal to metal contact or accidental removal.

G. Adjustable Shelves: Sides and ends formed down, and returned to front and back.

H. Glass for Glazed Doors: Double strength "B" quality.

I. Drawer Guides: Provide nylon rollers with metal guide channels with integral stops to eliminate accidental removal of drawer include provisions to prevent rebounding action when doors are closed.

J. Filler Strips: Provide where required for closing space between cabinets and walls and ceilings of same material and finish as cabinets. Hem exposed edges. Job fabricated fillers not acceptable.

K. Utility Space: Provide space, cut outs, and holes for pipes, conduits and fittings in cabinet bodies to accommodate services and their support strut assemblies.

L. Toe Space: Approximately 4" high by 3" deep, closed metal with no open pockets.

M. Table Legs: Not less than 2" square electrically welded tubing. Provide leg stretchers where required for strength and rigidity, welded or bolted to legs and cross stretchers. Securely bolt legs to table aprons. Provide leveling device welded to bottom of each leg.

2.4 STEEL CABINET FINISH

A. Pretreatment: After assembly, thoroughly clean surfaces of grease, dirt, oil, flux and other foreign matter by physical and chemical means. Treat entire unit with metallic phosphate process leaving surfaces with uniform, fine grained, crystalline phosphate coating providing excellent bond for subsequent finish.

B. Top Coats: One coat high bake primer followed by one or more coats of high bake chemical resistant enamel to provide a hard and smooth, satin luster finish, applied to treated surfaces. Unless otherwise indicated, color to be selected by Architect from manufacturer's standard palette of at least five colors.

2.5 CASEWORK, HARDWARE AND ACCESSORIES

A. Provide manufacturer's standard, satin finish hardware units, unless otherwise indicated.

B. Hinges: Institutional type, five knuckle. Provide one pair for doors less than 4 ft. high and 1 1/2 pair for doors over 4 ft.

C. Pulls: Solid metal, for drawers and swing doors, mounted with two screws fastened from back. For sliding doors, provide recessed flush pulls. Provide two pulls for drawers over 24" wide.

D. Door Catches: Nylon roller spring catch or dual self-aligning permanent magnet type. Provide two catches on doors over 4 ft. high.

E. Drawer Stops: Designed to permit easy removal, and yet prevent inadvertent drawer removal. Provide on all drawers located on the inside.

F. Label Holders: Provide where indicated, size to receive standard label cards approximately 1" x 2" nominal size finished to match other exposed hardware.

G. Drawer and Cupboard Locks: Half mortise type, five pin tumbler and dead bolt, round cylinder only exposed, brass with plated finish.

H. Sliding Door Hardware Sets: Manufacturer's standard to suit type and size of sliding door units.

I. Cabinet Base Molding: Furnished and installed in Section 09650.

J. Leg Shoes: Extruded vinyl or rubber, black, open bottom type.

K. Adjustable Shelf Supports: BHMA B84072, wrought steel, mortise mounted.

2.6 MORE FABRICATION

A. Fabricate casework to dimensions, profiles, and details shown.

B. Assemble units in the shop in as large components as practicable to minimize field jointing.

C. Install hardware uniformly and precisely after final finishing is complete. Set hinges snug and flat in mortises unless otherwise indicated. Turn screws to flat seat. Adjust and align hardware so that moving parts operate freely and contact points meet accurately. Allow for final field adjustment after installation.

2.7 TOPS, SINKS AND ACCESSORIES

A. Tops, Box Curbs, Splash Rim: Provide smooth, clean, exposed tops and edges in uniform plane free of defects. Make exposed edges and corners uniformly rounded.

B. Top Sizes: Furnish tops in maximum practicable lengths.

C. Top Thickness: Maintain 1 1/4" thickness with tolerance not exceeding plus or minus 1/32". Provide front and end overhang of 1" over base cabinets formed with continuous drip groove on under surface 1/2" from edge. Countertop Material to be Solid Surface (See Specification Section 12 36 61 – Solid Surface)

D. Extend top down to provide a 1 1/4" thickness and 1/2" return flange under frame. Sound deaden entire under surface with heavy build mastic coating.

E. Form backsplash to be coved to and integral with top surface.

F. Provide a raised marine edge around perimeter of tops and counters containing sinks. Pitch top surface two ways to bowl to provide adequate drainage without channeling or grooving.

G. Where stainless steel sinks occur in stainless steel tops, factory assembled sinks and tops into one integral unit with welds ground and polished.

H. Stainless Steel Sinks: 18 gage, Type 302/304, with No. 4 satin finish, unless otherwise indicated. Fabricate with horizontal and vertical corners rounded and coved to at least 5/8" radius. Slope

sink bottoms to pitch to outlet. Provide double wall construction for sink partitions with top edge rounded to at least 1/2" diameter. Continuous butt weld joints and provide factory punching for fixtures. When stainless steel sinks are part of stainless steel tops, weld sink units to tops and finish to produce an integral unit with invisible joint line.

PART 3 – EXECUTION

3.1 CASEWORK INSTALLATION

A. Install plumb, level, true and straight with no distortions. Shim as required using concealed shims. Where laboratory furniture abuts other finished work, scribe and apply filler strips for accurate fit with fasteners concealed where practicable.

B. Base Cabinets: Set cabinets straight, plumb, and level. Adjust sub tops within 1/16" of a single plane. Fasten each individual cabinet to floor at toe space with fasteners spaced 24" o.c. Bolt continuous cabinets together. Secure individual cabinets with not less than two fasteners into floor where they do not adjoin other cabinets.

C. Where required, assemble units into one integral unit with joints flush, tight, and uniform. Align similar adjoining doors and drawers to a tolerance of 1/16".

D. Wall Cabinets: Securely fasten to solid supporting material, not plaster, lath, or wallboard. Anchor, adjust, and align wall cabinets as specified for base cabinets.

E. Reinforcement of stud walls to support wall mounted cabinets will be done during wall erection involved by trade, but responsibility for accurate location and sizing of reinforcement is part of this work.

F. Adjust casework and hardware so that doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturers.

3.2 INSTALLATION OF TOPS

A. Field Jointing: Where practicable, make in same manner as factory jointing using dowels, splines, adhesives, and fasteners recommended by manufacturer. Locate field joints as shown on accepted shop drawings, factory prepared so there is no job site processing of top and edge surfaces.

B. Fastenings: Use concealed clamping devices for field joints located within 6" of front at back edges and at intervals not exceeding 24". Tighten in accordance with manufacturer's instructions to exert a constant, heavy clamping pressure at joints. Secure tops to cabinets with "Z" type fasteners or equivalent using two or more fasteners at each front, end, and back.

C. Workmanship: Abutt top and edge surfaces in one true plane with internal support placed to prevent any deflection.

D. Provide flush hairline joints in top units using clamping devices.

E. After installation, carefully dress joints smooth, remove any surface scratches, clean and polish entire surface.

F. Provide holes and cutouts as required for mechanical and electrical service fixtures.

G. Provide scribe mouldings for closures at junctures of top, curb and splash with walls as recommended by manufacturer for materials involved. Use chemical resistant, permanently elastic sealing compound where recommended by manufacturer.

3.3 CLEANING AND PROTECTION

A. Repair or remove and replace defective work as directed upon completion of installation.

B. Clean shop-finished surfaces, touch up as required, and remove or refinish damaged or soiled areas as acceptable to Architect.

C. Protection: Advise Contractor of procedures and precautions for protection of materials and installed casework from damage by work of other trades.

END OF SECTION

SECTION 12 36 61 - SOLID SURFACE

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 DESCRIPTION OF WORK:

A. The extent of solid surface is indicated on drawings and in schedules.

1. Countertops.

2. Sills.

B. Joint sealers are specified in Division 7.

1.3 QUALITY ASSURANCE:

A. Source Quality Control:

1. Fabricator of solid surface is to be a firm which has successfully fabricated solid surface similar to quality specified for a period of not less than five years and is equipped to provide quantity required.

B. Allowable Installed Tolerances:

1. Variation from plumb: For surfaces and walls as well as for arises, external corners, joints and other conspicuous lines do not exceed 1/8" in 10".

2. Variation in level: Horizontal joints and other conspicuous lines, do not exceed 1/8" in ten feet maximum.

3. Variation in cross-section dimensions: Do not exceed minus 1/16", nor plus 1/16" from dimensions shown.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Products offered by manufacturers to comply with requirements include but are not limited to the following:

1. Those listed in the drawings or approved equal.

2.2 SUBMITTALS:

A. Shop Drawings: Submit setting drawings showing sizes, dimensions, sections and profiles of marble units, arrangement and provisions for jointing, anchoring and fastening, and other necessary details for reception of other work. Indicate location of each on setting drawings with number designation corresponding to number marked on each unit.

B. Samples: Submit one set of samples, not less than 6" x 6" of each different color, grade and finish of material required.

2.3 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Protect materials during storage and construction against soiling, staining and physical damage.

B. Handle material to prevent chipping, breakage, soiling or other damage.

C. Store solid surface material on wood skids or pallets, covered with non-staining, waterproof membrane. Place and stock skids and to distribute weight evenly and to prevent breakage or cracking. Protect stored material from weather with waterproof, non-staining covers or enclosures, but allow air to circulate.

2.4 MATERIALS:

A. Color: Select from Manufacturer’s Standard Colors.

B. Setting Materials: Panel Adhesive: Manufacturers Standard.

2.5 FABRICATION:

A. General: Fabricate as shown and as detailed on final shop drawings.

B. Fabricate Units: Accurate to shape and dimensions shown on final shop drawings, maintaining fabrication tolerances listed.

C. Overflow Drain: Provide internal drain in lavatory bowl.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General: Do not use units with chips, cracks, voids, stains, or other defects which might be visible in finished work, unless otherwise acceptable to Architect.

B. Execute work by skilled mechanics who are experienced in setting of interior stone of the type indicated and can perform necessary field cutting as stone is set.

C. Set units with joints uniform and accurately aligned in solid backing with adhesive specified.

3.2 ADJUSTMENTS, CLEANING AND PROTECTION:

A. Remove and replace units which are broken, chipped, stained or otherwise damaged, and, where directed, which do not match adjoining units. Provide new matching units, install as specified and in manner to eliminate evidence of replacement. Recaulk defective and unsatisfactory joints as required to provide a neat uniform appearance.

B. Clean solid surface material after setting, caulking, curing is complete; use procedures recommended by manufacturer.

END OF SECTION

SECTION 21 05 47 - SEISMIC RESTRAINT OF FIRE PROTECTION EQUIPMENT AND SUSPENDED UTILITIES

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide engineered seismic restraint systems for suspended and base mounted Fire Protection, Automatic Sprinkler Systems, utilities compliant with the 2018 International Building Code (IBC) with local building code amendments.

B. All equipment manufacturers shall submit, as part of the equipment submittal, compliance certifications. Contractor to provide equipment anchorage details specific to each unit provided.

C. At seismic restraint installation locations, provide vertical support systems engineered to accommodate dead load plus seismic force reactions.

1.02 RELATED SPECIFICATION SECTIONS

A. Fire Protection General Provisions 210100 and Automatic Sprinkler Systems 211313.

1.03 REFERENCES

A. Publications, codes and standards listed below form a part of this specification to the extent referenced.

1. 2018 International Building Code (IBC)
    a. Chapter 16 - Structural Design
    b. Chapter 17 – Structural Tests And Special Inspections
2. ASCE 7-16, Chapter 13, Minimum Design Loads For Buildings and Other Structures, American Society of Civil Engineers (ASCE).
3. ACI 318, Building Code Requirements for Structural Concrete, American Concrete Institute (ACI).
4. NFPA 13.

1.04 COMPONENT IMPORTANCE FACTOR

A. In order to identify systems requiring seismic restraint and to define those from which restraints may be excluded, utility components are assigned an ASCE 7 Importance Factor (Ip) on the basis of the following:

B. Ip = 1.5

1. Risk Category IV, essential facilities required for post earthquake recovery – all “Designated Seismic Systems” per IBC Chapter 16 required for the continued operation of the facility.
2. Life-safety component which is required to function after a seismic event including fire protection sprinkler systems.
3. Components that contain hazardous or flammable materials.

1.05 SUBMITTALS

A. Equipment Certification.

1. Equipment manufacturer to provide certificate of compliance for 2018 IBC proxing on line capability for the project use group and seismic design category. Provide certifications for the following equipment: Components with hazardous contents, built up or field assembled plumbing equipment, fire suppression control panels, pre action control panels, and auxiliary or remote power supplies, and above ground storage tanks. Equipment manufacturer certification to be based on shake table or three dimensional shock testing or experience data as required by ASCE/SEI 7-16.

2. The following equipment is considered rugged and does not require a certificate of compliance: pumps, valves, motors, air compressors, and underground tanks.

B. Contractor to identify and convey each overhead deck condition to which seismic attachments will be made. Information to include type and density of concrete, concrete thickness, size and gage of metal deck and any point load limitations or restrictions.

C. Provide Seismic Design Force calculations per ASCE 7-16, Formulas 13.3-1 thru 13.3-3 stamped by a registered design professional qualified civil or structural engineer licensed to practice in the State where project is located. For multi-story projects, provide calculated Seismic Design Force for each floor.

D. Submit seismic restraint layouts stamped by a registered design professional qualified civil or structural engineer licensed to practice in the State where project is located. Seismic restraint layouts to show:

1. All vertical support and seismic brace locations.

2. All anchorage connections to structure. Anchor brand, type, quantity and size.

3. Vertical support and brace reaction point load at all connections to structure. For review by engineer of record in checking suitability of the building structure to accommodate imposed loads.

4. Plan set sheets showing appropriate installation details reflecting actual job site conditions.

E. Include cover sheet with Seismic Restraint Bracing Legend delineating:

1. Maximum Allowable Size or Utility Weight (Lbs/Lf).

2. Minimum Vertical Support Rod Diameter.

3. Support Rod Total Vertical Load.

4. Maximum Allowable Transverse Brace Spacing.

5. Transverse Brace Reaction.

6. Maximum Allowable Longitudinal Brace Spacing.

7. Longitudinal Brace Reaction.

8. Minimum Required Seismic Restraint Brace Arm Assembly.

9. Minimum Required Seismic Restraint Anchorage to Overhead Structure.

10. Installation Detail Drawing References.

1.06 QUALITY ASSURANCE

A. Registered design professional completing seismic submittal to check suitability of structure to accommodate applied seismic loads.

B. Registered design professional completing seismic submittal is to provide a “Statement of Special Inspections” in conformance with 2018 IBC, Chapter 17.

C. Each contractor responsible for the construction of a “Designated Seismic System” shall submit to the building official and owner prior to the commencement of work on the system or component a written “statement of responsibility” per IBC Chapter 17.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Seismic restraint hardware and engineering by International Seismic Application Technology (ISAT), Mason Industries, Tolco, or approved equal.

B. Vertical support and seismic restraint anchorages to utilize Cast-In Place Deck Inserts, or Post Installed Anchors. All deck inserts or post installed anchors to have a valid ICC ESR evaluation report (or equal) substantiating the insert or anchor capacity.

C. Vertical support and seismic restraint connections to structural steel are to utilize fixed Beam Clamp connections or Welded or bolted connections.

PART 3 EXECUTION

3.01 INSTALLATION

A. Roof mounted equipment: All roof mounted equipment is to be positively attached to roof support curb or isolators by bolting or welding. All support curbs to resist compressive, shear, tension, and rotational loads (including seismic loads) and translate these loads to building structure. The design of all support curbs shall be performed by an engineer licensed in the project state. Curb design to minimize rotational loads to structure and be positively attached to building structure by bolting or welding.

B. For conditions not covered within pre-engineered drawings, the required engineering is to be performed by a registered Engineer.

C. Manufacturer shall provide field installation training prior to commencement of install.

D. Field relocation of any seismic installation points away from that shown on the furnished shop drawing layouts shall be coordinated with registered design professional who completed seismic submittal.

E. Consult registered design professional who completed seismic submittal when field conditions prohibit compliance with the supplied installation details.

F. In order to satisfy ASCE 7 minimum yield strength requirements, the allowable brace spacing for non-ductile systems (eg. cast iron, plastic and glass pipe) shall be no more than half that for ductile systems.

3.02 EQUIPMENT CONNECTIONS

A. Where seismic bracing is allowed to be omitted due to size or proximity to overhead deck, all terminations to fixed equipment, panels, etc. or to other portions of the system requiring seismic restraint are to utilize flexible connectors.

B. Where seismic bracing is allowed by code to be omitted due to size or proximity to overhead deck, contractor shall be responsible for assuring that damaging impact or vertical support failure cannot occur.

3.03 SPECIAL INSPECTION

A. Special Inspection Requirements: All Designated Seismic Systems are subject to Special Inspection per IBC Chapter 17.

B. Special inspection for Fire Protection components shall be provided as follows:

1. For all Designated Seismic Systems within seismic design categories D, E or F.

2. Periodic special inspection during the installation of vibration isolation systems where the construction documents indicate a maximum clearance (air gap) between the equipment support frame and restraint less than or equal to 1/4 inch.

3. Installation of mechanical and electrical equipment, including ductwork, piping systems and their structural supports, where automatic fire sprinkler systems are installed in structures assigned to Seismic Design Category C, D, E or F to verify one of the following:

a. Minimum clearances have been provided as required by section 13 .2 .3 ASCE 7.

b. A nominal clearance of not less than 3 inches has been provided between fire protection sprinkler system drops and sprigs and : structural members not used collectively or independently to support the sprinklers; equipment attached to the building structure; and other systems' piping. On projects where flexible sprinkler hose fittings are used, special inspection of minimum clearances is not required.

C. Install identification tags at all seismic brace locations. Tags to include the following information:

1. Specific seismic forces (g-force) the location was designed to resist.

2. Maximum brace reaction at connection to structure.

3. For single hung items, the maximum pipe/conduit size the brace location was designed to accommodate.

4. For trapeze supported items, the maximum weight (lbs/lf) the brace location was designed to accommodate.

5. For suspended equipment, the maximum unit operating weight (lbs) the brace location was designed to accommodate.

6. Location identifier cross matched to that on plan set layout.

7. Company name of installing contractor.

D. Upon completion of construction a Quality Assurance Representative of registered design professional who completed seismic submittal shall review the installation of the seismic-force-resisting system and provide documentation indicating general conformance to seismic restraint layout drawing.

END OF SECTION 210547

SECTION 22 01 00 - PLUMBING GENERAL PROVISIONS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide all labor, materials, tools, and services for a complete installation of equipment and systems contained in contract documents.

B. Principal features of work included are:

1. Plumbing system.
2. Demolition of existing equipment, and piping.

1.02 RELATED WORK

A. Electrical power and interlock and control wiring and conduit.

1.03 GENERAL

A. The contract documents form a guide for a complete system. Provide all items necessary to provide a complete system but not specifically mentioned, such as hangers, transitions, offsets, and drains.

B. Layouts indicated on drawings are diagrammatical only. Coordinate exact location of equipment, ductwork, and piping to eliminate conflict with other divisions. Designer reserves right to make reasonable changes in location of equipment, ductwork, and piping prior to construction.

C. Should Contractor find during progress of work that in his judgment existing conditions make desirable a modification, report such item promptly to Designer for instructions. Do not make deviations from contract documents without review of Designer.

D. Supervise all work with a competent mechanic specifically qualified in mechanical discipline.

E. All products used for dispensing potable drinking water must be lead free and meet the requirements of NSF 61 and NSF 372 test standards via third party testing and certification.

1.04 PERMITS

A. Secure and pay for permits, licenses, and inspections for work under this Division, including water and sewage connections.

1.05 CODES

A. Comply with all pertinent local, state, and national codes.

1.06 STANDARDS

A. Comply with all pertinent standards. This list is provided as a convenience to Contractor and is not to be considered all inclusive.

1. American Gas Association (AGA).
2. CISPI Standard 301.
3. ASTM A 74.

1.07 SUBMITTALS

A. Submit for review complete brochures and shop drawings for materials and equipment proposed.

1. Brochures: Submit complete descriptions, illustrations and specification data for materials and equipment proposed. Clearly indicate proposed items when other items are shown on same sheet. Submit samples on request and/or set up for inspection. Samples will be returned to Contractor.

2. Submittals shall be submitted in line by line format. Each submittal shall be provided with a cover letter and supporting documentation indicating how the submittal meets each line of the referenced specification section. All discrepancies between the construction documents and the submitted product shall be clearly identified for engineer evaluation.

3. If a product other than the basis of design is rejected by the engineer for any reason, the Contractor shall provide the basis of design product at no additional cost to the Owner.

4. Shop Drawings:

a. Complete equipment and piping systems in equipment rooms.

b. Complete equipment and piping systems in entire building (new pharmacy building) and area of renovation (existing building).

c. Owner furnished equipment rough-in layouts.

d. Firestop systems.

1.08 PROJECT MAINTENANCE MANUALS

A. Prior to final acceptance of project, provide Owner with bound maintenance manuals.

1.09 PROJECT TECHNICAL INSTRUCTION

A. Prior to final inspection of project, provide technical instruction to Owner as follows:

1. Field Instruction: Provide explanation of how systems and equipment are to operate during each season and during emergencies.

2. Field Demonstration: Demonstrate operation and routine maintenance for systems and equipment.

3. Videotape: Provide videotape or DVD of field instruction and demonstration to Owner at completion.

1.10 CONSTRUCTION RECORD DOCUMENTS

A. Provide construction record documents. Keep at the project one set of drawings and daily record changes at the time they are made. Give drawings to Owner at project completion.

1.11 EXISTING SERVICES

A. Maintain existing services in operation during construction. Coordinate and schedule all service interruptions with Owner.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Provide materials and equipment of domestic manufacturer bearing the U.L. label when such label is available.

B. Cast Iron Soil Pipe and Fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute ® and listed by NSF® International.

PART 3 EXECUTION

3.01 COORDINATION

A. Coordinate locations of equipment and piping to eliminate conflict with other divisions.

B. Carefully examine contract documents to be thoroughly familiar with items which require plumbing or mechanical connections and coordination.

C. Provide proper chases and openings. Place sleeves and supports prior to pouring concrete or installation of masonry.

3.02 CUTTING AND PATCHING

A. Repair or replace routine damage caused by cutting in performance of contract.

B. Correct unnecessary damage caused due to installation of plumbing work.

C. Perform repairs with materials that match existing in accordance with the appropriate section of these specifications.

3.03 FLASHING, COUNTERFLASHING, AND SEALING

A. Flash, counterflash, and seal piping at penetrations of roofs and outside walls.

3.04 TRENCHING, EXCAVATION AND BACKFILLING

A. Excavate to a depth at least 6" below bottom of pipe and a minimum of 36" above top of pipe. Fill below pipe, around pipe, and minimum of 12" above pipe with sand or Class "B" crushed stone tamped firm and even. Provide topsoil for final layer of dirt (12" minimum). Provide 6" spacing between pipes and between pipe and trench sides. Hand-grade with batterboards placed every 25'. Backfill by hand. Do not use rock or stone above sand or Class "B" crushed stone.

3.05 CONNECTION TO EQUIPMENT

A. Rough-in and connect to sterilizers, lab equipment, and Owner furnished equipment and provide a shutoff valve and union at each connection. Operating valves and/or controls for this equipment will be provided as an integral part of the equipment. Do not rough-in until shop drawings showing rough-in locations have been reviewed by Designer.

3.06 FOUNDATIONS AND PADS

A. Provide foundations, pads, and bases required for equipment. Concrete to be in accordance with concrete division of specifications.

B. Coordinate proper sizes and locations of foundations, pads, bases, anchors, supports, and other items to be built into structure.

3.07 IDENTIFICATION

A. Identify exposed or accessible piping with stenciling contents indicating pipe contents and direction of flow on piping not more than 20 feet apart, at valves, at access panels, and at least once above each space.

B. Contractors option to identify exposed or accessible piping with snap-on or strap-on type markers. Color code markers in accordance with ANSI. Indicate pipe contents and direction of flow on marker. Install markers on piping not more than 20 feet apart, at valves, at access panels, and at least once above each space.

C. Sanitary waste and buried lines need not be marked.

D. Identify all equipment with engraved brass, aluminum, or stainless steel nameplates or tags. Use equipment names and numbers appearing in schedules on drawings. Fasten nameplates to equipment using screws. Glue or adhesive is not acceptable. Fasten tags to equipment using brass, aluminum or stainless steel chains.

E. Identify each valve with engraved brass, aluminum, or stainless steel identification tag indicating valve service and sequential identification number. Attach tag to valve handle with brass, aluminum or stainless steel chain. Provide two bound manuals to Owner listing each valve sequentially and indicating valve manufacturer, style, size, service, normal position, and specific location for each valve.

3.08 CLEANING

A. Repair damaged factory finishes covering all bare places and scratches.

B. Cleaning Domestic Water System: Flush domestic water system progressively by opening building outlets and permitting flow to continue from each until water runs clear. Sterilize system in accordance with requirements of State Department of Public Health by the following method or other method acceptable to local authorities:

1. Introduce chlorine or a solution of calcium or sodium hypochlorite, filling lines slowly and applying sterilizing agent at a rate of 50 ppm of chlorine as determined by residual chlorine tests at ends of lines. Open and close all valves while the system is being chlorinated.

2. After sterilizing agent has been applied and left standing for 24 hours, test for residual chlorine at ends of lines. If less than 25 ppm is indicated, repeat sterilizing process.

3. After standing for 24 hours and tests show at least 25 ppm of residual chlorine, flush out system until all traces of chemical used are removed.

3.09 TESTING

A. Test all installed equipment and systems and demonstrate proper operation. Correct and retest work found defective when tested.

B. Thoroughly check piping system for leaks. Do not add any leak-stop compounds to the system. Make repairs to piping system with new materials. Peening, doping, or caulking of joints or holes is not acceptable.

C. Test hot and cold domestic water piping systems upon completion of rough-in and before connection to fixtures at a water pressure of 125 psig for two hours without leaks.

D. Test drainage and venting system with necessary openings plugged to permit system to be filled with water and subjected to a minimum water pressure of 10 feet head at top of system. System to hold water for two hours without a water level drop greater than 4" in a 4" standpipe and without visible leakage. Test system in sections if minimum head can be maintained in each section.

E. Conduct air or smoke test if in opinion of Designer reasonable cause exists to suspect leakage or low quality workmanship.

F. Test foundation drain system in sections of 100 foot lengths before and after backfilling. Pass plumbers tape or Roto-Rooter through drain sections to ensure there are no restrictions to water flow.

G. Test flush valves for proper operation.

END OF SECTION 220100

SECTION 22 07 19 - PLUMBING INSULATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Contractor shall provide all necessary labor, materials, tools, and equipment to perform work required on the drawings and specified herein.

B. Certain equipment and/or systems to be factory insulated by manufacturer. Factory insulation materials to be as specified in applicable sections of the specifications.

C. All pipe fittings, valves and strainers in insulated pipe systems to be insulated.

D. Thermal resistance "R" values used herein are expressed in units of "Hour, Degrees F., Sq. Ft./BTU per Inch of Thickness" on a flat surface at a mean temperature of 75 degrees F.

E. Note that where electric cable wrap is called for, insulation is to be applied over cable.

F. "Contractor's Option" referred to in Materials below indicates optional materials which may be used as equals.

1.02 DEFINITIONS

A. "Exposed" equipment, and piping are areas which will be visible without removing ceilings or opening access panels.

B. Outdoors is considered exposed to the weather.

C. Underground is buried, whereas in a trench below grade is considered concealed.

1.03 CERTIFICATION/QUALITY ASSURANCE

A. Products shall meet applicable national, state, and local building codes and be U.L. (or other recognized testing lab) listed for intended service.

B. All insulations, jackets, adhesives, coatings, sealers, and tapes shall have a flame spread rating of 25 or less and smoke development rating of 50 or less when tested in accordance with ASTM E-84, NFPA 225, U.L. 723, and further must meet the requirements of NFPA 90-A and applicable building, and plumbing, codes.

C. All insulation materials shall be delivered and stored in manufacturers’ containers and kept free from dirt, water, chemical, and mechanical damage.

D. Insulation shall be applied in a workmanlike manner by experienced, qualified tradesmen.

E. Insulation shall not be applied until all pressure testing has been completed, inspected, and released for insulation application.

F. Surfaces shall be clean and dry.

G. Insulation joints shall be butted firmly together and all jackets and tapes shall be smoothly and securely installed.

H. Insulation for duct, pipe, and equipment for above grade exposed to weather outside building shall be certified as being self-extinguishing for 1" thickness in less than 53 seconds when tested in accordance with ASTM D-1692.

1.04 APPLICABLE CODES AND STANDARDS

A. ASTM E-84.

B. U.L. 723.

C. State of Mississippi Energy Code.

PART 2 PRODUCTS

2.01 MATERIALS FOR PIPE AND EQUIPMENT

A. Materials for Pipe and Equipment: Provide factory pre-molded or shop or site mitered segment type insulation for pipe, pipe fittings, and valves. Fitting insulation to be of same thickness and material as adjoining pipe insulation. All insulation and related materials such as tape and mastic to meet applicable building code requirements for fire and smoke development.

1. Flexible Tubular: Provide 25/50 rated, closed-cell, flexible tubular rubber type pipe insulation. Product to have continuous operational temperature limit of 200 degrees F. and a minimum "R" value of 3.6 per inch (K=0.28) at 100 degrees F mean temperature. Product to be Armstrong AP Armaflex or approved equal pipe insulation. Use flexible tubular for the following services:
   a. Horizontal runs of waste lines carrying cold condensate from air conditioning equipment: 1" thick.
   b. Domestic cold water piping 2" and under (contractor option): 1/2" thick.
   c. Domestic hot water supply and recirculating return piping (contractor option): All sizes – 1-1/2” thick.

2. Fiberglass: Provide factory-formed, factory-jacketed fiberglass piping insulation. Product to be Manville "Micro-Lok 650" with "Type AP-T" jacketing or equivalent product manufactured by CertainTeed, Knauf, or Owens-Corning. Product to have continuous operational temperature limit of 850 degrees F and a minimum "R" value of 3.6 per inch (K=0.28) at 100 degrees F mean temperature. Jacket to be fiberglass reinforced kraft paper with aluminum foil and pressure sensitive closure system. Vapor-barrier mastic for application to below ambient pipe insulation shall be fungus resistant per ASTM D 5590 with 0 growth rating; Water based; Permeance per ASTM E 96, Procedure B, 0.013 perm or less at 43-mil dry film thickness suitable for indoor and jacketed outdoor use. Products: Foster 30-80 AF. Color: White. A breather mastic for application to above ambient pipe insulation (fittings, tees, valves, etc.) shall be water based Foster 46-50 mastic or Childers CP-10 / CP-11. Use fiberglass piping insulation for the following services:
   a. Domestic hot water supply and recirculating return piping: 1-1/4 and under – 1” thick, 1-1/2” and greater 1-1/2 thick.
   b. Domestic cold water piping: 1/2" thick.

2.02 MATERIALS FOR FITTINGS, VALVES, AND SPECIAL COVERINGS

A. Provide coverings and finishes for specific items hereinafter specified.

1. Use pre-molded insulation fabricated by the manufacturer of insulation material or shop or site mitered segment type insulation for all pipe fittings, elbows, tees, valves, and couplings.

2. PVC fitting covers over blanket fiberglass are NOT acceptable.

3. Contractor's option to provide factory pre-molded one-piece PVC insulated fitting covers, precut fiberglass insulation inserts, and necessary installation materials for all pipe fittings. Materials to be equal to Manville Zeston white, U.V. resistant, 25/50 rated, 20 mil thickness insulated PVC fitting covers and insulation inserts.

B. For any service, when below grade direct buried, cover straight pipe and fitting insulation with equivalent of Pittsburgh Corning "Pittwrap", Foster C.I. Wrap 50 mil or "Pittwrap SS11" jacketing. Valves in systems operating above 60 degrees F. and installed in valve boxes shall not be insulated; however, the valves shall be painted with a rust resistant product equivalent to Rustoleum.

C. For flexible tubular pipe and fitting insulation when exposed-to-view inside building, finish with two coats of paint, custom color blended to match surrounding surfaces.

D. When specifically approved by designer, when it is impossible to completely insulate pipe, fittings, or valves with specified insulation, Armstrong Armaflex insulation tape may be used to prevent condensate drip on small piping. Use of cork insulation tape is prohibited.

PART 3 EXECUTION

3.01 GENERAL

A. No insulation shall be cut where a hanger is located. If hangers have been installed by pipefitter tradesmen which violates this strict requirement, notify Designer immediately.

B. Piping systems shall be tested and found free of all leaks prior to installation of insulation covering.

C. All surfaces shall be clean and dry when covering is applied. Covering to be dry when installed and during application of any finish, unless such finish specifically requires a wetted surface for application.

D. All adhesives, cements, and mastics shall be compatible with materials applied and shall not attack materials in either wet or dry state.

E. Install insulation using professional insulators who have adequate experience and ability.

F. Exposed-to-view insulation shall have a well tailored appearance.

G. Treat insulated pipe in equipment rooms and where exposed to normal view, so surfaces may be painted with water base latex paint. Use of mastics, adhesives, or jacketing which cause "bleeding" is prohibited.

3.02 INSTALLATION OF PIPE AND EQUIPMENT COVERING

A. Where fiberglass or flexible tubular insulation is used on piping sized 2" and larger, insert a section of foamglass insulation at hanger or support points between pipe and metal shield for full length of shield to prevent crushing of insulation. Insulation thickness to be same as adjoining insulation. Where insulation passes through pipe hangers and across trapeze supports, 12" long metal saddles shall be used. On cold pipe, vapor barrier should be carried through the hanger and sealed.

B. Apply flexible tubular insulation to pipe and fittings using the slip-on method with all joints tightly fitted and sealed with Armstrong 520 adhesive or approved equal. Seal butt joints, miter joints and torn or damaged insulation with adhesive.

C. Apply PVC insulated fitting covers and precut insulation inserts as follows:

1. Installation for hot systems:
    a. Place the precut fiberglass insert around the fitting, positioning the points of the insert on the inside radius of the elbow.
    b. Butt the ends of the fiberglass insert against the ends of the pipe covering. Tuck and fold the insulation so that it covers all bare surfaces. Keep the fiberglass fluffed up to the thickness of the adjacent pipe insulation to assure maximum thermal efficiency.
    c. Insert two stainless steel serrated tacks approximately 1/4" from one of the lap edges of the fitting cover. Then snap the cover in place over the fiberglass insulation.
    d. After the fitting cover is in position, push the tacks into the overlapping throat seam. Apply color-matched, pressure-sensitive tape to the butt joints.

2. Installation for cold systems:
   a. Position, tuck, and fold the fiberglass insulation insert as described above in steps (a) and (b) for hot systems.
   b. Apply a vapor barrier mastic around the edges of the adjoining pipe insulation. Apply the mastic along the inside of the fitting cover throat overlap seam.
   c. Place the fitting cover over the insulation, lapping the mastic-covered edge over the other side of the throat seam.
   d. Apply color-matched, pressure-sensitive tape over the circumferential joints. The tape should extend over the adjacent pipe insulation and overlap itself by at least 2" on the downward side of the lap.

END OF SECTION 220719

SECTION 22 11 19 - DOMESTIC WATER BACKFLOW PREVENTERS, TRAP PRIMERS, AND SHOCK ABSORBERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. This section includes requirements for:

1. Backflow preventers.
2. Shock absorbers.
3. Trap primers.
4. Equipment connection backflow device.
5. Vacuum breakers.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers are indicated in subsequent paragraphs.

B. All products used for dispensing potable drinking water must be lead free and meet the requirements of NSF 61 and NSF 372 test standards via third party testing and certification.

2.02 BACKFLOW PREVENTERS

A. Acceptable Manufacturers: Apollo, Febco, Cla-Val, Wilkins, or Watts.

B. Product must meet NSF-61.

C. Provide completely automatic, unit, fitted with tight closing shut-off valves and test cocks at each end.

D. Construct such that all parts are replaceable without removing unit from line.

E. Design such that total pressure drop through complete backflow preventer does not exceed 12 PSI at rated flow. Certified U.S.C. flow curves shall be provided for each device as part of the submittal package.

2.03 SHOCK ABSORBERS

A. Acceptable Manufacturers: Josam, Wade, J.R. Smith, Precision Products, Zurn, or Sioux Chief.

B. Refer to drawings for placement and size of shock absorbers.

C. Access Covers: Minimum size 12” x 12” located for access to shock absorbers.

2.04 TRAP PRIMERS

A. Acceptable Manufacturers: Josam, Zurn, Wade, J.R. Smith or Precision Plumbing Products.

B. Construct trap primer valve of all bronze, chrome plated with removable operating parts, integral vacuum breaker, and gasketed access cover.

C. Access Covers: Minimum size 12” x 12” located for access to trap primers.

2.05 EQUIPMENT CONNECTION BACKFLOW DEVICE

A. Acceptable manufactures: McCann Engineering ASSE 1022 Backflow Preventer.

B. Must meet ASSE 1022

C. Provide the above referenced backflow device if beverage equipment does not have integral backflow device.

2.06 VACUUM BREAKERS

A. Wilkins model 420

PART 3 EXECUTION

3.01 INSTALLATION AND TESTING

A. Backflow Preventers:

1. Pipe relief through fixed air gap and discharge to sewer.
2. Install adjacent to wall and/or floor utilizing stand-off brackets, angle frame, and/or concrete piers.
3. Test unit for leaks and pressure drop. Clean and/or replace soiled strainer media.
4. Provide a reduced pressure backflow preventer on the main domestic water entrance to the facility.
5. Provide backflow prevention vacuum breaker on any water line feeding any piece of equipment which could cause back siphonage such as mechanical equipment, trap primer lines, etc.

B. Shock Absorbers:

1. Install shock absorbers above ceiling, outside wall so access and maintenance can be performed without disturbing walls and non-liftouts ceilings.
2. Install shock absorbers on all flush valves, solenoid valves and quick closing devices.
3. Test and certify shock absorbers by plumbing and drainage institute.

C. Trap Primers: Trap primers to have approval of plumbing and drainage institute.

D. Equipment Connection Backflow device: Provide on all water lines feeding coffee makers, ice machines and beverage dispensers.

E. Vacuum Breakers: Provide on water lines feeding equipment to protect against back siphonage of contaminated water.

END OF SECTION 221119

SECTION 22 13 16 - SANITARY WASTE AND VENT PIPING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Submit pipe and fittings and have approved before starting installation. Pipe and fittings to be new, manufactured domestically, and marked clearly with manufacturers' name, weight, and classification or working pressure.

B. Piping to run approximately as shown on drawings or as structural and architectural conditions permit.

PART 2 PRODUCTS

2.01 STEEL PIPES

A. Standard-weight galvanized steel pipe: Waste, vent, and drainage piping 1-1/2" and smaller.

2.02 STEEL PIPE FITTINGS

A. Flanges, fittings, unions and other products recognized as regularly available products to be marked in accordance with MSS SP-25. Markings on products of small size or shape may be omitted in the sequence allowed by MSS SP-25, except manufacturers' name or trademark.

B. Fittings to be factory-forged in USA and shall not have been machined, remarked, painted, or otherwise produced domestically from non-domestic forgings.

C. Fittings 1-1/2" and smaller to be threaded, Class 150, standard, malleable iron fittings, conforming to ANSI B16.3 and ASTM A-197.

D. Fittings for galvanized steel pipe to be same as above except have galvanized coating. Fittings for waste, vent, and drainage piping to be drainage pattern type.

E. Flanges to be factory forged in U.S.A.

F. Unions to be Class 150 malleable iron with bronze-to-iron ground joint conforming to ANSI B16.39, ANSI B1.20.1, and ASTM A-197.

G. Bolting materials to be semi-finished carbon steel bolts and hex nuts conforming to ASTM A-307. Threads and dimensions to be in accordance with ANSI B1.1 and B18.2.

H. Thread lubricant to be Crane "Formular 425" or equal. Approved Teflon tape may be used at Contractor's option.

I. Gaskets to be 1/8" thick "Sepco" or equal.

2.03 CAST IRON SOIL PIPE

A. Standard weight cast iron soil pipe with drainage fittings:

1. Waste, drainage, and vent lines 2" and larger located above slab and below grade where servicing Boiler Rooms, Central Sterile and Food Prep/Dishwash. All pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute ® and listed by NSF® International.

2. Drain lines under concrete or other paving and under buildings, including to a distance of not less than 5'-0" from building. All pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute ® and listed by NSF® International.

3. Manufacturers: Charlotte Pipe and Foundry, Tyler Pipe, AB&I Foundry.

4. Joints in cast iron soil pipe may be hub and spigot with neoprene compression gaskets conforming to ASTM C564 or "No-hub". No-hub shall not be permitted on underground systems. No-hub couplings shall be standard CISPI 310 couplings manufactured with 300 series stainless steel and neoprene rubber sleeve.

2.04 PVC PIPE

A. Schedule 40 PVC DWV pipe, ASTM D-2665 solid wall Type 1, Grade 1. Schedule 40 DWV waste and drainage piping below grade ONLY. PVC piping not permitted within Boiler Room, Central Sterile or Food Prep/Dishwashing areas.

B. Fittings to match piping system. Fittings to have manufacturer's trademark permanently identified in accordance with MSS-SP-25. Supplier to include with submittal data certification that fittings and flanges have met requirements.

C. Joints for piping to be made with tetrahydrofuron solvent cement. Joints to be in accordance with manufacturer's recommendations.

D. Pipe, fittings, and cement to all be supplied by single manufacturer for entire project.

E. All solvent cements shall be low emitting VOC at 510 g/L or less.

2.05 HANGERS

A. Non-insulated steel piping 1-1/2" and smaller with no longitudinal movement to be Grinnell Figure 260, MSS SP-69 Type 1, adjustable clevis hanger.

B. Non-insulated cast iron soil pipe thru 8" to be Grinnell Figure 104, MSS SP-69 TYPE 6, adjustable swivel ring, split ring type, and pipe 10" thru 15" Grinnell Figure 260, MSS SP-69 TYPE 1, adjustable clevis hanger.

C. Non-insulated PVC pipe 1/2" O.D. thru 4" O.D. with no longitudinal movement to be Grinnell Figure CT-99C, MSS SP-69 TYPE 9, plastic coated adjustable tubing ring hanger.

D. Support PVC pipe risers by Grinnell Figure CT-121C, MSS SP-69 TYPE 8, plastic coated riser clamps at floor penetrations.

E. Support steel pipe risers by Grinnell Figure 261, MSS SP-69 TYPE 8, riser clamps at floor slab penetrations.

F. Support three or more parallel lines by trapeze hangers utilizing Unistrut channel or equal in bottom mounting arrangement with rod hanging support.

G. Adequately size hangers on insulated piping for insulation to pass continuously through hangers. Insulated piping to be supported outside insulation covering.

H. Provide concrete inserts, Grinnell Figure 282, MSS SP-69 TYPE 18, universal concrete insert, for attaching hangers to building structure. Inserts to be adequately sized and correctly positioned to support piping, valves, etc., when full of water and system is in operation.

I. Provide C-clamps with locknut, Grinnell Figure 86, MSS SP-69 TYPE 23, where piping is to be hung from steel beams. Welding hanger rods to steel members is not permitted. Provide malleable beam clamps, Grinnell Figure 218, MSS SP-69 TYPE 30, with extension piece, Grinnell Figure 157, where piping is hung from bar joist.

J. Support all piping by heavy steel, adjustable hangers, or brackets suitably fastened to structural portion of building. Place hangers in accordance with following.

1. Steel Pipe Supports

a. Size (in.): 1-1/4, Distance Between Supports (ft.) 8.

b. Size (in.): 1-1/2 Distance Between Supports (ft.) 10.

2. PVC and Cast Iron Supports: Support each fitting, at intervals of not more than 5 feet, and at least at each joint.

K. Perforated metal, strap iron, or band iron hangers are not permitted. Offsets in hangers are not allowed. Pipe risers to be supported at regular intervals in pipe shafts within the limits of good practice.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install piping not to interfere with opening of doors or other moving parts. Do not install piping near or directly over any portion of electrical equipment.

3.02 FIRE-RATED PARTITIONS

A. Provide permanent firestop system at all piping penetrations of fire-rated walls and floors. Review details on drawing as well as this specification for permissible firestop systems. The firestop system shall have been tested and approved in accordance with ASTM E119 and U.L. 1479 (ASTM E814) and classified for up to 2 hours fire rating. Firestop system shall be type detailed on drawings or intumescent type capable of expanding up to 8 times its original volume. Firestop system to be 3M, Hilti, Nelson, Johns Manville, or Specified Technologies. Firestop system shall be installed in strict accordance with published U.L. approved installation instructions. Piping to pass through the fire-rated partition insulated or non-insulated as specified and detailed. Submit U.L. approved installation drawing for each type of penetration prior to construction.

3.03 NON-RATED PARTITIONS

A. Piping to pass through the walls insulated or non-insulated as specified. Wall should be finished to fit neatly around the piping. Firestopping is not required at non-rated partitions.

B. Provide chromium-plated escutcheon plates for exposed uninsulated pipes projecting through floors or walls in finished spaces. Mechanical rooms and janitor closets are not considered "finished" spaces.

C. Hang piping so equipment, flanges, and connections do not bear weight of piping.

D. Adequately support vertical lines at their bases or by a suitable hanger placed in horizontal line near riser or by a base fitting set on pedestal.

E. Pipes not to be hung or supported by pumps. No torque to be applied to pumps by connecting pipes. After final pipe adjustments and initial operation of the pumps, this Contractor to recheck alignment of pumps and realign as required.

F. Run piping in straight lines; riser lines to be plumb with such offsets only as indicated or necessary. No sagging of lines permitted.

G. Unless otherwise shown on drawings, lines to be installed to drain to sumps or sewer.

H. Ream pipe after cutting to full bore. Remove foreign matter from inside of pipe before installing. Keep installed piping free from dirt and scale and protect open ends from foreign matter. Use temporary plugs or other approved methods of open end closure.

I. Threads to be right-hand, pipe standard, clean cut, full depth, and tapered. Joints to be made tight without caulking. Approved pipe joint lubricant to be used, applied in thin layer to the male thread only.

J. Piping to have sufficient number of flanges or unions for convenient installation and removal of piping and equipment.

K. Remake or replace defective, leaking, or otherwise unsatisfactory joints or material. Peening, caulking, or doping of piping is not permitted.

L. Install piping to prevent stresses and strains to piping and hangers from expansion or contraction. Provision for proper loops, offsets, or expansion joints to be responsibility of Contractor. Make provision for servicing and removal of equipment without dismantling piping.

3.04 PIPING IN TRANSFORMER, ELECTRICAL, AND ELEVATOR EQUIPMENT ROOMS

A. Refer to drawings. No water piping permitted in transformer, electrical, or elevator equipment rooms.

3.05 GRADES AND ELEVATIONS

A. Uniformly grade sanitary drainage lines to elevations shown. If no elevations are given, pitch sewers not less than 1/8" per foot.

END OF SECTION 221316

SECTION 22 13 19 - SANITARY WASTE PIPING SPECIALTIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. This section includes requirements for:

1. Cleanouts.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers are indicated in subsequent paragraphs.

2.02 CLEANOUTS

A. Acceptable Manufacturers: Josam, Wade, J.R. Smith, or Zurn. The following model numbers listed are Zurn.

B. Exterior: ZN-1402-BP-HD cast iron cutoff ferrule with round nickel bronze scoriated frame and cover, secured.

C. Finished Concrete Floor: ZN-1400-HD-BP inside caulk round nickel bronze scoriated frame and cover.

D. Resilient Tile Floor: ZN-1400-X-BP inside caulk round nickel bronze scoriated frame and cover, secured.

E. Carpet: ZN-1400-CM-BP inside caulk round nickel bronze scoriated frame and cover; provide carpet marker and permanent marker in ceiling above.

F. Wall: ZN-1441-BP cast iron cleanout with bronze plug and round stainless steel cover.

G. Access Covers: Minimum size 12" x 12" located for access to valves, shock absorbers, trap primers, wall cleanouts, etc.

H. Furnish cleanouts occurring in waterproof floors with clamping devices.

PART 3 EXECUTION

3.01 INSTALLATION AND TESTING

A. Cleanouts:

1. Locate line size cleanouts, except 4" largest required, at base of all soil and waste stacks, at all changes in direction and in straight runs. Ensure spacing in straight runs does not exceed 50 feet inside building and 100 feet outside the building.

2. Extend inaccessible cleanouts up through floor and/or wall provided easy accessibility cannot be obtained otherwise.

END OF SECTION 221319

SECTION 22 34 23 SUBMERSIBLE EFFLUENT PUMP

EFFLUENT PUMPS – Pumps shall be F.E. Myers model P102 effluent pumps selected in accordance with the following design criteria:

Minimum Shut-off Head:	124’
Motor Horsepower:	1
Motor Speed:	3450 RPM
Electrical:	230V, 1 Phase, 60 Hz

PUMP – The pump shall be designed to handle septic tank effluent and be capable of passing ¾ inch spherical solids. The pump shall be capable of handling liquids with temperatures to 140° F intermittent and shall be capable of running dry without damage to the seals or bearings.

MOTOR – The pump motor shall be of the submersible type. Single phase motors shall be of the permanent split capacitor type with no relays or starting switches. Stator winding shall be of the open type with Class B insulation rated for 130° C maximum operating temperature. The winding housing will be filled with clean dielectric oil to lubricate bearings, seals, and transfer heat from the windings to the outer shell. The motor assembly shall be of the standard frame design and shall be secured in place by four threaded fasteners allowing for easy field serviceability.

The motor shall be capable of operating over the full range of the performance curve without overloading the motor and causing any objectionable noise or vibration. The motor shall have two bearings to support the rotor; an upper ball bearings to accommodate radial loads and a lower ball bearing to take thrust and radial loads. Ball bearings shall be designed for a B-10 life of 50,000 hours. A heat sensor thermostat and overload shall be attached to the top end of the motor windings and shall be wired in series with the windings to stop the motor if the motor winding temperature reaches 266° F. The overload thermostat shall reset automatically when the motor cools to a safe operating temperature.

POWER CORD – The motor power cord shall be 14-3 SJOW/SJOWA or SOW/SOWA. The cable jacket shall be sealed at the motor entrance by means of a rubber compression washer and compression nut. A heat shrink tube filled with epoxy shall seal the outer cable jacket and the individual leads to prevent water from entering the motor housing.

SEAL CHAMBER – The motor shall be protected by two (2) rotary shaft seals mounted in tandem with an oil filled chamber separating the seals. The seals shall have carbon and ceramic seal faces diamond lapped to a tolerance of one light band. Metal parts and springs for seals shall be 300 series stainless steel. Two optional electrical sensing probes shall be mounted in the seal chamber to detect any water leakage past the lower seal. The sensing probes shall be connected to a red warning light in the control panel. The warning light shall serve to indicate a seal leak and shall not stop the pump.

PUMP IMPELLER – The pump impeller shall be of the single vane enclosed type. The impeller shall be constructed of an engineered thermoplastic. A stainless steel wear ring shall be molded into the neck of the thermoplastic impeller to provide a sealing surface. A replaceable Buna-N sealing cup shall effect a seal between the volute and impeller in order to maintain high efficiency and prevent recirculation. The impeller shall be threaded onto the 416 stainless steel pump/motor shaft.

PUMP AND MOTOR CASTINGS – All castings shall be of high tensile strength Class 30 gray cast iron. Castings shall be treated with phosphate and chromate rinse and painted with a high quality air dry alkyd enamel.

FASTENERS – All exposed fasteners shall be of 300 series stainless steel.

END OF SECTION 22 34 23

SECTION 22 43 13 - HEALTHCARE PLUMBING FIXTURES

PART 1 GENERAL

1.01 MANUFACTURERS

A. Provide plumbing fixtures and drains as listed on drawings and described herein. Fixture numbers are Kohler products. Equal fixtures by Zurn, American Standard or Sloan will be considered equivalents

B. All drainage products to be Josam, Zurn, J.R. Smith, MIFAB or Wade. All drains installed above slab to be complete with clamping device.

C. Stainless steel sinks shall be Just, Elkay, or Kohler.

D. Flush valves shall be Zurn-AV or Sloan Royal, no exceptions.

E. Pressure balancing shower valves shall be Symmons, Leonard (Pam II).

F. Commercial or public faucets shall be Zurn, Chicago Faucets, Symmons, or Speakman.

G. Gooseneck faucets shall be Zurn, Chicago Faucet, or T&S.

H. Fixture supplies, stops, and traps to be commercial grade McGuire, E.B.C., Zurn, or approved equal. Traps to be 17 gauge with wall flange. Supplies and stops to be heavy pattern with wheel handle unless noted otherwise.

I. Water closet seats shall be Bemis, Church, Kohler, Beneke, or Olsonite.

J. Thermostatic mixing valves shall be Symmons, Holby, Powers, or Leonard.

K. China or enamel fixtures to be white color, unless otherwise noted.

L. All wall-mounted lavatories shall be capable of supporting a minimum vertical load of 250 pounds. Install wall-mounted lavatories with floor-anchored carriers which fit in standard stud walls.

M. All water supply spouts for lavatories and sinks shall discharge a minimum of 1" above the rim of the specified fixture.

N. All gooseneck water supply spouts for lavatories and sinks shall discharge a minimum of 5" above the rim of the specified fixture. All gooseneck faucets shall be furnished with plain end spouts; aerators shall not be accepted. An in-line flow control device to limit flow to 2.5 GPM maximum shall be installed on all gooseneck faucets.

O. Where blade handles are specified, they shall not be less than 3-1/2", or more than 4-1/2" in length, except that handles of clinical sinks shall not be less than 6" long.

P. All products used for dispensing potable drinking water must be lead free and meet the requirements of NSF 61 and NSF 372 test standards via third party testing and certification.

PART 2 PRODUCTS

2.01 FIXTURES

P-1 Water Closet - Public, Floor Mounted, Barrier-Free, 1.6 Gallon:
Kohler K-96057
Kohler K-4670-C seat
Zurn Z-6000-AV-WS1

P-2 Water Closet - Public, Floor Mounted, 1.6 Gallon:
Kohler K-96053
Kohler K-4670-C seat
Zurn Z-6000-AV-WS1

P-3 Lavatory, Solid Surface, Barrier-Free, Public:
Solid Surface counter with integral 19” x 19” x 6 ½” bowl by others
Symmons S-20 single lever faucet
Wilkins Model 38-ZW3870-XL-T mixing valve
Zurn Z8746 offset grid drain
Zurn ZH8822-XL-LR supplies
Zurn Z8700 p-trap
Zurn Z8946-3 trap wrap kit

P-4 Lavatory, Wall Hung, Stainless Steel, Eyewash:
Elkay CHS1716C
Elkay LK940GN04L2H faucet
Wilkins Model 38-ZW3870-XL-T mixing valve
Elkay LK-8
Zurn ZH8822-XL-LR
Elkay LK500 P-trap
Guardian G1101 faucet-mounted eyewash

P-5 Single Compartment Sink, Kitchen Faucet:
Elkay DLR-222212
Kohler Crue K-22972 Pull-down single-handle kitchen faucet
Wilkins Model 38-ZW3870-XL-T mixing valve
Zurn ZH8822-XL-LR supplies
Zurn Z8740 basket drain
Zurn Z8702 p-trap

P-6 Service Sink:
Stern-Williams SBC-1500 BP (24"x 24"x12") with stainless steel caps, two tiling flanges, back panels (corner mounted sink).
Zurn ZZ843M4CSRC integral spring-loaded check stops

P-7 Electric Water Cooler (Split Level), Barrier-Free:
Elkay LZWS-LRPBM28K
Zurn ZH8822-XL stop
Zurn Z8700 p-trap
Install with lower bubbler 36" above finished floor

P-8 Ice Machine Connection:
Oatey No. 39140 metal ice maker box with metal face plate
Box with valve and water hammer arrestor

P-9 Wall Hydrant, Exterior:
Oatey No. 39140 metal ice maker box with metal face plate
Box with valve and water hammer arrestor

P-10 Floor Drain, 9” Mechanical Room:
Zurn ZN-508-P-Y, nickel bronze top, sediment bucket, trap primer

P-11 Floor Drain, Regular:
Zurn ZN-415-P-Y B strainer, nickel bronze top, trap primer, sediment bucket

PART 3 EXECUTION

3.01 REQUIREMENTS

A. Water closets shall be installed complete with wall carriers, wax rings, bolt caps, and flush valves (or float valves).

B. Elevated vacuum breakers, where specified, shall be installed 7'-6" above the finished floor.

C. Countertop sinks shall be installed complete with required mounting rim or clips.

D. After installation, all fixtures shall be cleaned and labels removed. Where fixtures are in contact with walls, floors, or countertops, caulking shall be applied. Caulking shall be General Electric white silicon sanitary sealant.

E. Water closets identified on plans as barrier free fixtures shall have the flush valves installed per American Disabilities Act. Flush valves shall have the handle installed on the wide side of the stall. Coordinate with the architectural drawings.

F. Non pre-fabricated showers shall have chloraloy 240 brand non-plasticized chlorinated polyethylene concealed waterproofing membrane .040 inch thick. Installation shall be per manufacturers recommendations.

G. At each floor drain installed above slab on grade, install a 36" x 36" apron equal to chloraloy 240 brand non-plasticized chlorinated polyethylene concealed waterproofing membrane, .040 inch thick, waterproofing membrane to be installed per manufacturers recommendations.

H. At each flush valve, solenoid valve and other quick closing devices provide shock absorber.

END OF SECTION 224313

SECTION 23 05 13 - ELECTRIC MOTORS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide and install electric motors for mechanical and plumbing equipment.

1.02 SUBMITTALS

A. Submittal data is NOT required for products under this section as separate items. It is assumed they will be reviewed with appropriate equipment submittal.

PART 2 PRODUCTS

2.01 MOTORS

A. Electric motors shall be new NEMA Standard, sized and designed to operate at full load and full speed continuously without causing noise, vibration, and temperature rise in excess of their rating.

B. Motors on belt driven equipment shall have slide rails with adjusting screws for belt tension adjustment. Motors exposed to the weather shall be weather protected.

C. High efficiency electric motors shall be provided for all motors 3 horsepower and greater. Any motor used with a variable speed motor controller shall be high efficiency type and VFD compatible.

D. High efficiency motors shall have efficiency and losses determined in accordance with the latest revisions of IEEE Standard 112. Polyphase squirrel-cage motors rated 1 through 125 horsepower shall be tested by dynamometer method B. The efficiency shall be determined using segregated losses in which stray load loss is obtained from a linear regression analysis to reduce the effect of random errors in the test measurements. Guaranteed minimum full load efficiency shall be as follows:

MINIMUM NOMINAL FULL-LOAD EFFICIENCY (%)		
	Open Motors	Enclosed Motors
Number of Poles	4	4
Synchronous Speed (RPM)	1750	1750
Motor Horsepower		
3	86.5	87.5
5	87.5	87.5
7.5	88.5	89.5
10	89.5	89.5
15	91.0	91.0
20	91.0	91.0
25	91.7	92.4
30	92.4	92.4
40 – 75	93.0	93.0
100 above	94.1	94.5
Refer to Latest Edition of ASHRAE 90.1 for other motor rpm and efficiencies.		

E. Motor sound power levels shall not be greater than recommended in NEMA M61-12.49.

F. Motors shall be provided with drive shafts long enough to extend completely through belt sheaves.

G. Motor characteristics shall be as follows:

1. 120V/1/60 Hz: Capacitor start, open drip-proof type, ball bearing, rated 40 degrees C. continuous rise.

2. 208V/3/60 Hz: NEMA Design B, normal starting torque, single speed, squirrel cage type, open drip-proof, rated 40 degrees C. continuous rise, with ball bearings rated for B-10 life of 100,000 hours and fitted with grease fittings and relief ports. Provide motors with aluminum end brackets with steel inserts in bearing cavities.

H. Motor horsepower 50 and greater to have part-winding start capabilities.

PART 3 PRODUCTS

3.01 INSTALLATION

A. Arrange and set motors.

B. Line up motors on direct drive equipment using dial type gauges.

C. Electrical Contractor to make connections and test motor for proper rotation/phasing.

3.02 ADJUSTMENTS

A. All motors together with driven equipment shall be statically and dynamically balanced by equipment supplier, start-up representative, or this contractor using approved balancing equipment. Fan vibration should be limited to manufacturers' recommendations, but should not exceed 2 mils in any case.

END OF SECTION 230513

SECTION 23 07 10 - INSULATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Contractor shall provide all necessary labor, materials, tools, and equipment to perform work required on the drawings and specified herein.

B. Certain equipment and/or systems to be factory insulated by manufacturer. Factory insulation materials to be as specified in applicable sections of the specifications.

C. All pipe fittings, valves, and strainers in insulated pipe systems to be insulated.

D. Thermal resistance "R" values used herein are expressed in units of "Hour, Degrees F., Sq. Ft./BTU per Inch of Thickness" on a flat surface at a mean temperature of 75 degrees F.

E. Note that where electric cable wrap is called for, insulation is to be applied over cable.

F. "Contractor's Option" referred to in Materials below indicates optional materials which may be used as equals.

1.02 DEFINITIONS

A. "Exposed" equipment, ducts, and piping are areas which will be visible without removing ceilings or opening access panels.

B. Outdoors is considered exposed to the weather.

C. Underground is buried, whereas in a trench below grade is considered concealed.

1.03 CERTIFICATION/QUALITY ASSURANCE

A. Products shall meet applicable national, state, and local building codes and be U.L. (or other recognized testing lab) listed for intended service.

B. All insulations, jackets, adhesives, coatings, sealers, and tapes shall have a flame spread rating of 25 or less and smoke development rating of 50 or less when tested in accordance with ASTM E-84, NFPA 225, U.L. 723, and further must meet the requirements of NFPA 90-A and applicable building, plumbing, and mechanical codes.

C. All insulation materials shall be delivered and stored in manufacturers’ containers and kept free from dirt, water, chemical, and mechanical damage.

D. Insulation shall be applied in a workmanlike manner by experienced, qualified tradesmen.

E. Insulation shall not be applied until all pressure testing has been completed, inspected, and released for insulation application.

F. Surfaces shall be clean and dry.

G. Insulation joints shall be butted firmly together and all jackets and tapes shall be smoothly and securely installed.

H. Insulation for duct, pipe, and equipment for above grade exposed to weather outside building shall be certified as being self-extinguishing for 1" thickness in less than 53 seconds when tested in accordance with ASTM D-1692.

1.04 APPLICABLE CODES AND STANDARDS

A. ASTM E-84.

B. U.L. 723.

C. NFPA 90-A.

D. State of Mississippi Energy Code.

PART 2 PRODUCTS

2.01 MATERIALS FOR PIPE AND EQUIPMENT

A. Materials for Pipe and Equipment: Provide factory pre-molded or shop or site mitered segment type insulation for pipe, pipe fittings, and valves. Fitting insulation to be of same thickness and material as adjoining pipe insulation. All insulation and related materials such as tape and mastic to meet applicable building code requirements for fire and smoke development.

1. Flexible Tubular: Provide 25/50 rated, closed-cell, flexible tubular rubber type pipe insulation. Product to have continuous operational temperature limit of 200 degrees F. and a minimum "R" value of 3.7 per inch (K=0.27) at 75 degrees F mean temperature. Product to be Armstrong AP Armaflex or approved equal pipe insulation. Use flexible tubular for the following services:

a. Moisture condensate drains: 1" thick.

b. Horizontal runs of waste lines carrying cold condensate from air conditioning equipment: 1" thick.

c. Refrigerant suction lines for split systems: 1" thick.

d. Provide multiple layers as required to obtain minimum thickness.

e. All refrigerant lines for Variable Refrigerant Flow (VRF) systems: 1” thick.

2.02 MATERIALS FOR DUCTS

A. Blanket Type Duct Insulation: Provide minimum 3/4 pound per cubic foot density, flexible blanket fiberglass duct insulation with FSKL aluminum foil vapor barrier facing and 2" tab. Insulation shall have minimum ‘R’ value of 3.4 per inch (K=0.29) at 75 degrees F mean temperature. Product to be Manville "Microlite" or equivalent standard duct wrap by CertainTeed, Knauf, or Owens-Corning. Use blanket type duct insulation for the following:

1. Unlined heating and/or cooling supply and return air ductwork concealed from view: 2" thick.

2. Unlined outside air ductwork concealed from view: 2" thick.

3. Unlined heating and/or cooling supply and return air ductwork located in attic: 2-1/2" thick.

4. Lined heating and/or cooling supply and return air ductwork located in attic: 2" thick.

5. Unlined return air ductwork located in attic: 2-1/2" thick.

B. Board Type Duct Insulation: Provide minimum 3 pound per cubic foot density, semi-rigid fiberglass duct insulation with FSKL aluminum foil vapor barrier facing. Insulation shall have a minimum ‘R’ value of 3.8 per inch (K=0.26) at 75 degrees F mean temperature. Product to be Manville "800 series Spin-Glas" or equivalent by CertainTeed, Knauf, or Owens-Corning. Use board type duct insulation for the following services:

1. Unlined exposed heating and/or cooling supply air ducts: 1-1/2" thick.

2. Unlined exposed outside air ducts: 1-1/2" thick.

3. Unlined exposed return ducts: 1-1/2" thick.

4. Apparatus casing: 1-1/2" thick.

5. Unlined air-handling plenums within equipment rooms: 1-1/2" thick.

6. Side access filter housings: 1-1/2" thick.

2.03 MATERIALS FOR FITTINGS, VALVES, AND SPECIAL COVERINGS

A. Provide coverings and finishes for specific items hereinafter specified.

1. Use pre-molded insulation fabricated by the manufacturer of insulation material or shop or site mitered segment type insulation for: All pipe fittings, elbows, tees, valves, and couplings.

2. PVC fitting covers over blanket fiberglass are NOT acceptable.

3. Contractor's option to provide factory pre-molded one-piece PVC insulated fitting covers, precut fiberglass insulation inserts, and necessary installation materials for all pipe fittings. Materials to be equal to Manville Zeston white, U.V. resistant, 25/50 rated, 20 mil thickness insulated PVC fitting covers and insulation inserts.

B. For heat exchangers, air separators, large pipes, etc., in systems operating over 60 degrees F., when exposed-to-view inside building or in equipment rooms, cover insulation with a smoothing coat of Keane Powerhouse cement, one layer of white colored glass mesh embedded and finished with Foster 46-50 mastic or Childers CP-10 / CP-11 mastic.

C. For pipe fittings, valves, strainers, air separators, and other irregular surfaces, in systems operating below 60 degrees F., when exposed to view inside building or in equipment rooms, cover insulation with white colored glass mesh embedded in white, fungus resistant vapor barrier coating Foster 30-80 AF. Coating shall meet ASTM D 5590 with 0 growth rating.

D. Fabricate and install readily removable insulation caps to facilitate service and maintenance accessibility to all strainers including suction diffusers in systems operating below 60 degrees F.

E. For any service, when below grade direct buried, cover straight pipe and fitting insulation with equivalent of Pittsburgh Corning "Pittwrap", Foster C.I. Wrap 50 or "Pittwrap SS11" jacketing. Valves in systems operating above 60 degrees F. and installed in valve boxes shall not be insulated; however, the valves shall be painted with a rust resistant product equivalent to Rustoleum.

F. For flexible tubular pipe and fitting insulation when exposed-to-view inside building or exposed to the weather, finish with two coats of paint, custom color blended to match surrounding surfaces.

G. When specifically approved by designer, when it is impossible to completely insulate pipe, fittings, or valves with specified insulation, Armstrong Armaflex insulation tape may be used to prevent condensate drip on small piping. Use of cork insulation tape is prohibited.

PART 3 EXECUTION

3.01 GENERAL

A. No insulation shall be cut where a hanger is located. If hangers have been installed by pipefitter tradesmen which violates this strict requirement, notify Designer immediately.

B. Piping and ductwork systems shall be tested and found free of all leaks prior to installation of insulation covering.

C. All surfaces shall be clean and dry when covering is applied. Covering to be dry when installed and during application of any finish, unless such finish specifically requires a wetted surface for application.

D. All adhesives, cements, and mastics shall be compatible with materials applied and shall not attack materials in either wet or dry state.

E. Install insulation using professional insulators who have adequate experience and ability.

F. Exposed-to-view insulation shall have a well tailored appearance.

G. Stop all duct coverings, including jacket and insulation, at fire and smoke dampered penetrations of partitions. "Fan-Out" or extend jacketed insulation at least 2" beyond angle frames of dampers and secure insulation to partition. Maintain vapor barrier. Where insulated duct access door is not used, install covering over damper access panel so as to be readily removable and identifiable.

H. Treat insulated pipe and duct surfaces in equipment rooms and where exposed to normal view, so surfaces may be painted with water base latex paint. Use of mastics, adhesives, or jacketing which cause "bleeding" is prohibited.

3.02 INSTALLATION OF DUCT COVERING

A. Apply jacketed blanket type fiberglass covering to ducts pulled snug but not so tight as to compress corners more than 1/4". Use insulation having 2" tab, or cut insulation long enough to allow for "peel off" of insulation from jacket to effect a minimum overlap of 2". Secure 2" jacket laps using equivalent of Foster 85-75 or CP-82 adhesive and staple lap with flare type staples on 2" centers. Cover standing seams, stiffeners, and braces with same insulation blanket, using 2" jacket lap and staple lap as hereinbefore outlined. Cover and seal all staples with Foster 30/80 AF, fire resistant vapor barrier coating reinforced with glass cloth.

B. For duct 24" or wider, mechanically fasten insulation to duct bottom, using weld pins or nylon "stick-clip" base plates having self-locking coated metal or nylon discs. Locate fasteners on not over 12" centers laterally and longitudinally. Seal pins as above.

C. For ducts more than 20” deep, mechanically fasten insulation to duct sides, using one row of pins, plates, or discs located on not over 12" centers longitudinally and equidistant laterally between duct top and bottom. For ducts over 24" deep, apply fasteners as before only using minimum of two rows.

D. Apply jacketed board type fiberglass covering to ducts using weld pins or nylon "stick-clip" base plates having self-locking coated metal or nylon discs. Locate fasteners on not over 12" centers laterally and longitudinally. If insulation is grooved to fit around corners, in order to eliminate as many joints as possible, pin as required to hold insulation tight to duct, especially on bottom of duct. Seal pins and joints with Foster 30-80 AF reinforced with glass mesh.

E. Cover all joints, rips, tears, punctures, disc heads, staples, or breaks in vapor barrier jacket with 4" wide woven glass fabric tape embedded in Foster 30-80 AF fire resistant vapor barrier coating. PRESSURE SENSITIVE TAPE NOT ALLOWED.

3.03 INSTALLATION OF PIPE AND EQUIPMENT COVERING

A. Where fiberglass or flexible tubular insulation is used on piping sized 2" and larger, insert a section of foamglass insulation at hanger or support points between pipe and metal shield for full length of shield to prevent crushing of insulation. Insulation thickness to be same as adjoining insulation. Where insulation passes through pipe hangers and across trapeze supports, 12" long metal saddles shall be used. On cold pipe, vapor barrier should be carried through the hanger and sealed.

B. Apply flexible tubular insulation to pipe and fittings using the slip-on method with all joints tightly fitted and sealed with Armstrong 520, Foster 85-75, Childres CP-82 adhesive or approved equal. Seal butt joints, miter joints and torn or damaged insulation with adhesive.

C. Apply PVC insulated fitting covers and precut insulation inserts as follows:

1. Installation for hot systems:

a. Place the precut fiberglass insert around the fitting, positioning the points of the insert on the inside radius of the elbow.

b. Butt the ends of the fiberglass insert against the ends of the pipe covering. Tuck and fold the insulation so that it covers all bare surfaces. Keep the fiberglass fluffed up to the thickness of the adjacent pipe insulation to assure maximum thermal efficiency.

c. Insert two stainless steel serrated tacks approximately 1/4" from one of the lap edges of the fitting cover. Then snap the cover in place over the fiberglass insulation.

d. After the fitting cover is in position, push the tacks into the overlapping throat seam. Apply color-matched, pressure-sensitive tape to the butt joints.

2. Installation for cold systems:

a. Position, tuck, and fold the fiberglass insulation insert as described above in steps (a) and (b) for hot systems.

b. Apply a vapor barrier mastic around the edges of the adjoining pipe insulation. Apply the mastic along the inside of the fitting cover throat overlap seam.

c. Place the fitting cover over the insulation, lapping the mastic-covered edge over the other side of the throat seam.

d. Apply color-matched, pressure-sensitive tape over the circumferential joints. The tape should extend over the adjacent pipe insulation and overlap itself by at least 2" on the downward side of the lap.

END OF SECTION 230710

SECTION 23 23 00 - REFRIGERANT PIPING SYSTEM

PART 1 GENERAL

1.01 WORK INCLUDED

A. Refrigeration piping, valves and fittings to connect remote condensers to air handling units and split system heat pump and air conditioning systems.

1.02 SAFETY CODE

A. Comply with the requirements of ANSI B9.1, Code for Refrigerant Systems.

PART 2 PRODUCTS

2.01 MATERIALS

A. Piping: Type "L" ACR hard copper, ASTM B88.

B. Fittings: Wrought copper.

C. Solder: Silver solder, or phos-copper solder having a melting point of 1125 degrees F. or higher.

2.02 EQUIPMENT

A. Service Valves: Henry valves or equal. Provide packed type receiver, purge, and gauge valves with valve stem seal cap ports.

1. Valves up to 5/8" O.D.: Henry Figure 516 or equal, diaphragm type.

2. Valves larger than 5/8" O.D.: Henry Figure 203 or equal.

B. Solenoid Valves: Manufactured by Sporlan Co., or equal, suitable for the type of refrigerant used, and of a type permitting manual lifting of stem for emergency operation. Size valves for pressure drop of 3 pounds at design flow.

C. Refrigerant Filter Dehydrator: Sporlan Co. Filter-Drier or equal sealed core type of size recommended by manufacturer for maximum design tonnage. For systems 20 nominal tons and larger, provide replaceable core filter driers.

D. Moisture Indicator: Sporlan Co. See-All type SA-125 or equal.

E. Pipe Supports:

1. Pipes subject to vibration: Isolation type brackets.

2. Pipes not subject to vibration: Grinnel No. CT-95 or equal.

3. Riser clamps: Grinnel CT-121 or equal.

F. Escutcheons: Chrome plated escutcheons sized for pipe.

G. Sleeves: Pipe sleeves shall be provided at non-rated partitions and floor penetrations. Pipe sleeves to be Schedule 40 or 18 gage steel. Sleeves to extend 1-1/2" in excess of partition depth on each side. Sleeves penetrating floors in wet areas, including all mechanical rooms, shall extend a minimum of 1 inch above the floor.

1. Piping requiring sleeves: Copper pipes thru masonry walls

H. Insulation: Insulate piping as specified in Section 23 07 10.

PART 3 EXECUTION

3.01 INSTALLATION

A. Make solder joints with carbon dioxide or nitrogen passing through joints being soldered. Ensure a clean, tight system. Pull a clean rag through each piece of tubing after cutting or reaming.

B. Install pipe and hangers in accordance with hanger manufacturers' printed instructions.

C. Provide escutcheons at all visible wall penetrations in finished areas.

3.02 LEAK TESTING

A. Test for leaks by use of carbon dioxide or nitrogen and a liquid soapsuds solution. Correct leaks found.

B. Evacuate system to 20" vacuum and charge with refrigerant until a pressure of 15 psig is reached. Then test for leaks using a Halide leak detector. Correct leaks found.

C. Pressurize system, with carbon dioxide or nitrogen, to 300 psig on the high side, and 200 psig on the low side, and test for leaks. Correct leaks found.

3.03 SYSTEM DEHYDRATION

A. Dehydrate system by "Double Dehydration" method.

B. Use a suitable vacuum pump. Evacuate system to a vacuum of 0.2" Hg absolute and operate pump for eight hours when that pressure is reached.

C. After eight hours, admit dry nitrogen directly to the system, and then evacuate system to a vacuum of 0.2" Hg absolute and operate pump for four hours.

3.04 CHARGING SYSTEM

A. When system dehydration is complete and all leaks are corrected, charge system with refrigerant.

END OF SECTION 232300

SECTION 23 33 10 - SHEET METAL SPECIALTIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Specialties to be submitted and approved before starting installation.

B. Items to be installed approximately as shown on drawings taking into account differences in mechanical equipment submitted and that shown on contract documents. Each item to be installed so that it is readily accessible for maintenance, repair, and/or setting and balancing.

C. Diffusers, registers, and grilles to have ratings certified by Air Diffusion Council and tested per ADC Equipment Test Code 1062R2 and ASHRAE Standard 36B-63.

D. Refer to drawings for diffuser, register, and grille sizes and number of airflow directions.

PART 2 PRODUCTS

2.01 FIRE DAMPERS

A. Fire dampers to be U.L. listed in accordance with UL-555. Fire dampers to be held in an open position with a 165 degree F fusible link and arranged to lock in position on closure.

B. Fire dampers for rectangular duct to be type "B" (Blades out of air stream) and for round duct to be Type "C" (Blades and frame out of air stream). Fire dampers located behind sidewall registers and grilles and others specifically indicated on drawings to be Type "A" (Frame and Blades in air stream). Fire dampers to be multi-leaf type with spring closing for horizontal mounting and weighted-gravity closing for vertical mounting. Dampers to be steel construction with rust resistant finish and provided with a factory-installed mounting sleeve suitable for structure. Mount per manufacturer's published U.L. approved installation instructions. Manufacturer models which provide square to round or round oval transitions are acceptable.

C. See Architectural drawings for hour-rating of walls and/or floors. Dampers to be compatible with hour ratings.

D. Fire dampers to be Ruskin Model IBD2 Curtain Type Static Fire Dampers.

2.02 COMBINATION SMOKE/FIRE DAMPERS

A. Combination smoke/fire dampers to be U.L. listed both as 1-1/2 hour fire damper under UL-555 and as smoke damper under UL-555S as Minimum Leakage Category II and Elevated Temperature Category B (350 degrees F).

B. Dampers to be steel construction with rust resistant finish and provided with 165 degree F electronic resettable fuse link (EFL) and factory-installed mounting sleeve suitable for structure. Mount damper per manufacturer's published U.L. approved installation instructions.

C. Smoke detectors to be furnished by Division 26; coordinate wiring hook-ups. Damper operator to be electric type compatible with electrical characteristics used for smoke detection and/or fire alarm system.

D. Dampers to be Ruskin Model FSD36 with crimped type blades for low-pressure duct systems and Ruskin Model FSD60 with airfoil blades for medium- and high-pressure duct systems.

2.03 SMOKE DAMPERS

A. Smoke dampers to be U.L. listed in accordance with UL-555S as Minimum Leakage Category II and Elevated Temperature Category B (350 degrees F).

B. Dampers to be steel construction with rust resistant finish and provided with factory installed mounting sleeve suitable for structure. Mount damper per manufacturer's published U.L. approved installation instructions.

C. Smoke detectors to be furnished by Division 26; coordinate wiring hook-ups. Damper operator to be electric type compatible with electrical characteristics used for smoke detection and/or fire alarm system.

D. Dampers to be Ruskin Model SD60 with crimped type blades for low-pressure duct systems and Ruskin Model SD60 with airfoil blades for medium- and high-pressure duct systems.

2.04 DAMPERS

A. Automatic Control Dampers: All automatic control dampers to be furnished by Control Subcontractor and installed by this Contractor (except unit mounted dampers).

B. Manual Volume Dampers (MVD): Manual volume dampers to be hand-operated type dampers constructed of galvanized steel, minimum 22-gauge for duct widths 18" and less, minimum 16-gauge for duct widths greater than 18". Dampers for ducts to 12" height and 12" diameter to be single blade carried on a 3/8" round steel rod mounted inside of duct without frame and fitted with locking type quadrant and brass end bearing plate accurately drilled and secured to duct. Dampers for ducts greater than 12" height to be multi-blade type, 12" maximum blade width up to 30" blade length and 10" maximum blade width over 30" blade length. Blades to be mounted on frame with brass sleeve bearings interconnected for operation from one locking type hand quadrant. Round pivot rods to have section faced flat to receive locking setscrew in locking quadrant. Refer to SMACNA manual Figures 2-14 and 2-15.

1. For manual damper locations above a rigid or non-accessible ceiling or where damper access is limited, a remote damper operator shall be used. Damper operator to be self-locking worm gear designed for 3/8” damper shaft. Shaft extension to be 3/8” square rod with coupler. Remote operator to be provided with wrench operated shaft adjustment, position indication and lock nut. Where straight shaft extension cannot be used due to accessibility, a flexible cable operator with compatible damper operator and regulator may be utilized. Damper operator, shaft and regulator shall be designed for minimum 35 in-lb torque. Remote operator in non-sterile areas to be ceiling mounted with removable cover plate or mounted above access door. Sterile area installations such as surgery rooms or elsewhere as indicated on drawings shall use bracket mount installation above access door. Where multiple operators are routed to single or multiple access locations, provide markings to identify the associated air device for future use. The damper operator, shaft extension and ceiling termination/regulator shall be manufactured by Young Regulator, Inc. or approved equal.

C. Backdraft Dampers (BDD): Backdraft dampers to be Ruskin Model BD2-A2 or approved equal low-leak backdraft dampers. Dampers to be heavy-duty type suitable for air velocities to 2500 fpm with all extruded aluminum construction, minimum 0.81" thick frame, and minimum .050" thick blades on maximum 4" centers. Provide blades with vinyl edge seals. Provide dampers with aluminum linkage and corrosion resistant type bearings.

2.05 SQUARE CEILING DIFFUSERS

A. Provide Titus TDC or approved equal round or square neck, louvered face ceiling diffusers at all locations designated by schedule on drawings. Diffusers to be all aluminum construction. Frame to be flush mount for diffusers in "hard" ceilings and lay-in T-bar mount for diffusers in lay-in ceilings. Finish to be baked-on, off-white enamel.

2.06 LINEAR CEILING DIFFUSERS

A. Provide Titus ML-39 or approved equal at all locations designated by schedule on drawings. Diffusers to be complete with horizontal to vertical airflow pattern adjustment. Minimum lengths of continuous border sections to be 4 feet. Slot width to be 1-inch. Total number of slots required to be indicated on drawings. Border finish to be anodized with color selected by architect. Internal airflow pattern adjustment mechanism to be flat black. Provide each diffuser with insulated plenum with round duct connection, Titus MPI-39.

2.07 SIDEWALL SUPPLY REGISTERS

A. Provide Titus 1707 or approved equal at all locations designated by "SAR". Registers to be all aluminum construction complete with removable and rotating fixed horizontal blade core, and attached rear set of individually adjustable vertical blades. Finish to be baked-on, off-white enamel. Border to be curved, Titus Type C.

2.08 SIDEWALL RETURN REGISTERS

A. Provide Titus 1700 or approved equal at all locations designated by "RAR". Registers to be all aluminum construction complete with removable and rotating fixed horizontal blade core. Finish to be baked-on, off-white enamel. Border to be curved, Titus Type "C".

2.09 CEILING RETURN & EXHAUST REGISTERS

A. Provide Titus Model 50-F or approved equal at locations designated by schedule on drawings. Registers to be complete with 1/2" cube egg-crate aluminum grid. Finish to be baked-on, off-white enamel. Border to be flush mounted frame style.

2.10 AIR LOUVERS

A. Air louvers shall be stationary horizontal, wind driven rain, extruded aluminum blades equal to Greenheck model EHH-601. The louvers shall be AMCA Certified. Louvers to be have minimum 0.081” thick aluminum frame and blades. Louver depth to be 6” with blades on approximate 2” spacing. Blade construction to be horizontal rain resistant style. Finish shall be Kynar color selected by Architect. Manufacturer will submit metal color chip to Architect as part of the submittal approval. Louver shall be rated at: the beginning point of water penetration (0.01 oz. of water (penetration) per sq. ft. of louver free area is above 1,250 fpm, minimum 46% free area, 0.21” S.P. resistance at 1,000 fpm. Provided 1/2” mesh expanded aluminum screen with removable frame mounted on inside face of louver. Provide minimum 10 year finish warranty.

2.11 BRICK VENTS

A. Brick vents to be constructed of heavy extruded aluminum frames and blades. Blades to be supported on vertical aluminum rods. Vent to include continuous overhanging weather-guard visor at top of frame to prevent water from running down wall into face of vent. Vent to include continuous overhanging weather-guard sill at bottom of frame to drain water out and away from wall below. Bottom frame member to include integral water stop. Finish shall be primer, suitable for painting. Provide extruded aluminum birdscreen mounted on inside face of vent.

2.12 FLEXIBLE CONNECTORS

A. Install UL listed flexible duct connectors between duct and fan/equipment connections. Flexible duct connectors to be made of 28-ounce, heavy glass fabric double coated with neoprene.

2.13 FLEXIBLE DUCT

A. Flexmaster Type 1M Acoustical Attenuating or Approved equal. Submit acoustical performance of any alternate product for prior approval.

1. Characteristics of flexible duct:
    a. Approved as UL-181 Class 1 air duct.
    b. Flame spread rating less than 25 and smoke developed rating less than 50.
    c. Rated for 6" w.g. positive pressure, 4" w.g. negative pressure, and 5000 fpm air velocity.
    d. Tear and puncture resistant reinforced CPE inner liner mechanically locked together with a corrosive resistant galvanized steel helix.
    e. Insulated with minimum 1/2" thick fiberglass insulation with vapor barrier jacket.

B. Seal off the insulation jacket at its ends and at joints with mastic, Hardcast, or similar material. Replace flexible duct if jacket is punctured.

C. Flexible duct is NOT to be used for runouts where it must pass through walls or through smoke or fire partitions. Flexible duct is not to be used in exposed application. Flexible duct lengths shall not exceed 6 feet at each connection.

D. No bends shall be made in flexible duct with the center line radius less than one and one-half duct diameter and only one bend may occur per 6 foot length of duct material.

2.14 DUCT ACCESS DOORS

A. Duct access doors to be provided for access to all coils, fire, fire/smoke, and smoke dampers, automatic and backdraft dampers, duct smoke detectors, static pressure and air volume sensing devices, and other equipment installed in ducts and at other points indicated on drawings.

B. Access door construction and airtightness must be suitable for the duct pressure class used (low, medium, or high).

C. Access doors to be double-panel, galvanized steel construction with minimum 1" rigid insulation between panels. Access doors in exhaust duct and unlined return duct may be uninsulated single panel, galvanized steel construction. Doors to mount in rigid frame constructed of formed galvanized steel. Angle iron bracing to be used as required to provide rigid assembly. Doors to hinge on one side with door latch on opposite side.

D. Access doors in ductwork shall fully comply with Figure 7-2, 7-3 and 7-2M of SMACNA manual. Casing access doors shall fully comply with Figure 9-15 and 9-16 of SMACNA manual. Minimum size shall be 12” x 12” per NFPA 80.

E. Doors to close against gasket seal.

F. Access doors for fire dampers, fire/smoke dampers, and smoke dampers shall be permanently identified on the exterior by a label having letters not less than 0.5 inches in height reading: “Fire Damper” “Fire/Smoke Damper” or “Smoke Damper” as required by 2012 International Mechanical Code.

PART 3 EXECUTION

3.01 INSTALLATION

A. Installation to be in accordance with manufacturers’ published installation instructions as well as applicable sections of SMACNA manual.

B. Provide all screws, bolts, nuts, and inserts required for attaching sheet metal specialty items to ducts, walls, floors and ceilings.

END OF SECTION 233310

SECTION 23 36 10 - VARIABLE VOLUME AIR TERMINAL UNITS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Variable volume air terminal units to be pressure independent, single duct, DDC control type with electric reheat coil as manufactured by Trane, Titus, Environmental Technologies, Tempmaster, or approved equal.

B. Air terminal unit airflow and sound performance ratings to be certified in accordance with AHRI Standard 880.

PART 2 PRODUCTS

2.01 EQUIPMENT REQUIREMENT

A. Provide terminal units with minimum 22-gauge welded galvanized steel housing, slip and drive duct connection, hanger holes or brackets, and 1/2 inch thick internal glass fiber insulation with minimum 22-gauge inner sheet metal liner. Insulation to be UL listed and meet NFPA-90A and UL-181 requirements. Device to be double wall construction.

B. Terminal units to be pressure independent. Terminal unit airflow to be monitored by an integral, multiple point, averaging airflow sensing ring or cross to maintain constant airflow within 5 percent of rated cfm down to 25 percent of nominal cfm, independent of changes in system static pressure. Factory set, field adjustable settings for terminal unit maximum and minimum airflows to be provided in accordance with schedule on drawings. Integral flow taps and calibration chart to be provided for each terminal unit.

C. Internal resistance of terminal unit shall not exceed that scheduled on drawings when handling maximum scheduled air volumes.

D. Terminal unit leakage rate to be maximum 1 percent of nominal cfm at 0.50" w.g. inlet static pressure.

E. Maximum room N.C. due to discharge or radiated sound shall not exceed NC-35 when terminals are either in throttled or full open position with inlet static pressure ranging from 0.5 to 2" w.g. Correction of noise excesses not to constitute additional charges.

F. Terminal units to be complete with factory installed, direct digital control actuator for connection to DDC controls provided by controls contractor. Coordinate controls with controls contractor.

G. Provide factory-mounted, UL listed, open-type electric resistance heater for terminal units scheduled on drawings. Provide heaters with automatic primary thermal safety cut-out, manual reset secondary thermal cut-out, airflow switch, 80 percent nickel/20 percent chromium elements, stainless steel terminal connections with ceramic or phenolic insulators, and disconnect switch.

H. Provide access door/panel in terminal units for access to terminal unit interior.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install terminal units in strict accordance with manufacturers' published installation instructions.

B. Terminal units to be supported directly from unit to structure with appropriate supports.

END OF SECTION 233610

SECTION 23 75 56 - MULTI INDOOR UNIT VARIABLE REFRIGERANT FLOW SYSTEM

PART 1 GENERAL

1.01 SYSTEM DESCRIPTION

A. Heating and Cooling Heat Pump: The VRF (Variable Refrigerant Flow) system shall be a cooling and heating heat pump. The heating and cooling heat pump VRF system shall consist of an outdoor heat pump unit, high efficiency heat pump units designed for minimum piping and maximum design flexibility, central station indoor air handler units, and controls by the equipment manufacturer. The system shall be capable of changing mode of individual indoor units (cooling to heating or heating to cooling) within a maximum time of 5 minutes to ensure indoor temperature can be properly maintained.

1.02 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Basis of Design: Daikin.
2. Alternate manufacturers: Mitsubishi, LG, Trane, Toshiba-Carrier or Sanyo.

B. All manufacturers other than the basis of design are required to coordinate all manufacturer specific requirements with all associated trades. Any additional costs associated with the alternate equipment including but not limited to electrical wiring costs, piping costs, insulation, ceiling systems coordination and engineering design costs shall be covered by the equipment manufacturer and sub contractor. No additional costs shall be incurred by the owner or designer.

1.03 QUALITY ASSURANCE

A. The units shall be listed by Electrical Laboratories (ETL) and bear the ETL label.

B. All wiring shall be in accordance with the National Electrical Code (N.E.C.).

C. The units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).

D. A full charge of R-32 for the condensing unit only shall be provided in the condensing unit.

E. The VRF system shall be installed by a licensed mechanical contractor trained by the VRF equipment manufacturer or certified manufacturer’s agent.

F. Commissioning shall be performed by the manufacturer or certified manufacturer’s agent.

1.04 STORAGE AND HANDLING

A. All VRF equipment shall be stored protected from weather, extreme temperature, etc. as suggested by the manufacturer. All VRF equipment shall be moved, lifted, etc. as suggested by the manufacturer.

1.05 WARRANTY

A. VRF equipment shall be warranted by the manufacturer’s limited warranty for a period of one year from date of substantial completion. Manufacturers shall provide an extended warranty including 1 additional year parts and 5 additional year’s compressor.

PART 2 PRODUCTS

2.01 HEATING AND COOLING HEAT PUMP OUTDOOR UNIT

A. General: The outdoor unit shall be used specifically with manufacturer approved piping components and air handling units. The outdoor units shall be equipped with multiple circuit boards that interface to the VRF controls system and shall perform all functions necessary for operation. Each outdoor unit module shall be completely factory assembled, piped and wired and run tested at the factory.

1. All units requiring a factory supplied twinning kits shall be piped together in the field, without the need for equalizing line(s). If an alternate manufacturer is selected, any additional material, cost, and labor to install additional lines shall be incurred by the contractor.
2. Outdoor unit shall have a sound rating no higher than 60 dB(A) individually or 64 dB(A) twinned. Units shall have a sound rating no higher than 50 dB(A) individually or 53 dB(A) twinned while in night mode operation. If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the contractor.
3. All refrigerant lines from the outdoor unit to the BC (Branch Circuit) Controller (Single or Main) shall be insulated.
4. Outdoor unit shall be approved to connect to a central station air handling unit with DX heat pump coil.
5. The outdoor unit shall have an accumulator with refrigerant level sensors and controls.
6. The outdoor unit shall have a high pressure safety switch, over-current protection, crankcase heater and DC bus protection.
7. The outdoor unit shall have the ability to operate with a maximum height difference of 164 feet and have total refrigerant tubing length of 1804-2625 feet. The greatest length is not to exceed 541 feet between outdoor unit and the indoor units without the need for line size changes or traps.
8. The outdoor unit shall be capable of operating in heating mode down to -4 degrees Fahrenheit ambient temperature or cooling mode down to 23 degrees Fahrenheit ambient temperature, without additional low ambient controls. If an alternate manufacturer is selected, any additional material, cost, and labor to meet low ambient operating condition and performance shall be incurred by the contractor.
9. The outdoor unit shall be capable of operating in cooling mode down to -10°F with optional manufacturer supplied low ambient kit.
10. Manufacturer supplied low ambient kit shall be provided with predesigned control box rated for outdoor installation and capable of controlling kit operation automatically in all outdoor unit operation modes.
11. Manufacturer supplied low ambient kit shall be listed by Electrical Laboratories (ETL) and bear the ETL label.
12. Manufacturer supplied low ambient kit shall be factory tested in low ambient temperature chamber to ensure operation. Factory performance testing data shall be available when requested.
13. The outdoor unit shall not cease operation in any mode based solely on outdoor ambient temperature.
14. The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.

15. Unit must defrost all circuits simultaneously in order to resume full heating more quickly. Partial defrost which may extend “no or reduced heating” periods shall not be allowed.

16. Unit Cabinet: The casing(s) shall be fabricated of galvanized steel, bonderized and finished. Unit cabinets shall be able to withstand 960 hours per ASTM B117 criteria for seacoast protected models.

B. Fan:

1. Each outdoor unit module shall be furnished with one direct drive, variable speed propeller type fan. The fan shall be factory set for operation under 0 in. WG external static pressure, but capable of normal operation under a maximum of 0.24 in. WG external static pressure via dipswitch.

2. All fan motors shall have inherent protection, have permanently lubricated bearings, and be completely variable speed.

3. All fan motors shall be mounted for quiet operation.

4. All fans shall be provided with a raised guard to prevent contact with moving parts.

5. The outdoor unit shall have vertical discharge airflow.

C. Refrigerant:

1. R32 refrigerant shall be used for all systems.

2. Contractor shall provide sufficient refrigerant to properly charge system.

D. Coil:

1. Each outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.

2. The coil fins shall have a factory applied corrosion resistant blue-fin finish.

3. The coil shall be protected with an integral metal guard.

4. Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.

5. The outdoor coil shall include 4 circuits with two position valves for each circuit, except for the last stage.

E. Compressor:

1. Each outdoor unit module shall be equipped with one inverter driven scroll hermetic compressor. Non inverter-driven compressors shall not be allowed.

2. A crankcase heater(s) shall be factory mounted on the compressor(s).

3. The outdoor unit compressor shall have an inverter to modulate capacity. The capacity shall be completely variable with a turndown of 19%-5% of rated capacity, depending upon unit size.

4. The compressor will be equipped with an internal thermal overload.

5. The compressor shall be mounted to avoid the transmission of vibration.

6. Field-installed oil equalization lines between modules are not allowed. Prior to bidding, manufacturers requiring equalization must submit oil line sizing calculations specific to each system and module placement for this project.

F. Electrical:

1. The outdoor unit electrical power shall be 208 volts, 3-phase 60 hertz.

2. The outdoor unit shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz).

3. The outdoor unit shall be controlled by integral microprocessors.

4. Provide all manufacturer required control wiring between each unit outdoor unit and system controller. Control wiring shall be 2 conductor twisted pair shielded cable.

G. Multiple Condensing Unit Sections:

1. The outdoor unit shall be completely factory assembled, piped and wired. Dual and triple frame outdoor units will be field piped with factory designed and supplied Y-branch kits to manifold them together into a single refrigerant circuit.

2. The outdoor unit shall be modular in design and should allow for side-by-side installation with minimal spacing.

3. Multiple modules shall have duty cycling function to ensure sequential starting of each module at each start/stop cycle, completion of oil return, completion of defrost or every 8 hours of runtime.

2.02 BRANCH CIRCUIT (BC) CONTROLLERS / HEAT RECOVERY BOXES / SOLENOID VALVE KITS

A. General: Unit manufacturer shall provide branch circuit controller / heat recovery box / or solenoid valve kit as required by system to allow for simultaneous heating or cooling operation of any indoor fan coil unit.

B. The BC (Branch Circuit) Controllers shall be specifically used with manufacturer provided fan coil units. These units shall be equipped with a circuit board that interfaces to the VRF controls system and shall perform all functions necessary for operation. The unit shall have a galvanized steel finish. The BC Controller shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory. This unit shall be mounted indoors, with access and service clearance provided for each controller. The sum of connected capacity of all indoor air handlers shall range from 50% to 150% of rated capacity.

1. BC Unit Cabinet:

a. The casing shall be fabricated of galvanized steel.

b. Each cabinet shall house a liquid-gas separator and multiple refrigeration control valves.

c. The unit shall house two tube-in-tube heat exchangers.

2. Refrigerant: R32 refrigerant shall be required.

3. Refrigerant valves:

a. The unit shall be furnished with multiple branch circuits which can individually accommodate up to 54,000 BTUH and up to three indoor units. Branches may be twinned to allow more than 54,000 BTUH.

b. Each branch shall have multiple two-position valves to control refrigerant flow.

c. Service shut-off valves shall be field-provided/installed for each branch to allow service to any indoor unit without field interruption to overall system operation.

d. Linear electronic expansion valves shall be used to control the variable refrigerant flow.

4. See drawings for required quantity of zones for each system. All system alternate manufacturers shall provide identical quantity of cooling and heating zones per BC controller as shown on drawings. If alternate manufacturer unable to provide identical quantity, then manufacturer shall provide additional BC controllers, wiring, and piping to provide same number of zones shown on the drawings at no additional cost.
5. Integral Drain Pan: An integral condensate pan and drain shall be provided.
6. Electrical:
    a. The unit electrical power shall be 208/230 volts, 1 phase, 60 hertz.
    b. The unit shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253V (230V/60Hz).
7. The BC Controller shall be controlled by integral microprocessors.
8. The control circuit between the indoor units and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

C. shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function, a test run switch, and the ability to adjust airflow patterns for different ceiling heights. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

D. Unit Cabinet:
1. The cabinet shall be space-saving ceiling-recessed cassette.
2. The cabinet panel shall have provisions for a field installed filtered outside air intake.
3. Branch ducting shall be allowed from cabinet.
4. Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.

E. Condensate Pump: The unit shall be provided with an integral condensate lift mechanism that will be able to raise drain water 33 inches above the condensate pan.

F. Electrical:
1. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

G. Controls: This unit shall use controls provided by unit manufacturer to perform functions necessary to operate the system.

2.03 GATEWAY:

A. Provide BACnet Gateway to fully interface system function into building DDC control system. Manufacturer shall coordinate gateway requirements with control contractor prior to bid.

PART 3 EXECUTION

3.01 INSTALLATION

A. Installation, Operation and Maintenance manual shall be supplied with the unit.

B. Installing contractor shall install unit, including field installed components, in accordance with Installation, Operation and Maintenance manual instructions.

C. Start up and maintenance requirements shall be complied with to ensure safe and correct operation of the unit. Engage manufacturer or factory-authorized service representative to perform startup service. Manufacturer shall provide on-site startup and commissioning assistance through job completion. Complete installation and startup checks according to manufacturer's written instructions.

D. Unit manufacturer to provide services of factory trained personnel to verify operation of system installation and control hardware.

E. Provide all labor, refrigerant, and material required for a complete installation. Work to be performed shall be in accord with local codes, regulations, and OSHA standards.

F. Install all piping, fittings, and insulation to meet manufacturer's requirements. Install units level and plumb. Evaporator-fan components shall be installed using manufacturer's standard mounting devices securely fastened to building structure. Install and connect refrigerant tubing and fittings.

G. All lines from outdoor unit to BC controller / heat recovery box and all lines from BC controller to indoor fan coil unit shall be insulated.

H. Installer shall supply isolation ball valves for zoned refrigerant isolation. Installer shall supply Isolation ball valves with Schrader connection for isolating refrigerant charge and evacuation at each connected air handling unit and condensing unit. Isolation ball valves, with Schrader connection, are required for instances of air handling unit isolation for troubleshooting, repair or replacement without affecting the remainder of the system. Isolation ball valves with Schrader connection are also required at condensing unit connection to isolate unit for troubleshooting, repair or replacement and as required to provide partial capacity Heating/Cooling in the instance of a failure of one of the multiple outdoor unit (condensing unit) compressors.

I. Contractor shall install and pressure test piping system in accordance with manufactures instructions. Provide written documentation of all pressure tests.

3.02 OWNER TRAINING

A. The manufacturer that provides the VRV system for this project will include in his price the cost to have a "Factory Service Representative" provide onsite training for the VRV system to include, but not limited to:

1. System rebooting.
2. Identifying error codes.
3. Resetting filter indicators.
4. Basis system operation.
5. Explanation of service indicators.
6. How the manufacturer can support with system issues.

B. This training will be a minimum of:

1. 8 hours during equipment startup.
2. 8 hours at Substantial Completion.
3. 8 hours and the end of the Manufacturer Warranty period.

C. Training shall be by a representative from the Factory. Training by local sales representative is not acceptable.

D. Prior to beginning of training, Manufacturer shall provide written material and outline of training for approval by Owner, Cx agent, and design team.

E. Contractor shall schedule training in advance with Owner.

END OF SECTION 237556

SECTION 26 01 00 - GENERAL PROVISIONS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Secondary power wiring and distribution system.

B. Fire alarm and smoke detection system.

C. Telephone system rough-in.

D. Lighting control equipment.

E. Electrical control systems and interlock wiring.

1.02 RELATED WORK

A. Foundations and pads required for equipment furnished under this division of the specifications.

B. Field painting, except such painting as is required to maintain shop coat painting and factory finish painting.

C. Electrical control systems and interlock wiring as required by mechanical drawings, specifications or manufacturer's schematics.

D. Flashing of conduits into roofing and outside walls.

E. Heating, ventilating, and air conditioning equipment.

F. Plumbing equipment.

G. Kitchen equipment.

H. Telephone system equipment.

1.03 QUALITY ASSURANCE

A. Comply with applicable local, state and federal codes.

B. Comply with applicable requirements of recognized industry associations which promulgate standards for the various trades.

C. Employ only qualified journeymen for this work. Employ a competent qualified electrician to supervise the work.

1.04 STANDARDS

A. Perform work specified in Division 26 in accordance with standards listed below including amendments or revisions. When these specifications are more stringent, they take precedence. In case of conflict, obtain a decision from the Designer.

B. National Fire Codes (NFPA) including, but not limited to following:

1. NFPA-70 - National Electrical Code. 2020 Edition.
2. NFPA-72 - National Fire Alarm Code. 2019 Edition.
3. NFPA-101 - Life Safety Code. 2021 Edition.

C. Applicable Codes:

1. ANSI-A17.1: Elevators, Dumbwaiters, Escalators and moving walks.
2. InterNational Building Code: 2018 Edition.

D. Should any work be construed as being contrary to or not conforming to aforementioned codes, such alleged confliction to be brought to attention of **Architect** in writing ten (10) days prior to bid date for review so that such point in question may be resolved. All work to be installed in strict conformity with applicable codes without additional cost to Owner.

E. Contractor to submit and/or file with proper authorities all necessary specifications and drawings as required by governing authorities.

1.05 DESIGN REQUIREMENTS

A. Complete Short Circuit, Protective Device Coordination, and Arc Flash Study to meet requirements of NFPA 70 **and NFPA 70E**. ARC Flash Study to include new panels and existing equipment being modified.

1. Arc Flash Study: Perform Arc Flash Analysis to include the following at each distribution bus:

a. Bolted fault current.

b. Arc fault current.

c. Protective device characteristic and arc fault duration.

d. System voltages and equipment class.

e. Working distances.

f. Calculated incident energy.

g. Calculated arc flash protective boundary.

B. Arc Flash Sign Installation: Implement the Arc Flash sign installation requirements for electrical equipment as specified in NEC Article 110.16 Flash Protection and NFPA 70E.

C. Arc Flash Training: Provide training for the Owner's qualified electrical personnel of the potential arc flash hazards associated with working on energized equipment (minimum of 4 hours).

1. The training shall be certified for continuing education units (CEUs) by the International Association for Continuing Education Training (IACET) or equivalent.

2. Include in Project Close-out Documents training notes, outlines, and Power Point presentation of training session. Also include attendance record of personnel attending the training session.

3. Training session shall be video taped. Include copy of DVD of training session in Project Close-out Documents.

1.06 SUBMITTALS

A. Submit individual submittals for each item or piece of equipment. Assign a separate submittal number and transmittal to each item. Do **NOT** group items or equipment together in one submittal, they will be rejected and returned without review.

B. Within fifteen (15) days after contract has been awarded, Contractor to submit to Designer for review a complete list of materials, equipment, and accessories proposed for use, listing the item and manufacturer's name only.

C. Based upon aforementioned approved listing, Contractor to submit One (1) electronic PDF copy of COMPLETE BROCHURES AND SHOP DRAWINGS OF ALL MATERIALS, FIXTURES, AND EQUIPMENT that he proposes to use giving the names of manufacturers, trade name and specific catalog numbers.

D. Brochures to be submitted in time to allow fifteen (15) days from date of receipt in Engineer's office before final approval or disapproval is required to meet construction schedule. Submittals to bear Contractor's stamp of approval evidencing he has examined and checked same and information contained therein is in accordance with contract requirements, and any deviations to be clearly marked. Approval of shop drawings not to be construed as permitting departure from the contractual documents.

E. Above-mentioned brochures to be submitted and approved before any materials are ordered.

F. In the event that within time stated above contractor fails to submit complete list of materials, equipment and accessories in proper form, the Designer reserves the right to select a full line of materials, fixtures, and equipment, which shall be binding upon Contractor for these materials, fixtures, and equipment as the case may be and which shall be used in his work.

G. Brochures: Submit complete descriptions, illustrations, specification data, etc. of all materials, fittings, devices, fixtures, special systems, etc., including the following:

1. Panelboards.
2. Wiring devices and plates.
3. Motor starters and contactors.
4. Disconnect switches.
5. Enclosed circuit breakers.
6. Lighting, including lamps.
7. Arc flash calculations and printout of labels.

H. Proposed items to be clearly indicated when other items are shown on same sheet. When proposing items other than those specified, brochures to contain both specified item sheets and proposed item sheets for ease of comparison. On request from Designer, samples shall be submitted and/or set up, as directed, for inspection and approval. Samples will be returned to Contractor.

I. Shop Drawings: Submit specific shop drawings for major materials including the following:

1. Motor starters and contactors including custom wiring diagrams.
2. Fire alarms and smoke detection systems, including point-to-point wiring diagrams.
3. Distribution switchboards.
4. Electromagnetic shielding systems.
5. Motor Control Centers including schematic wiring diagrams.
6. Modular headwall units.
7. Nurse Call system, including Code Blue.
8. Intercom equipment.
9. MATV.
10. Dimensional layout of all electrical rooms, drawn to scale, with equipment location shown therein. Clearances to be in accordance with NEC and local codes.
11. Electrical Coordination Study submitted by switchgear manufacturer to include time-current curves and all related breaker data information. Coordination Study must be approved by the engineer prior to order of switchgear.

1.07 OPERATING AND MAINTENANCE MANUALS

A. Prior to final acceptance of the project, furnish to Owner complete bound sets of operation and maintenance manuals of instructions for operation and maintenance of all pieces of equipment and systems provided under this division of specifications.

B. Manuals to also include all submittal data on all materials and equipment. Clearly indicate items provided on this project. A list giving name and address of nearest supply house carrying spare parts and name of Installation Contractor to be given to Owner.

C. Verbally instruct Owner's representatives. Contractor to obtain letter signed by the owner's representative indicating that the in-service training has been completed.

D. Three sets of the following data are required:

1. Operating and maintenance instructions.

2. Spare parts lists.

3. Copies of approved submittal data.

E. Arrange each set of data in an orderly way, and bind each set in a separate 3-ring, hard-cover binder.

F. As soon as data accumulates, prepare one of the sets and deliver to the Owner's Representative, continuously updating this set as additional data is obtained.

G. At completion of work, submit two complete sets of data to the Owner's Representative for distribution to the proper parties.

H. Short Circuit, Protective Device Coordination and Arc Flash Study.

I. Arc Flash Hazard/Risk Category Chart, from NFPA 70E, identifying required protective clothing and Personal Protective Equipment (PPE).

1.08 DELIVERY AND STORAGE

A. Insofar as possible, deliver items in manufacturers’ original unopened packaging. Where this is not practical, cover items with protective materials, to keep them from being damaged. Use care in loading, transporting, unloading, and storage to keep items from being damaged.

B. Store items in a clean dry place and protect from damage.

C. All damaged painted surfaces of equipment to be touched up to match original paint.

1.09 RECORD DRAWINGS

A. Keep a set of blueline prints at the job site exclusively for recording deviations from the drawings.

B. Record locations and depths of buried and concealed conduits from fixed easily identifiable objects, such as building walls. Where conduits are concealed in walls, indicate distances off of building corners or other building features not likely to be disturbed by future alterations.

C. Mark deviations in colored pencils so that work of various systems can be easily identified.

D. When work is completed, record all deviations on clean sepia copies of drawings.

E. Submit three sepia copies of completed "record drawings" to Owner's Representative for distribution.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. All materials and equipment used in carrying out these specifications to be American made unless approved otherwise by the Owner and to be new and have UL listing, or listing by other recognized testing laboratory when such listings are available. Specifications and drawings indicate name, type, and catalog numbers of materials and equipment to be used as "standards" shall not be construed as limiting competition. Contractor may at his option, use materials and equipment when, in the judgment of the Designer, they are equivalent to that specified.

PART 3 EXECUTION

3.01 COORDINATION

A. Intent:

1. These sections of specifications and drawings form a complete set of documents for the electrical work of this project. Neither is complete without the other. Any item mentioned in one shall be as binding as though mentioned in both.

2. The intent of these specifications and drawings is to form a guide for a complete electrical installation. Where an item is reasonably necessary for a complete system but not specifically mentioned, such as pull boxes, fittings, expansion fittings, support hangers, etc., provide same without additional cost to Owner.

3. Electrical layouts indicated on drawings are diagrammatical only. Exact location of outlets to be governed by project conditions. The Designer reserves the right to make any reasonable changes (approximately 6 feet) in location of junction boxes, or equipment prior to roughing-in of such without additional cost to Owner.

B. Deviations:

1. No deviations from specifications and drawings to be made without full knowledge and consent of Designer.

2. Should Contractor find during progress of work that existing conditions make desirable a modification of the requirements of any particular item, report such item promptly to Designer for his decision and instructions.

C. Insofar as it is possible to determine in advance, leave proper chases and openings. Place all outlets, anchors, sleeves, and supports prior to pouring concrete or installation of masonry work. Should contractor neglect doing this, any cutting and/or patching required to be done is at this contractor's expense.

D. Visit site and be informed of conditions under which work must be performed. No subsequent allowance will be made because of error or failure to obtain necessary information to completely estimate and perform work involved.

E. Designer to be mediating authority in all design related deviations and disputes arising on the project.

F. Coordinate to assure that proper points of service transformer locations, voltage characteristics and capacity of service are in accordance with contract drawings.

3.02 CUTTING AND PATCHING

A. Repair or replace routine damage caused by cutting in performance of this contract.

B. Correct unnecessary damage caused due to installation of electrical work, brought about through carelessness or lack of coordination.

C. Repairs to be performed with materials which match existing materials and to be installed in accordance with appropriate sections of these specifications.

3.03 TRENCHING, EXCAVATION, BACKFILLING, AND REPAIRS

A. Provide trenching, excavation, and backfilling necessary for performance of electrical work.

B. Trenching and excavation to be unclassified. No extra will be paid in event that rock is encountered.

C. Backfilling to be carefully done using only clean earth thoroughly tamped and compacted below and above embedded items.

3.04 FOUNDATIONS AND PADS

A. Provide foundations and pads required for equipment provided under this division of specifications. Coordinate proper size and location of foundations, pads, anchor bolts, and other items to be built into structure.

B. Concrete to be in accordance with concrete division of these specifications.

3.05 TESTS

A. On completion of work, installation to be entirely free from grounds, short circuits, and open circuits. Perform a thorough operational test in presence of Owner or his representative. Balance all circuits so that feeders to panels be not more than 10% out of balance between phases with all available load energized and operating. Furnish all labor, materials and instruments for above tests.

B. Furnish Owner, as a part of closing file, a copy of such tests including identification of each circuit and readings recorded, also the main service ground test as described in Section 26 05 26 of these specifications. Test information to be furnished to Owner includes ampere readings of all panels and major circuit breakers, insulation resistance reading of motors and transformers.

C. Prior to final observation and acceptance, test, leave in satisfactory operating condition all electrical systems and equipment including but not limited to the following:

1. Electrical distribution system.
2. Ground fault protection system.
3. Transformers.
4. Fire alarm and smoke detection system.
5. Electric motors for all equipment.
6. Electric safety devices.
7. Any alarm system, including narcotics, generator, door security, etc.
8. CCTV system.

3.06 INSPECTION FEES AND PERMITS

A. Obtain and pay for all necessary permits and inspection fees required for electrical installation.

3.07 IDENTIFICATION OF EQUIPMENT

A. Properly identify all starters, contactors, relays, safety switches and panels with permanently attached black (normal power) or red (essential systems) phenolic plates with 1/4" white engraved lettering on the face of each attached, with two sheet metal screws. Starters and relays connected by the electrical tradesman to be identified by him whether furnished by him or others.

3.08 TEMPORARY LIGHTS AND POWER

A. Provide a temporary electrical lighting and power distribution system of adequate size to properly serve the following requirements, including adequate feeder sizes to prevent excessive voltage drop. Temporary work to be installed in a neat and safe manner in accordance with the National Electrical Code, Article 590, and as required by OSHA or applicable local safety codes.

B. Provide one duplex power outlet for every 1,500 square feet of floor area, evenly distributed throughout the building. Power outlets to be 20 amp, single phase located as directed by the contractor.

C. Check with contractor prior to installation to determine if any lighting or power outlets over the maximum quantity noted above are required.

D. Provide service and panelboards required for above lighting and power outlets.

E. Power consumption will be paid for by the **Owner**.

F. Check with the Contractor prior to installation to determine whether single phase or three phase service is desired.

G. Contractor to maintain the existing lights and power during normal regular hours as directed by Owner. Any interruption of power must be approved by and coordinated with Owner's representative.

3.09 DEMOLITION

A. Contractor shall visit the site before submitting a bid to acquaint himself with existing conditions.

B. Work in existing buildings shall be scheduled well in advance with the Owner. Work shall be performed at such times and under such conditions as suit the convenience of the Owner. Plan the work to minimize disruption of formal operations.

C. In renovated areas, remove wiring devices, fixtures, components, electrical equipment, conductors, boxes, and conduits not required to remain in service when this project is complete.

D. Remove existing conduit and wire from areas to be remodeled, back to panelboard, cabinet or junction box.

E. Where a circuit is interrupted by removal of a device or fixture from that circuit, the contractor shall install wire, conduit, etc., as required to restore service to the remaining devices and fixtures on that circuit.

F. Lighting fixtures, wiring devices, panelboards, and conductors removed shall be offered to the Owner. If he chooses to retain these items or a part of these items, turn those chosen over to him. Items rejected by the Owner shall be removed from the project site by the contractor.

3.10 OBSERVATIONS

A. When field observation services are a part of the project scope, Engineer's office will provide periodic observation of the progress of work specified herein. Purpose of the observation is to ensure compliance of Contractor's work with specifications and drawings. Engineer's office will also observe tests required of Contractor as called for in other sections of specifications.

B. Specifications and drawings represent work to be done in view of total project requirements. Final location of conduits, fixtures, panels, switchboards, etc., to eliminate possible conflict with other trades is responsibility of Contractor. Contractor to provide all supervision required for his personnel to ensure that installation is made in accordance with specifications and drawings and all safety rules and regulations are observed. In event of conflicts of work on project with other trades, Contractor to make every reasonable effort to resolve conflict through meetings and discussions with other parties involved, by preparation of drawings or other appropriate action. Only after this has been done shall the Engineer's assistance be requested.

C. When Engineer is requested to visit project to aid in resolution of conflicts or for witnessing tests, he shall be given a minimum of 48 hours notice prior to time his presence is required at job site.

3.11 WARRANTY-GUARANTEE

A. Designer reserves right to accept or reject any part of installation which does not successfully meet requirements as set out in these specifications.

B. Contractor shall and hereby does guarantee all work installed under this division shall be free from defects in workmanship and materials for a period of one year from date of final acceptance, whichever is earliest. The above parties further agree that they will repair and replace any defective material or workmanship which becomes defective within the terms of this warranty-guarantee.

END OF SECTION 260100

SECTION 26 05 19 - CONDUCTORS 600 VOLT AND BELOW

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide a complete system of conductors for lighting, power, and controls throughout building.

B. Refer to drawings for sizes of conductors.

PART 2 PRODUCTS

2.01 CONDUCTORS - POWER AND LIGHTING

A. Provide 98% conductivity copper conductors with 600-volt insulation.

B. Interior conductors shall be Type THHN-2/THWN-2 insulation.

C. 600-volt insulation for conductors installed in underground raceways shall have XLP (cross-linked polyethylene) insulation, Type XHHW-2.

D. For feeder and branch circuit conductors No. 12 AWG and No. 10 AWG, provide solid type.

E. For all control and motor circuits, and all conductors No. 8 AWG and larger, provide stranded type.

F. Conductors shall be manufactured by Triangle, Phelps Dodge, Southwire, or approved substitute.

G. Provide white or gray colored neutral conductors; provide black or color coded phase conductors.

H. Provide No. 14 AWG stranded type THHN fixture conductors, for conductors entering fixtures and in stems of pendant fixtures.

I. Provide type THHN stranded conductors, 90° C for conductors running through continuous rows of fluorescent fixtures.

J. For service entrance conductors and panel feeders (#1/0 and larger), stranded aluminum conductors of equivalent ampacities may be substituted. Increase conduit sizes to accommodate larger aluminum conductors.

2.02 CONDUCTORS - CONTROLS

A. Single Conductor

1. Class B stranded soft-drawn copper with 600 volt thermoplastic insulation.
2. Size 14 AWG.
3. Type THHN/THWN.

B. Multiconductor

1. 600 Volt insulated Type TC
2. 16 AWG stranded (7x24) copper
3. PVC insulation – unshielded
4. 90º C rating

2.03 CONDUCTORS - INSTRUMENTATION

A. Type TC, Class B concentrically stranded copper with 300 volt PVC insulation.

B. Single twisted pair of triad shielded cables as required.

C. Overall foil shield with stranded, tinned copper drain wire.

D. Separate communication wire for calibration.

E. Size 16 or 18 AWG.

F. Temperature Rating: 105°C.

2.04 CONDUCTORS - THERMOCOUPLE

A. Solid thermocouple extension wire with 300 volt PVC insulation (nominal 16 mils).

B. Color coded per ANSI - MC96.1 - 1982.

C. Single twisted pair, one conductor identified, with overall aluminum/mylar shield with a tinned copper drain wire.

D. PVC insulated copper communications wire.

E. Size 16 AWG for runs over 100 feet - otherwise 20 AWG.

F. Temperature Rating: 105° C.

2.05 ACCEPTABLE MANUFACTURERS AND TYPES - CONTROLS, INSTRUMENTATION, DATA CONNECTIONS AND THERMOCOUPLE

A. Use Belden or approved substitute.

B. Control Wiring: Belden 27090A multiconductor cable

C. Instrumentation: Twisted Pair – Belden 1032A or Belden 3076F cable.

D. Instrumentation: Twisted Triad – Belden 1031A cable.

E. Thermocouple Extension: Belden 311xA series cable where x = thermocouple type.

F. Ethernet Cable: Belden 7953A DataTuff Cat-6 shielded cable

G. Ethernet Fiber: Belden I100655 Fiber – TrayOptic fiber cable.

H. RS – 485 Cable: Belden 3107A cable

I. ControlNet Cable: Belden 3092A or 3093A for underground and wet locations

J. DH+ Cable: Belden 9463 or Belden 9463DB for underground locations

K. DeviceNet: Belden 9880 (Thicknet) or 9907 (Thinnet)

L. Foundation Fieldbus and PROFIBUS Cable: Belden 1327A (2 – Pair) for connection from control cabinet to segment protector and Belden 3076F (1 – Pair) for instrument drop connection.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install pull boxes in circuits or feeders over 100' long.

B. All conductors shall be continuous from origin to panel or equipment termination without splices where possible. Where splices and taps are necessary or are required, they shall be made in splice boxes with suitable connectors.

C. Make all splices or connections only at outlet, pull or junction boxes.

D. Use pulling compound to pull conductors.

E. Install instrument and data connection conductor in separate raceways from all other conductors. Separate control wiring from power wiring in separate raceways. Separation distances shall be as specified by control system manufacturer or as listed in IEEE Standard 518, whichever is greater.

F. Bend radius on conductors shall be less than the limitations listed by the cable manufacturer.

G. Deliver all conductors to job site new and in original wrapping, package or reel.

H. All conductors and connections shall test free of grounds, shorts, and opens.

I. For 20-amp, 120-volt branch circuits, provide No. 10 wire in lieu of No. 12 wire for any branch circuit in excess of 90 linear feet to prevent excessive voltage drop. Where branch circuit exceeds 175 linear feet, use No. 8 wire.

J. Use Ideal wing nuts, Scotchlok Type Y, R, G, or B, or approved equivalent connectors for fixture connections at outlet boxes.

K. Make feeder taps and joints with OZ type T, PT, PM or PTS, or approved equivalent clamp connectors as manufactured by Kupler, or with approved compression sleeves. Wrap connectors with No. 10 electro-seal or approved equivalent plastic filler and vinyl tape.

L. Use only compression lugs equal to T & B series 60,000 for termination of aluminum conductors.

M. Leave a minimum of 8" slack wire in every outlet box whether it be in use or left for future use.

N. Color code conductors as follows:

CONDUCTOR COLOR CODE	
	120/208 Volt
Phase A	Black
Phase B	Red
Phase C	Blue
Neutral	White
Ground	Green

O. If the above conflicts with existing color coding, match existing.

P. Use factory color coded conductors where commercially available. If not, use black wire and band with color tape.

END OF SECTION 260519

SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. The entire system of raceways and equipment to be grounded in accordance with Article No. 250 of latest edition of National Electrical Code and any local regulation or governmental governing authority.

PART 2 PRODUCTS

2.01 EQUIPMENT REQUIREMENTS

A. Main service **disconnect means** shall be bonded to street side of first flange or coupling of incoming main water line serving project with heavy-duty ground clamp in accordance with Article 250.104 of N.E.C. The grounding electrode conductor shall be sized in accordance with Table 250.66 of N.E.C. An additional ground wire of same size shall be run to a tripod grounding rod system driven in ground outside foundation of building. This system shall consist of three 3/4" x 10' copperweld ground rods driven in ground in an equilateral triangular configuration with a minimum of 15' spacing between each. Connection of each ground rod to one another shall be made using a conductor of same size as being run for main service ground. Building steel shall be connected to ground bus on main service with a conductor the same as required on the service. This ground will be in addition to the previously specified grounds.

2.02 GROUND CLAMPS

A. OZ Electrical Manufacturing Company, Steel City, Appleton, or approved substitute.

B. Feeder circuits to panels, motor control centers, etc., shall have a separate green grounding conductor in conduit sized in accordance with Table 250.122 of N.E.C.

C. All branch circuits shall have a separate green grounding conductor installed in same conduit as phase and neutral conductor from panel ground bus to device. The grounding conductor shall be sized in accordance with Table 250.122 of N.E.C.

D. Ground all electrically operated equipment utilizing separate code size grounding conductors run in feeder conduits or contained within outer jacket enclosing the circuit conductors contained in flexible cords.

E. Flexible conduit will not be approved as achieving continuity of ground. All flexible conduit shall have a jumper wire sized to ampacity of branch breaker and shall be connected to conduit system on both ends; this applies to fixtures, motors, controls, etc.

PART 3 EXECUTION

3.01 INSTALLATION

A. Effectively bond all grounding conductors to grounding electrodes, equipment enclosures and ground busses.

B. Provide a shunt path around main water meter by bonding around both sides of meter to assure continuity.

C. Locate all grounding attachments away from areas subject to physical damage. Provide protective covering as required.

D. Clean all non-conductive surfaces on equipment to be grounded, to assure good electrical continuity.

E. Ground on main service shall be tested to obtain no greater than 10 ohms using 3-Point Fall of potential test. Test data shall be submitted to Engineer for review and such test data shall become a part of the final brochure.

END OF SECTION 260526

SECTION 26 05 29 - SUPPORTING DEVICES AND HANGERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide a system of supporting devices and hangers to ensure secure support or bracing for conduit, electrical equipment, including safety switches, fixtures, panelboards, outlet boxes, junction boxes, cabinets, etc.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Provide appropriate supporting devices and hangers as manufactured by Erico Products, Inc., Steel City, Rayco, or approved substitute:

1. Vertical flange clamps (beam clamps).
2. "Z" purlin clips.
3. Conduit clips.
4. Universal clamps (Beam clamps).
5. Beam clamps (set screw type).
6. Combination push-in conduit clips.
7. Combination conduit hanger clamps.
8. Flexible conduit clips.
9. Special combination conduit clips.
10. One hole steel straps.
11. Minerallac conduit hangers.

PART 3 EXECUTION

3.01 INSTALLATION

A. Secure conduits to within 3' of each outlet box, junction box, cabinet, fitting, etc., and at intervals not to exceed ten feet (10') for EMT and IMC conduit and in accordance with Table 344.30 (B) (2) for Rigid Steel conduit.

B. Install clamps secured to structure for feeder and other conduits routed against the structure. Use drop rods and hangers or racks to support conduits run apart from the structure.

C. Furnish and install suitable angle iron, channel iron or steel metal framing with accessories to support or brace electrical equipment including safety switches, fixtures, panelboards, outlet boxes, etc.

D. Paint all supporting metal not otherwise protected, with rust inhibiting primer and then with a finish coat if appropriate to match the surrounding metal surfaces. (Prepainted or galvanized support material is not required to be painted or repainted.)

E. Use of chains, perforated iron, bailing wire, or tie wire for supporting conduit runs will not be permitted.

END OF SECTION 260529

SECTION 26 05 34 - RACEWAYS AND CONDUIT SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide a complete conduit system with associated couplings, connectors, and fittings.

B. Conduits shall be mechanically and electrically continuous from outlet to outlet and from outlets to cabinets, pull or junction boxes.

1.02 SUBMITTALS

A. Submittal for products furnished under this section is not required.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. IMC, RGS and EMT conduit shall be hot-dip galvanized, or electrogalvanized steel by Allied, Wheatland Tube, Republic Conduit, Western Tube, or approved substitute.

B. Erickson couplings for IMC and RGS, shall be used where neither length of conduit can be rotated.

C. IMC/RGS conduit connectors from 1/2” to 4” trade sizes shall use compression type.

D. EMT conduit connectors from 1/2” to 2” trade sizes shall use set screw type. EMT conduit connectors from 2-1/2” to 4” trade sizes shall use two set screw type.

E. Weatherproof hub shall be complete with sealing "O" ring or sealing locknuts.

F. Provide polyvinyl chloride (PVC) conduit, Type 40, and associated couplings, connectors, and fittings. PVC conduit shall be UL listed and 90 degrees C UL rated.

2.02 ELECTRICAL METALLIC TUBING (EMT)

A. Use Electric Metallic Tubing (EMT) for:

1. Branch circuits installed overhead, both exposed and concealed, installed more than 6 feet above finished floor.
2. Branch circuits originating from isolated panels (O.R., Cystoscopy, or Delivery).

2.03 INTERMEDIATE METAL CONDUIT (IMC)

A. Use Intermediate Metal Conduit (IMC) for:

1. Panelboard feeders.
2. Branch circuits installed in hazardous areas.
3. Branch circuits and feeders installed in concrete slabs at ground floor.
4. Branch circuits installed exposed below 6 feet above finished floor.
5. Branch circuits installed in wet locations.
6. Pendant drops.

2.04 RIGID GALVANIZED STEEL (RGS)

A. Conduit Use:

1. Interior and exterior exposed primary service conduit.
2. Interior and exterior exposed secondary service conduit.

3. Exterior exposed branch circuits.

2.05 POLYVINYL CHLORIDE (PVC)

A. Use PVC for:

1. Service entrance conduits for power encased in concrete.
2. Service entrance conduits for telephone.
3. Exterior feeders encased in concrete.
4. Exterior underground branch circuits.
5. Primary power conduits encased in concrete.

B. PVC conduit shall not be used for feeders or branch circuits inside the building.

2.06 FLEXIBLE METAL CONDUIT

A. Provide a flexible metal conduit system for the termination points at equipment that may possibly vibrate such as motors, welders, etc. The length shall not exceed 6 feet.

B. Conduit shall be electrically continuous from outlet or conduit end to the utilization equipment.

C. The total length of flexible conduit in any circuit shall not exceed 6 feet.

D. Where exposed to continuous or intermittent moisture, conduit shall be liquid tight flexible type, U.L. Type EF.

PART 3 EXECUTION

3.01 INSTALLATION

A. Minimum size of conduits shall be 1/2 inch.

B. Conduit joints shall be cut square, threaded, reamed smooth, and drawn up tight so conduit ends will butt in couplings, connectors, and fittings.

C. Make bends or offsets with standard ells or field bends with an approved bender.

D. Run conduits concealed in floor slabs, below slabs, or in walls in direct line with long sweep bends or offsets. Run exposed conduits and conduits run above lay-in ceilings parallel to and at right angles to building lines. Group multiple conduit runs in banks.

E. Secure EMT conduits to all boxes and cabinets with a steel set screw on the outside and a locknut on the inside.

F. Cap ends of conduits to prevent entrance of water and other foreign material during construction.

G. Complete conduit systems before pulling conductors.

H. Provide cable supports in conduits rising vertically in accordance with the National Electrical Code, Article 300-19.

I. Provide nylon pull cord in all empty conduits. Steel wire not acceptable as pull wire.

J. Conduits which pass through floor slabs (except ground floor) shall be sealed with concrete grout. Seal around conduits or other wiring materials passing through partitions, which extend to the underside of the slab above, and those passing through smoke partitions and fire-rated walls. Refer to appropriate details on architectural and mechanical drawings.

K. Conduits which enter crawl space, tunnels, and basements from outside the building shall be grouted-in to prevent entry of gases, vapors, insects, or rodents to these spaces from street mains.

L. Conduit not serving elevator equipment shall not be permitted to pass through elevator shafts or elevator equipment rooms.

M. Where IMC or RGS conduit is installed in a cabinet, junction box, pull box, or auxiliary gutter, conductors shall be protected by an insulated bushing. Locknuts shall be installed on conduit outside and inside enclosure.

N. In areas where enclosed and gasketed fixtures and weatherproof devices are specified, where rigid conduit enters a sheet metal enclosure, junction box and outlet box, and not terminated in a threaded hub, a steel, or malleable iron nylon insulated hub, complete with recessed sealing "O" ring or sealing locknut shall be used.

O. Where conduits stub up in conduit space beneath switchgear and do not connect directly to equipment enclosures, use malleable iron nylon insulated ground bushing with a lay-in lug design complete with bonding screw, Raco 1212-1296.

P. Provide seal-off fitting in all conduits entering hazardous areas and any conduits entering a cold temperature area such as freezers and dry refrigerators.

Q. In concrete slabs, block up conduit from forms and securely fasten in place. All conduits in slabs shall have a minimum of 1-1/2 inches concrete coverage above and below.

R. Encase in 4 inches of 1:2:4 mix concrete on all sides all feeder conduits laid below ground outside building foundation line.

S. Where conduits running overhead pass through building expansion joints they shall be connected by flexible metal conduit of same size with sufficient slack to allow conduits on either side of expansion joint to move a minimum of 3 inches in any direction. Provide supports as required on each side of expansion joint, all in accordance with seismic requirements of specific area.

T. Conduits for feeders and branch circuits shall be terminated directly into panelboard enclosure without the use of pull boxes, junction boxes, wireways, or auxiliary gutters, unless the panelboard enclosure does not provide sufficient surface area for all conduits. Where such cases exist, the contractor shall notify the Designer. In no case will splices in such boxes, wireways, etc., be permitted.

U. Failure to route conduit through building without interfering with other equipment and construction shall not constitute a reason for an extra charge. Equipment, conduit, and fixtures shall fit into available spaces in building and shall not be introduced into building at such times and manner as to cause damage to structure. Equipment requiring servicing shall be readily accessible.

V. No conduit shall be installed in elevated slabs.

3.02 EMT

A. Do not use electric metallic tubing in cinder concrete or cinder fill where subject to permanent moisture unless protected on all sides by a layer of noncinder concrete at least 2 inches thick or unless the EMT is at least 18 inches under the fill. Use of set-screw fitting is not acceptable in concrete or in fill under slab.

3.03 PVC

A. Use threaded fittings for all connectors and adapters.

B. Provide code sized ground conductors in all power conduit runs.

C. Provide 1/4-inch nylon pull rope in all primary power and incoming telephone service entrance conduits.

D. Encase all PVC conduit in reinforced concrete with a minimum of 4-inch encasement on all sides except exterior branch circuits.

E. No PVC shall emerge from the ground or the concrete slab or encasement. PVC shall convert to galvanized rigid metal prior to its emergence.

F. Make bends with standard ells or with an approved heat bender.

3.04 FLEXIBLE METAL CONDUIT

A. Flexible metal conduits shall be 1/2 inch minimum size.

B. Where fittings for liquidtight flexible conduit are brought into an enclosure with a knock-out, a gasket assembly, consisting of one piece "O" ring, with Buna-N sealing material, Raco Series 3500, shall be installed on outside of box. Fittings shall be made of either steel or malleable iron only, and shall have insulated throats or insulated bushings.

C. In dry locations, where final connections to motors and other equipment may be made with flexible metal conduit, fittings shall be of steel or malleable iron only with insulated throats or insulated bushings, and shall be of wedge and screw type having an angular wedge fitting between convolutions of conduit.

D. An additional copper ground wire shall be installed inside of flexible conduit and bonded at each end to assure continuity of ground to lighting fixtures, controls, and other utilization equipment.

E. All recessed lighting fixtures shall be connected with flexible metallic conduit from outlet box to fixture. Rigid conduit connections to lighting fixtures are not acceptable.

F. Install liquidtight flexible conduit in such a manner as to prevent liquids from running on the surface toward fittings.

G. Allow sufficient slack conduit to reduce the effect of vibration.

END OF SECTION 260534

SECTION 26 05 38 - PULL AND JUNCTION BOXES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide pull and junction boxes of appropriate size and depth or as indicated on the drawings and as specified hereinafter.

1.02 SUBMITTALS

A. Submittals of products furnished under this section are not required.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS/MATERIALS

A. Pull and junction boxes shall be by Hoffman or approved substitute.

B. For interior work, provide galvanized sheet metal boxes of code thickness with lapped and welded joints, 3/4 inch flanges, screw covers, etc.

C. For exterior work, provide galvanized sheet metal boxes of code thickness with lapped and welded joints, 3/4 inch flanges, bolted covers with full gaskets forming a completely water-tight assembly, equal to Hoffman, Concept Series.

D. For exterior work in graded areas outside the building, provide heavy duty sidewalk junction boxes externally flanged for flush mounting. Covers to be fully gasketed, watertight and secured with plated screws or bolts. [**Crouse-Hinds Type WJB or approved substitute. See detail on drawings for size and type cover.**

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide junction boxes as shown on drawings and otherwise where required, sized according to number of conductors in box or type of service to be provided. Minimum junction box size 4 inches square and 2-1/8 inches deep. Provide screw covers for junction boxes.

B. Use minimum 16 gauge steel for pull boxes and provide with screw cover.

C. Install boxes in conduit runs wherever necessary to avoid long runs or excessive bends. Do not exceed 100 foot runs, or three 90 degree bends, without pull boxes.

D. Rigidly secure boxes to walls or ceilings. Use of conduit as a support is not acceptable.

E. Install boxes in accessible locations. Size boxes in accordance with Articles No. 312 and No. 314 of the latest edition of the National Electrical Code.

F. Install boxes so that the covers will be accessible at all times.

G. Do not install pull or junction boxes for joint use of line voltage and signal or low voltage controls unless all conductors are insulated for the highest voltage being used in the same box. Emergency system and normal system circuits shall not be routed through a common pull or junction box.

H. Contractor to spot paint all boxes inside and out per the following color code:

1. Red: Fire Alarm System

END OF SECTION 260538

SECTION 26 05 45 - PAD TRANSFORMER ELECTRIC SERVICE

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Service will be underground and will be a 120/208-volt, 3-phase, 4-wire, wye system.

B. System will be serviced by Mississippi Power. Electrical contractor to include all charges for service in their bid.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Service shall be grounded in accordance with latest edition of National Electric Code, Article No. 250, and any special requirements as required by municipal, state, or federal authorities having jurisdiction.

B. Metering shall be provided by power company on transformer housing.

C. Transformers shall be provided by power company and shall be a pad-mounted type of transformer.

D. Transformer shall be mounted on a reinforced concrete pad, sized and detailed in accordance with utility company requirements.

E. Primary conduits shall be provided by power company.

F. Primary conductors shall be provided by power company.

G. Secondary conduits, wire, excavation, and backfill to be provided by power company from transformer to meter. Electrical contractor to provide conductors from meter to electrical panel.

PART 3 - EXECUTION

3.01 INSTALLATION/COORDINATION

A. Division 26 shall coordinate with power company to determine final exact location of transformers, exact sizes required, and conduit stub-up points for primary and secondary entrances within transformer building.

B. Division 26 shall be responsible for furnishing a breakdown listing the loads as shown on the drawings for the power company.

END OF SECTION 26 05 45

SECTION 26 43 00 - SURGE PROTECTIVE DEVICES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide 3-phase, 4-wire Surge Protective Devices (SPDs) at **the main service and electrical panels** as indicated on the panelboard schedules and on the riser diagram.

1.02 RELATED WORK

A. **Section 26 24 16 - Panelboards.**

B. **Section 26 05 26 – Grounding and Bounding for Electrical Systems.**

1.03 STANDARDS

A. UL compliance: Listed to UL 1449 4th Edition by an OSHA approved Nationally Recognized Test Lab (NRTL)

B. ANSI/IEEE compliance: Comply with ANSI/IEEE C62.1, C62.41, and C62.45 test procedures.

C. National Electric Code - Section 280 and 285.

D. UL96A, Para. 13.1

1.04 SUBMITTALS

A. **Submit product data and shop drawings as required by Section 26 01 00.**

B. Submittals shall include the following:

1. Complete manufacturers' data for each suppressor indicating part numbers and rated voltages and currents.

2. Product performance analysis with graphic display of let-thru waveforms and peak clamping voltages for ANSI C62.41 tests, Categories A3 & B3 ringwaves and C1 & C3 impulses.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. SPDs shall be as manufactured by Current Technology, EFI Corporation, Liebert, or approved equal.

B. The suppressor manufacturer shall offer factory repair service for all units, which will include replacement for non-repairable sealed units.

2.02 WARRANTY

A. SPD devices shall be warranted for a minimum of 10 years.

2.03 SPECIFICATIONS

A. General:

1. SPD shall be internally fused, capable of allowing the suppressor's maximum rated transient current to pass through the suppressor without fuse operation. SPD shall be listed as a Type1 SPD without the need for upstream over current protection for safe operation.

2. Proper operation of the suppressor elements on each phase shall be indicated by a normally-on LED or lamp. Also, normally closed contacts shall be used for remote annunciation of suppressor failure.

3. The SPD shall be compatible with the electrical system voltage, current, and distribution configuration.
4. The SPD maximum continuous operating voltage shall be 115% of the nominal RMS voltage with no degradation. The MCOV value shall be a tested value as outlined in UL1449 3rd Edition section 37 .7 .3. The MCOV shall not be a claimed value based solely on the MCOV of the surge component used in the design, nor based solely on the 115% over voltage test outlined in UL1449.
5. The SPD shall be sine-wave tracking to provide added protection against oscillatory transients, such as Category A and B Ringwaves.
6. Failure of the SPD shall not cause any disruption of power.

B. Service Entrance SPD Devices:

1. The SPD shall have a surge current capacity of 100,000 amps (8 x 20 microsec) minimum per mode.
2. SPD devices shall meet or exceed the following operating characteristics and ratings: (Series Ratings)
3. The SPD shall be a Type1 listed SPD per UL1449 3rd Edition.
4. The SPD shall meet the requirements of UL96A, Para. 13.1
5. The unit shall not have more than 10% deterioration or degradation of the UL1449, 3rd Edition Voltage Protection Rating (VPR) due to repeated surges. Acceptable clamping values are shown below based on test procedures outlined in UL1449 3rd Edition.

System Voltage	Mode	MCOV	B3 Ringwave	C3 Comb. Wave	UL 1449 Second Edition SVR Rating	UL 1449 Third Edition VPR Rating
120/240 120/208	L-N	150	325/375	650/775	400/400	700/700
	L-G	150	400/450	650/825	500/500	700/700
	N-G	0	350/350	500/500	500/500	900/1000
	L-L	300	400/500	950/1250	700/700	900/1000
277/480	L-N	320	550/600	1125/1225	800/800	900/1000
	L-G	320	850/875	1075/1225	1000/1000	1200/1200
	N-G	0	700/700	900/900	900/900	1200/1500
	L-L	550	650/750	1950/2200	1500/1500	1800/1800

C. Distribution Panel SPD Devices:

1. The SPD shall have a surge current capacity of 60,000 amps (8 x 20 microsec) minimum per mode.
2. SPD devices shall meet or exceed the following operating characteristics and ratings: (Series Ratings)
3. The SPD shall be a Type1 or Type2 SPD per UL1449 3rd Edition.
4. The unit shall not have more than 10% deterioration or degradation of the UL1449, 3rd Edition Voltage Protection Rating (VPR) due to repeated surges. Acceptable clamping values are shown below based on test procedures outlined in UL1449 3rd Edition.

System Voltage	Mode	B3 Ringwave	B3/C1 Comb. Wave	C3 Comb. Wave	UL 1449 Second Edition SVR Rating	UL 1449 Third Edition VPR Rating
120/240	L-N	420	642	1040	400	800
120/208	L-G	480	690	1300	400	800
	N-G	340	620	1240	400	800
	L-L	610	1010	1420	700	1200
277/480	L-N	660	910	1490	700	1200
	L-G	750	1068	1830	800	1200
	N-G	720	974	1690	800	1200
	L-L	960	1700	2290	1500	1800

PART 3 EXECUTION

3.01 INSTALLATION

A. Mount all 3-phase SPD devices in a separate cabinet attached to the panelboard it serves. The SPD shall not be internally mounted to the power or distribution panelboard. Cabinets for devices serving large service entrance main switchboards shall be located in a section of the switchboard where this option is made available by the manufacturer or be externally mounted to the switchboard. Cabinets for devices serving flush-mounted panelboards shall also be suitable for flush mounting. Cabinets shall comply with Section 26 27 16 of the specifications.

B. Ground the SPDs and cabinets in accordance with the manufacturer's instructions, the National Electrical Code (section 280 and 285), and wiring diagrams shown on the drawings.

C. Provide wiring to the remote monitor(s) in accordance with the manufacturer's instruction and as shown on the drawings.

D. The SPD shall not include multiple replacement modules.

E. All conductors associated with SPDs shall be installed in conduit. Minimum conductor size shall be #8 AWG copper. Conductors shall be as short and as straight as possible with no unnecessary length or turns. A maximum length of 12 inches is required where possible.

F. SPDs shall be connected in parallel with main conductors. Service entrance SPDs shall incorporate the use of an internally mounted disconnect. Panelboard surge protectors shall be installed behind a minimum 60 amp overcurrent/disconnecting device. Where 12 inches of lead length is not possible utilization of a low impedance preassembled cable assembly is required to lower the clamping voltages of the installed system to acceptable levels. Lead length must include phase connection plus neutral or ground.

G. Mounting position of the SPD and overcurrent protection device shall be coordinated to minimize the total phase, neutral and ground cable lengths to achieve minimum installed system clamping voltages.

END OF SECTION 264300

SECTION 26 51 00 - INTERIOR LIGHTING AND LAMPS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide labor, material, equipment and services necessary to provide all interior lighting fixtures, necessary hangers and lamps. Fixtures include all interior fixtures plus all exterior fixtures mounted to exterior wall or to structures connected directly to building.

1.02 SUBMITTALS

A. Submit for approval prior to purchasing fixtures complete fixture lists of fixtures proposed to be used. Include cuts of both specified fixture and proposed equivalent fixtures if fixtures other than those specified are submitted.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. **Provide lighting fixtures indicated by type on lighting fixture schedule on drawings.**

2.02 EQUIPMENT REQUIREMENTS

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. Standards:

1. ENERGY STAR certified.
2. California Title 24 compliant.
3. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
4. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
5. UL Listing: Listed for damp location.
6. Recessed luminaires shall comply with NEMA LE 4.
7. User Replaceable Lamps:
    a. Bulb shape complying with ANSI C78.79.
    b. Lamp base complying with ANSI C81.61.

C. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

D. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

E. Provide luminaires from a single manufacturer for each luminaire type.

F. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

G. Rated lamp life of 50,000 hours to L70.

H. Lamps dimmable from 100 percent to 0 percent of maximum light output.

I. Internal driver.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Comply with NECA1.

B. Fixtures shall be securely mounted as required by Section 410, NEC and as specified herein.

C. Fixtures mounted in a suspended ceiling shall be secured to the grid with approved clips as required by the NEC.

D. Fixtures shall be mounted in locations as shown on architectural reflected ceiling drawings.

E. Mount fixtures as called for in schedule on electrical drawings. Determine type of ceiling to be installed in each space from architectural drawings and schedules and furnish fixtures suitable for the exact type.

F. Receive, store, uncrate, and install lighting fixtures shown in schedule on drawings to be furnished by others.

G. Recessed fixtures in dropped ceiling areas shall be connected using Greenfield and No. 14 THHN wire. Greenfield shall be connected to fixture and outlet box. Each piece of Greenfield shall include in it a separate insulated green grounding conductor not smaller than No. 14 AWG for grounding continuity between fixture and conduit system. Grounding conductor shall be mechanically connected in a permanent and effective manner to fixture and conduit system and shall be electrical continuous. No conduit shall enter a recessed fixture directly as this would prevent removal of fixture without disturbing balance of circuit.

H. Joints in fixture wiring shall be made using wire nuts, preinsulated Scotch locks, Ideal No. 30-410 crimps and No. 30-415 wrap caps, or other approved mechanical means of connection.

I. Adjustable type fixtures shall be adjusted by the Contractor to illuminate intended area to satisfaction of Owner.

J. Any adjustable outside area lights or lights mounted on building shall be adjusted at night by the contractor to satisfaction of Owner.

K. Recessed fixtures installed in exposed or concealed tee bar ceilings may not use ceiling grid to support fixtures. Fixtures shall be securely fastened to ceiling framework per NEC Article 410, and shall be supported as described in seismic detail.

L. Surface or recessed fixtures in or on plastered or drywall ceilings shall be supported in accordance with seismic fixture mounting details and shall not depend on ceilings for support.

M. Support fixtures in seismic zones per detail on drawings.

N. All light fixtures shall be grounded in accordance with the NEC. Any fixtures suspended from ceiling which do not include a separate ground wire shall be grounded in a method approved by section 250 of the NEC. Where the conduit is utilized as the ground with a hook pendant style mounting system, a separate ground conductor shall be bonded to the conduit where the conduit ceases to be continuous and routed to the fixture.

END OF SECTION 265100

SECTION 27 05 26 - GROUNDING AND BONDING FOR COMMUNICATIONS

PART 1 GENERAL

1.01 GENERAL

A. A bonding and grounding system supplemental to the electrical power grounding system and devoted to the communications system infrastructure is required in each building or suite. Its purpose is to protect personnel and equipment from unwanted electrical currents associated with the communications infrastructure and equipment.

B. Provide all services, labor, materials, tools, and equipment required for the complete and proper installation of the telecommunications grounding and bonding system for the Structured Cabling System as called for in these specifications and related drawings.

1.02 SYSTEM DESCRIPTION

A. Each Telecommunications Room (TR) in a building shall have a Primary Bonding Busbar (PBB) properly connected per ANSI/TIA/EIA-607.

B. Relevant bonding and grounding infrastructure acronyms:

1. PBB (Primary Bonding Busbar): A copper ground reference busbar, typically installed in the entrance facility or entrance room that is bonded to the service equipment (power) ground by the IC.
2. SBB (Secondary Bonding Busbar): A copper ground reference busbar, typically installed in telecommunication rooms (TR) that is bonded to the PBB by the TBB. The SBB references metallic entities in the TR space to ground.
3. EK (Equipment Bonding Conductor): An insulated copper conductor that bonds metallic items and equipment to the PBB and SBB.
4. IC (Interconnecting Bonding Conductor) (referred to in TIA/EIA-607 as the Bonding Conductor for Telecommunications): The copper conductor that bonds the PBB to the service equipment (power) ground.
5. TBB (Telecommunications Bonding Backbone): An insulated copper conductor extending from the PBB to each SBB.

1.03 SUBMITTALS

A. Submit product data for the following:

1. Primary Bonding Busbar.
2. Secondary Bonding Busbar.
3. Equipment rack busbars.
4. Two-hole and one-hole (with backstop) compression lugs.
5. No. 3/0 AWG and No. 6 AWG conductors.
6. Grounding Pig-tails or leads.

B. Submit details of grounding elements for equipment rack applications.

1.04 QUALITY ASSURANCE

A. Comply with section **27 00 00.**

B. All work will conform to Article 250-Grounding and Article 800-Communications of the National Electrical Code (NEC) for grounding, bonding, and protecting electrical and communications circuits.

C. Materials and work specified herein shall comply with the applicable requirements of ANSI/TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications.

D. Materials and work specified herein shall comply with the applicable requirements of IEEE-426.

E. If there is a conflict between the grounding standards, follow IEEE-426 as the primary standard.

F. Delivery, Storage, and Handling.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. All material must be UL listed.

B. A single manufacturer will be used for all grounding material.

2.02 MATERIALS AND FABRICATION

A. Primary Bonding Busbar (PBB) shall be 1/4" x 4" x 20" insulated copper ground bar in size.

B. Bonding Conductors:

1. All bonding conductors shall be insulated copper. The exception is the use of flat, braided, aluminum ground straps utilized for bonding sections of aluminum cable trays.
2. Unless otherwise specified, size the conductors as required by NEC.
3. Unless otherwise specified, the IC (Interconnecting Bonding Conductor) (referred to in TIA/EIA-607 at the Bonding Conductor for Telecommunications) shall be insulated, copper, No. 3/0 AWG.
4. Unless otherwise specified, the TBB (Telecommunications Bonding Backbone) shall be green-colored (or identified as a grounding wire every 10 feet) insulated, copper, No. 3/0 AWG.
5. Unless otherwise specified, the EK (Equipment Bonding Conductor) shall be green-colored insulated, copper, No. 6 AWG.

C. Bonding conductor terminations acceptable materials:

1. Two-hole compression lugs: (Used on conductors at the PBB or SBB) Color coded to appropriate cable, high conductivity wrought copper, electro tin plated, or approved equal.
2. One-hole compression lugs: (Used on conductors at the hardware/equipment) Color coded to appropriate cable, high conductivity wrought copper, electro tin plated, or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide all local bonding as specified on the drawings and in the specifications.

B. Bonding conductors shall be continuous and routed in as direct a route as possible to the point of termination.

C. All insulated ground bars must be isolated from the structural support by a 2-inch minimum separation, using manufacturer’s recommended insulating stand-offs and hardware.

D. Clean bonding bars prior to terminating conductors.

E. Label all telecommunications bonding conductors as close as possible to their termination point.

F. Confirm that the electrical contractor bonded the PBB to the service equipment (power) ground, typically located in the electrical entrance facility, utilizing the most direct route possible to minimize conductor length.

G. Bond the following when present:

1. Metallic equipment racks/cabinets.
2. Cable shields.
3. All metal raceways and cable trays.

END OF SECTION 270526

SECTION 27 05 28 - FIRESTOPPING FOR COMMUNICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping of Through Penetrations in Fire Rated Assemblies.

B. Smoke Seals.

C. Construction enclosing compartmentalized areas.

1.02 RELATED SECTIONS

A. **Division 26 – Section 26 05 34 – Electrical – Raceways and Conduit Systems.**

B. **Division 27 – Section 27 15 00 – Communications – Structured Voice and Data Cabling Infrastructure.**

1.03 REFERENCES

A. ASTM E 84, “Surface Burning Characteristics of Building Materials”.

B. ASTM E 119, “Fire Tests of Building Construction and Materials”.

C. ASTM E 814, “Fire Tests of Through Penetration Firestops”.

D. ANSI/UL263, “Fire Tests of Building Construction and Materials”.

E. ANSI/UL723, “Surface Burning Characteristics of Building Materials”.

F. ANSI/UL1479, “Fire Tests of Through Penetration Firestops”.

G. Underwriters Laboratories Inc. (UL) – Fire Resistance Directory

H. National Fire Protection Association (NFPA) – NFPA 101: Life Safety Code.

I. National Fire Protection Association (NFPA) – NFPA 70: National Electrical Code.

1.04 PERFORMANCE REQUIREMENTS

A. Fire rated pathway devices shall be the preferred product and shall be installed in all locations where frequent cable moves, add-ons and changes will occur.

B. Where non- mechanical products are utilized, provide products that upon curing do no re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during or after construction.

C. Where it is not practical to use a mechanical device, openings within floors and walls designed to accommodate telecommunications and data cabling shall be provided with re-enterable products that do not cure or dry.

D. Openings for cable trays shall be sealed using re-enterable firestopping pillows.

1.05 SUBMITTALS

A. **Submit under provisions of Section 01 33 00.**

B. Product Data: Provide manufacturer’s standard catalog data for specified products demonstrating compliance with referenced standards and listing numbers of systems in which each product is to be used.

C. Shop Drawings: Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance ratings.

D. Certificates: Product certificates signed by firestop system manufacturer certifying material compliance with applicable code and specified performance characteristics.

E. Installation Instructions: Submit manufacturer's printed installation instructions.

1.06 QUALITY ASSURANCE

A. Products/Systems: Provide firestopping systems that comply with the following requirements:

1. Firestopping tests are performed by a qualified, testing and inspection agency. A qualified testing and inspection agency is UL, or another agency performing testing and follow-up inspection services for firestop system acceptable to authorities having jurisdiction.

2. Firestopping products bear the classification marking of qualified testing and inspection agency.

B. Installer Qualifications: Experience in performing work of this section who is qualified by the firestopping manufacturer as having been provided the necessary training to install firestop products in accordance with specified requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Delivery:

1. Manufacturer's original, unopened, undamaged containers, identification labels intact identifying product and manufacturer, date of manufacture; lot number; shelf life, if applicable; qualified testing and inspection agency's classification marking; and mixing instruction for multicomponent products.

2. Handle and store products according to manufacturer's recommendations published in technical materials. Leave products wrapped or otherwise protected and under clean and dry storage conditions until required for installation.

B. Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

1.08 PROJECT CONDITIONS

A. Do not install firestopping products when ambient or substrate temperatures are outside limitations recommended by manufacturer.

B. Do not install firestopping products when substrates are wet due to rain, frost, condensation, or other causes.

C. Maintain minimum temperature before, during, and for a minimum 3 days after installation of materials.

D. Do not use materials that contain flammable solvents.

E. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

F. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

G. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers

1. Specified Technologies Inc., 200 Evans Way, Somerville, NJ 08876. Tel: (800) 992-1180, Fax: (908) 526-9623, Email: specseal@stifirestop.com, Website: www.stifirestop.com.

2. HILTI USA Inc., 5400 S. 122nd East Ave. Tulsa, OK 74146. Phone (866) 445-8827, Fax (800) 879-7000, Website: www.us.hilti.com.

B. Single Source: Obtain firestop systems for each type of penetration and construction condition indicated only from a single manufacturer.

2.02 MATERIALS

A. General: Use only firestopping products that have been tested for specific fire resistance rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire rating involved for each separate instance.

B. Firestop Sealants: STI SpecSeal® Brand single component latex formulations that upon cure do not re-emulsify during exposure to moisture, the following products are acceptable:

1. Specified Technologies Inc. (STI) SpecSeal® Series SSS Sealant.

2. Specified Technologies Inc. (STI) SpecSeal® Series LCI Sealant.

C. Firestop Putty: STI SpecSeal® Brand intumescent, non-hardening, water resistant putties containing no solvents, inorganic fibers or silicone compounds, the following products are acceptable: Specified Technologies Inc. (STI) SpecSeal® Series SSP Putty.

D. Firestop Pillows: STI SpecSeal® Brand re-enterable, non-curing, mineral fiber core encapsulated on six sides with intumescent coating contained in a flame retardant poly bag, the following products are acceptable: Specified Technologies Inc. (STI) SpecSeal® Series SSB Pillows.

E. Fire Rated Cable Pathways: STI EZ-PATH™ Brand device modules comprised of steel raceway with intumescent foam pads allowing 0 to 100 percent cable fill, the following products are acceptable: Specified Technologies Inc. (STI) EZ-PATH™ Fire Rated Pathway.

F. Fire Rated Cable Pathways: HILTI speed sleeve steels pathway allowing 100% cable fill.

PART 3 EXECUTION

3.01 EXAMINATION

A. Before beginning installation, verify that substrate conditions previously installed under other sections are acceptable for installation of firestopping in accordance with manufacturer’s installation instructions and technical information.

B. Surfaces shall be free of dirt, grease, oil, scale, laitance, rust, release agents, water repellants, and any other substances that may inhibit optimum adhesion.

C. Provide masking and temporary covering to protect adjacent surfaces.

D. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Install through-penetration firestop systems in accordance with Performance Criteria and in accordance with the conditions of testing and classification as specified in the published design.

B. Manufacturer’s Instructions: Comply with manufacturer’s instructions for installation of firestopping products.

3.03 FIELD QUALITY CONTROL

A. Inspections: Owner shall engage qualified independent inspection agency to inspect through-penetration firestop systems.

B. Keep areas of work accessible until inspection by authorities having jurisdiction.

C. Where deficiencies are found, repair firestopping products so they comply with requirements.

3.04 ADJUSTING AND CLEANING

A. Remove equipment, materials, and debris, leaving area in undamaged, clean condition.

B. Clean all surfaces adjacent to sealed openings to be free of excess firestopping materials and soiling as work progresses.

END OF SECTION 270528

SECTION 28 37 00 - LOW VOLTAGE ROUGH-IN

PART 1 GENERAL

1.01 WORK INCLUDED

A. All work specified in this section shall comply with the provisions of Division 26.

B. All conduit rough-in and outlet boxes for all low voltage systems/communications shall be provided and installed by Electrical Contractor.

C. All device locations will be as shown on communications systems drawings. Refer to system details for height requirements.

1.02 RELATED WORK

A. **Raceways and Conduit Systems: Sections 260534.**

B. **Supporting Devices and Hangers: Section 26 05 29.**

C. **Pull and Junction Boxes: Section 26 05 38.**

D. **Outlet Boxes: Section 26 05 37.**

PART 2 PRODUCTS

2.01 EQUIPMENT

A. All low voltage conduits shall be 3/4” EMT stubbed to nearest accessible ceiling unless otherwise noted in these specifications or drawings. Conduit shall be terminated with nylon bushing.

B. Contractor to provide standard outlet boxes to conform to "OUTLET BOX" section of these specifications and sized as shown on drawings.

C. The Electrical Contractor is responsible for all hangers, straps, and support structure necessary to properly hang/support conduit.

PART 3 EXECUTION

3.01 INSTALLATION

A. The General Contractor will schedule the installation of the conduit systems.

B. The Electrical Contractor will receive, store and protect all rough-in equipment.

C. The Electrical Contractor shall use building lines or 90° angles when installing conduit.

D. The Electrical Contractor shall work with others trades to coordinate location and installation of bracing for TV brackets.

E. For structured voice and data cabling infrastructure, the Electrical Contractor is to provide all rough-in, sleeves, fire stopping and standard outlet boxes. The Communications Contractor is to provide and install all cable, low voltage relays, and special backboxes. All equipment, devices, terminations and miscellaneous hardware required for a complete system is to be provided and installed.

F. For television cable system, background music/paging system, intercom system and nurse call/code blue system, the Electrical Contractor is to provide all rough-in, sleeves, fire stopping and standard outlet boxes. The Communications Contractor is to provide and install all cable, low voltage relays, and special backboxes. All equipment, devices, and miscellaneous hardware required for a complete system is to be provided and installed by the respective Owner/Vendor.

G. Where open cable is run above dropped ceilings and penetrates a smoke or fire rated wall, this contractor shall furnish and install a minimum 1" (unless otherwise noted) empty sleeve, 5' long, extending at least 2' on both sides of the partitions with bushings on both ends. In areas in which penetrations larger than 1” are required, the communications contactor shall install Specified Technologies EZ Path product or approved equivalent.

H. All cable concealed in walls or inaccessible (drywall) ceilings shall be installed in conduit.

END OF SECTION 283700

SECTION 31 00 00 - EARTHWORK

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 DESCRIPTION OF WORK:

A. Extent of earthwork is indicated on drawings and described herein.

B. Site grading to elevations indicated on drawings is included as part of this work.

C. Preparation of subgrade for building slabs, walks, and pavements is included as part of this work.

D. Soil compaction and control is included as a part of this work.

E. Drainage fill course for support of building slabs is included as part of this work.

F. Backfilling of trenches within building lines is included as part of this work.

G. Excavation of Mechanical/Electrical Work: Refer to Divisions 15 and 16 sections for excavation required in conjunction with underground mechanical and electrical utilities, backfilling of excavated trenches shall be in accordance with this section.

H. Definition: "Excavation" consists of removal of material encountered to subgrade elevations indicated and subsequent disposal or relocation of materials removed.

1.3 QUALITY ASSURANCE:

A. Codes and Standards: Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.

B. Testing and Inspection Service: Employ, at contractor's expense, testing laboratory to perform soil testing and inspection service for quality control testing during earthwork operations.

1.4 JOB CONDITIONS:

A. Existing Utilities: Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.

B. Should uncharted, or incorrectly charted, piping, or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner and utility

companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

1.5 SITE CLEARING AND PROTECTION

A. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shut-off of services if lines are active.

B. Use of Explosives: The use of explosives is not permitted.

C. Protection of Persons and Property: Barricade open excavations occurring as part of this work.

D. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS:

A. Select Fill – debris free, non organic select silty clays (CL) or sandy clays (CL) with a plasticity index (PI) less than 15 and a liquid limit less than 30.

B. Select on Site Material shall be non-organic material of the optimum moisture content that will allow the prescribed compaction and approved for use outside of building area by testing laboratory.

C. Building Slab Drainage Course shall be #610 Crushed Limestone as specified in SECTION 31 00 02

D. Backfill and Fill Materials: Satisfactory soil must as be a Select Fill or Select on Site Material as described above, free of clay, rock, or gravel larger than 2" in any dimension, debris, waste, frozen materials, vegetable and other deleterious matter.

PART 3 - EXECUTION

3.1 EXCAVATION:

A. Earth Excavation includes excavation of pavements and other obstructions visible on ground surface; underground structures, utilities and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as rock or unauthorized excavation.

B. At the new building, excavate the building footprint area plus 5’ beyond the footprint to an elevation 4’ below existing grade. Remove any unsuitable materials from site, stockpile any existing material that meets the definition of select fill for reuse. After overexcavating, proofroll

the existing subgrade with a loaded 10 ton axle weight dump truck in the presence of the Architects representative. If the existing subgrade is stable, scarify to a depth of 6", then compact the subgrade to 95% of standard proctor density. Replace excavated material with off-site or on-site select fill up to the bottom of the slab drainage course. Place fill in 8" thick layers and compact to 95% of standard proctor density. Stability is defined as the absence of significant pumping, rutting, or yielding of soils during compaction or proofrolling.

C. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be at contractor's expense.

D. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom without altering required top elevation.

E. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Architect.

F. In areas other than indicated for over-excavation, if unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated material as directed by Architect.

G. Additional Excavation: Where excavation has reached required subgrade elevations, notify Architect who will inspect conditions.

H. If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated material as directed by Architect.

I. Removal of unsuitable material and its replacement as directed will be paid on basis of contract conditions relative to changes in work.

J. Stability of Excavations: Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.

K. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

3.2 SHORING AND BRACING

A. Provide materials for shoring and bracing in good serviceable condition.

B. Establish requirements for trench shoring and bracing to comply with local codes and authorities having jurisdiction.

C. Maintain shoring and bracing in excavations regardless of time excavations will be open. Carry down shoring and bracing as excavation progresses.

3.3 DEWATERING

A. Prevent surface water from flowing into excavations and from flooding project site, surrounding area and existing building.

B. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

C. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rainwater and water removed from excavations to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.

3.4 MATERIAL STORAGE

A. Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place grade, and shape stockpiles for proper drainage.

B. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.

C. Dispose of excess soil material and waste materials as herein specified.

3.5 EXCAVATION FOR STRUCTURES

A. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10' and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.

B. In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.

3.6 EXCAVATION FOR PAVEMENTS

A. Cut surface under pavements to comply with elevations and grades as shown making provisions for 8" minimum of select fill.

3.7 EXCAVATION FOR TRENCHES

A. Dig trenches to the uniform width required for particular item to be installed, sufficiently wide to provide ample working room. Provide 6" to 9" clearance on both sides of pipe or conduit.

B. Excavate trenches to depth indicated or required. Carry depth of trenches for piping to establish indicated flow lines and invert elevations. Beyond building perimeter, keep bottoms of trenches sufficiently below finish grade to avoid freezing.

C. Except as otherwise indicated, excavate for exterior water-bearing piping (water, steam, condensate, drainage) so top of piping is not less than 2'0" below finished grade.

D. Grade bottoms of trenches as indicated, including notching under pipe bells to provide solid bearing for entire body of pipe.

E. Backfill trenches with concrete where trench excavations pass within 18" of column or wall footings and which are carried below bottom of such footings, or which pass under wall footings. Place concrete to level of bottom of adjacent footing.

F. Do not backfill trenches until tests and inspections have been made and backfilling authorized by Architect. Use care in backfilling to avoid damage or displacement of pipe systems.

3.8 COMPACTION:

A. General: Control soil compaction during construction providing minimum percentage of density specified for each area classification indicated below.

B. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density.

C. STRUCTURES, BUILDING SLABS, STEPS AND PAVEMENT

1. Compact 8” loose lifts for all layers of backfill or fill material at 95% standard proctor (ASTM D-698) within 3% of optimum moisture.

D. LAWN OR UNPAVE AREAS

1. Compact top 6" of subgrade and each layer of backfill or fill material at 90% maximum density.

E. WALKWAYS

1. Compact top 6" of subgrade and each layer of backfill or fill material at 95% maximum density.

3.9 MOISTURE CONTROL

A. Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, to prevent free water appearing on surface during or after compaction operations.

B. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

C. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.

3.10 BACKFILL AND FILL:

A. General

1. Place acceptable soil material in layers in required subgrade elevations, for each area classification listed below.

B. Inside Building Area with Drainage Course

1. Top four inches of material under all building slabs shall be building slab drainage course. Areas requiring fill (under drainage coverage) within building boundaries shall be Select Fill. In the areas requiring fill below five feet, select onsite material may be used if available.

C. Outside Building Area

1. Use select on-site material against foundation walls, under grassed areas, trenches, and piping areas not indicated to be paved shall have a minimum of 4" of topsoil.

D. Under Walks and Pavement

1. Use select on-site material. Cut existing grade as necessary to maintain 8" of select on-site material.

E. Backfill excavations as promptly as work permits, but not until completion of the following:

1. Acceptance of construction below finish grade including, where applicable, dampproofing, and waterproofing.

2. Inspection, testing, approval, and recording locations of underground utilities.

3. Removal of concrete formwork.

4. Removal of shoring, bracing, and backfilling of voids with satisfactory materials.

5. Removal of trash and debris.

6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

3.11 GROUND SURFACE PREPARATION

A. Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, or break-up sloped surfaces steeper than one vertical to four horizontal so that fill material will bond with existing surface.

B. When existing ground surface has a density less than that specified under "Compaction" for particular area classification. Break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.

3.12 PLACEMENT AND COMPACTION

A. Place backfill and fill materials in layers not more than 8" under building and 12" outside building in loose depth for material compacted by heavy compaction equipment, and not more than 6" in loose depth for material compacted by hand-operated tampers.

B. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

C. Place backfill and fill materials evenly adjacent to structures, piping or conduit to required elevations. Take care to prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping or conduit to approximately same elevation in each lift.

3.13 GRADING:

A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated, or between such points and existing grades.

B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding.

C. Finish surfaces free from irregular surface changes, and as follows:

1. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10' above or below required subgrade elevations.

2. Walks: Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 0.10' above or below required sub-grade elevation.

3. Pavements: Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than 1/2" above or below required subgrade elevation.

4. Grading Surface of Fill under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/2" when tested with a 10' straightedge.

5. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

D. If in opinion of Architect based on testing service reports and inspection, subgrade or fills which have been placed are below specified density, provide additional compaction and testing at no additional expense.

3.14 BUILDING SLAB DRAINAGE COURSE:

A. General: A drainage course shall be provided consisting of placement of crushed concrete, 4" thick, over the subgrade surface to support concrete building slabs.

3.15 FIELD QUALITY CONTROL:

A. Quality Control Testing During Construction: Allow testing service to inspect and approve subgrades and fill layers before further construction work is performed.

B. Perform field density tests in accordance with ASTM D2922 Density of Soil and Soil Aggregates in Place by Nuclear Methods.

C. Paved Areas and Building Slab Subgrade: Make at least one field density test of subgrade for every 2000 sq. ft. of paved area or building slab, but in no case less than three tests. In each compacted fill layer, make one field density test for every 2000 sq. ft. of overlaying building slab or paved area, but in no case less than three tests.

D. Foundation Wall Backfill: Take at least two field density tests at locations and elevations as directed.

3.16 MAINTENANCE:

A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

B. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

D. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work and eliminate evidence of restoration to greatest extent possible.

3.17 DISPOSAL OF EXCESS AND WASTE MATERIALS:

A. Removal from Owner's Property: Remove waste materials, including unacceptable and acceptable excavated material, trash, and debris, and dispose of it off Owner's property.

END OF SECTION

SECTION 31 00 01 - CRUSHED CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION

A. CONTRACTOR shall furnish and place crushed concrete, of the types specified at locations shown.

B. Work includes providing a crushed concrete surface on a prepared subgrade as required for building slab.

1.2 SUBMITTALS

A. CONTRACTOR shall furnish representative samples of the crushed concrete and shall advise of the source location.

1.3 QUALITY ASSURANCE

A. Tests:

1. Source Quality Control: CONTRACTOR shall be responsible for payment for all testing required to determine acceptability of crushed concrete at the locations where the material is obtained.
2. Field Quality Control Testing: The CONTRACTOR shall retain the services of a qualified testing laboratory to make tests and determine acceptability of the crushed concrete upon delivery to the job site.
3. CONTRACTOR shall give full cooperation to the testing lab personnel so that the required tests can be taken in an efficient and timely manner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Crushed Concrete (Recycled Concrete) Gradation size shall be the same as that required by no. 610 crushed limestone aggregate as specified in Section 703.04.2 of the "*Mississippi Standard Specification for Road and Bridge Construction*", 2004 Edition.

B. CONTRACTOR shall submit samples meeting the above requirements to an approved commercial testing laboratory for sieve analysis. The laboratory analysis results shall be approved by the ARCHITECT before any material is ordered.

C. After the materials are delivered to the job site, the ARCHITECT will take two samples from each shipment of material. The CONTRACTOR shall have a sieve analysis performed on these samples by the CONTRACTOR's testing laboratory. If the results of the samples taken in the field do not

conform to those previously approved, the material will be rejected and shall be modified or removed from the job site.

PART 3 -EXECUTION

3.1 COMPACTION

A. Crushed concrete sub-base should be compacted to not less than 100 percent of standard Proctor maximum dry density (ASTM D 698) at moisture contents within 3 percentage points of optimum water content.

3.2 INSPECTION

A. Examine the subgrade on which the crushed concrete shall be installed and notify the ARCHITECT in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to the ARCHITECT.

3.3 GENERAL PLACEMENT OF CRUSHED CONCRETE

A. Material shall be spread in layers of uniform thickness not exceeding four inches and shall be thoroughly compacted with suitable power driven tampers or other power driven equipment. The placing of crushed concrete, shall conform to applicable requirements of Section 02200 except as noted above.

END OF SECTION 032221

SECTION 31 1000 - SITE CLEARING

PART 1 - GENERAL

RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Specification sections, apply to work of this section.

SCOPE:

A. The work required under this section consists of clearing and grubbing of area within construction limits and related items to complete the work as indicated on the drawings and described in the specifications.

DESCRIPTION OF WORK:

A. Site clearing work includes, but is not limited to:

1. Protection of existing trees.

2. Removal of trees and other vegetation.

3. Topsoil stripping.

4. Clearing and grubbing.

5. Removing above-grade improvements.

6. Removing below-grade improvements.

JOB CONDITIONS:

A. Traffic: Conduct site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction.

B. Protection of Existing Improvements: Provide protections necessary to prevent damage to existing improvements indicated to remain in place.

Protect improvements on adjoining properties and on Owner's property.

Restore damaged improvements to their original condition, as acceptable to parties having jurisdiction.

C. Salvagable Improvements: Carefully remove items indicated to be salvaged, and store on Owner's premises where indicated or directed.

PART 2 - EXECUTION

SITE CLEARING:

A. General: Remove trees, shrubs, grass and other vegetation, improvements, or obstructions interfering with installation of new construction. Remove such items elsewhere on site or premises as specifically indicated. Removal includes digging out stumps and roots.

Carefully and cleanly cut roots and branches of trees indicated to be left standing, where such roots and branches obstruct new construction.

B. Topsoil: Topsoil is defined as friable clay loam surface soil found in a depth of not less than 4". Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 2" in diameter, and without weeds, roots, and other objectionable material.

Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material.

Remove heavy growths of grass from areas before stripping.

Where trees are indicated to be left standing, stop topsoil stripping a sufficient distance to prevent damage to main root system.

Stockpile topsoil in storage piles. Construct storage piles to freely drain surface water. Cover storage piles if required to prevent wind-blown dust.

C. Dispose of unsuitable or excess topsoil same as waste material, herein specified.

D. Clearing and Grubbing: Clear site of trees, shrubs and other vegetation, except for those indicated to be left standing.

Completely remove stumps, roots, and other debris protruding through ground surface or within building lines.

Use only hand methods for grubbing inside drip line of trees indicated to be left standing.

Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.

See earthwork specification for backfill requirements.

E. Removal of Improvements: Remove existing above-grade and below-grade improvements necessary to permit construction, and other work as indicated including but not limited to pipe, sidewalks, paving, foundations, buildings, walls, etc.

Abandonment or removal of certain underground pipe or conduits may be shown on mechanical or electrical drawings, and is included under work of those sections. Removal of abandoned underground piping or conduit interfering with construction is included under this section.

DISPOSAL OF WASTE MATERIALS:

A. Burning on Owner's Property: Burning is permitted only if approved by the Owner and/or Engineer. It will be the sole responsibility of the Contractor to obtain all necessary permits prior to burning. Copies of all necessary permits shall be provided to the Owner and/or Engineer prior to commencing burning operations. Compliance with all regulations necessary for burning operations are the sole responsibility of the Contractor. Contractor shall at a minimum comply with **11 Miss. Admin. Code Pt. 2, Ch.1**.

B. Removal from Owner's Property: ***Remove waste materials, unsuitable soils, and excess topsoil*** from Owner's property and dispose of off site in legal manner.

END OF SECTION 31 1000

SECTION 32 1300 - CAST IN PLACE CONCRETE PAVING AND EXTERIOR SLABS

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 specified in this section.

B. Related Specifications:

a. Section 32 1313.50 – Concrete Formwork - Paving
b. Section 32 1313.51 – Concrete Reinforcement - Paving

C. Decorative Concrete Submittals

a. Samples for Initial Selection: For each type of product, ingredient, or admixture requiring color, pattern, or texture selection.

b. Samples for Verification: For each type of exposed color, pattern, or texture indicated.

c. Qualification Data: For qualified Installer and ready-mix concrete manufacturer.

d. Material Certificates: For the following, from manufacturer:
1. Admixtures.
2. Curing compounds.
3. Applied finish materials.

D. Non-Decorative Concrete Paving Submittals:

A. Refer to architectural submittal procedures.

B. Product Data: Submit manufacturer's product data with application and installation instructions for proprietary materials and items, admixtures, patching compounds, curing compounds, and others as requested by Engineer.

C. Submit for review detailed shop drawings showing layout, sizes, arrangements, bar supports, etc., for reinforcing steel, all reinforcing for grade beams, walls, etc. shall be shown in elevations so as to indicate bar lengths, locations of splices, etc.

D. ***Submit layout of construction joints for Engineer review if different from that on project plans.***

E. Samples: Submit samples of materials as specified and as otherwise requested by Engineer, including names, sources and descriptions.

1.2 QUALITY ASSURANCE:

A. Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified:

American Concrete Institute (ACI):

ACI 301 "Specifications for Structural Concrete for Buildings".

ACI 318 "Building Code Requirements for Reinforced Concrete".

ACI 315 "Manual of Standard Practice for Detaining Reinforced Concrete Structures".

ACI 347 "Recommended Practice for Concrete Formwork".

American Society for Testing & Materials (ASTM):

ASTM A 615 "Deformed and Plain Billet Steel Bar for Concrete Reinforcement".

ASTM A 185 "Welded Steel Wire Fabric for Concrete Reinforcement".

ASTM C 33 "Concrete Aggregates".

ASTM C 94 "Ready-Mixed Concrete".

ASTM C 150 "Portland Cement".

ASTM C 260 "Air-Entraining Admixtures".

ASTM C 309 "Liquid Membrane Forming Compounds for Curing Concrete".

ASTM C 494 "Chemical Admixture for Concrete".

B. DECORATIVE CONCRETE PAVING QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer of decorative concrete paving systems.

B. Source Limitations: Obtain decorative concrete paving products and each type or class of cementitious material of the same brand from same manufacturer's plant, and obtain each aggregate from single source.

C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Build mockups of full-thickness sections of decorative concrete paving to demonstrate typical joints; surface color, pattern, and texture; curing; and standard of workmanship.

2. Build mockups of decorative concrete paving in the location and of the size indicated or, if not indicated, build mockups where directed by Architect and not less than 96 inches by 96 inches.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
5. Build mockups as necessary until approved by the Architect at no additional cost to the Owner. Remove rejected mockups.

1.3 CONCRETE TESTING:

A. The contractor shall furnish all concrete mix designs to the Engineer for review. ***Concrete placement will not be allowed until the mix design has been approved.***

B. Materials and installed work may require testing and retesting, as directed by the Engineer at anytime during progress of work. Allow free access to material during progress of work. Allow free access to material stockpiles and facilities. Tests, including retesting of rejected materials and installed work, shall be done at Contractor's expense.

C. ***The contractor shall employ at his expense a testing laboratory acceptable to the Engineer to perform material evaluation, design concrete mixes, take test specimens in the field, and perform all applicable test.*** All field technicians shall have taken and successfully passed the ACI approved course as specified by ACI C94.

D. The testing laboratory providing quality control has total authority and responsibility for the concrete exiting the truck. Any alteration of the concrete in the truck including addition of water, admixtures, or any other product will be allowed only at the discretion of the testing laboratory.

E. The quality control laboratory has total authority of rejection of concrete prior to placement for duration of time since departure from batch plant, or any inconsistency or deviation from standards set forth herein.

F. Compression Test Specimens: ASTM C31; one set is defined as 4 standard cylinders for each compressive strength test, unless otherwise indicated or directed. Mold and store cylinders for laboratory cured test specimens except field-cure one test specimen.

G. Compressive Strength Tests: ASTM C39; a minimum of one set as follows or fraction thereof, of each concrete class placed in any one day. 1 specimen tested at 7 days, 1 specimen tested at 28 days Test Field cured specimen at 28 days, 1 cylinder held as a test back up cylinder at 56 days or as directed by Engineer.

Retaining Walls:	1 set for each 25 cubic yards
Concrete Paving:	1 set for each 25 cubic yards
Concrete Walks:	Not Required
Concrete Curb Gutters:	Not Required

H. Manholes, Catch Basins, Junction Boxes, Fence Post, Light Pole Supports, Headwalls: *Not Required*

I. Slump: ASTM C143; one test for each concrete load at point of discharge; and one test for each set of compressive strength test specimens.

J. Air Content: ASTM C173, volumetric method for normal weight for each concrete load at point of discharge; and one test for each set of compressive strength test specimens.

K. Concrete Temperature: Test hourly when air temperature is 40 degrees F and below; and when 80 degrees and above; and each time a set of compression test specimens made.

L. When strength of field-cured cylinders is less than 85% of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protection and curing in-place concrete.

M. Test results will be reported in writing to Engineer and Contractor on same day that tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placements, name of concrete testing service, concrete type and class design mix identification, locations of concrete batch in structure shall be described so that it is easily determined where and to what extent it is in the project. Design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of test results shall be considered satisfactory if they equal 70% of the 28 day design requirements at a 7 day break.

N. Additional Tests: The testing service will make additional test of in-place concrete when test results indicate specified concrete strength and other characteristics have not been attained in the structure, as directed by Engineer. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods as directed. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

1.4 CEMENT MIXES

A. Ready-Mix Concrete: Comply with requirements of ANSI/ASTM C94, and as herein specified. Concrete Design mix is to be established to provide concrete of ten percent (10%) higher strength than the specified job strength.

B. Design mixes to provide required strength concrete with the following properties:

4,000 psi 28-day compressive strength.
W/C ratio, 0.40 maximum.

C. Proportions shall be made by weight and shall be uniformly and accurately controlled and inspected by the testing laboratory. During hot weather or under conditions contributing to rapid setting of concrete a shorter mixing time than specified in ANSI/ASTM C 94 may be required.

PART 2 – PRODUCTS

2.1.1 NON-DECORATIVE CONCRETE MATERIALS:

A. Portland Cement: ANSI/ASTM C 150, Type I.

B. Use one brand of cement throughout project, unless otherwise acceptable to Engineer.

C. Aggregates: ANSI/ASTM C 33, maximum size one inch (1").

D. Water: Potable, clean free of oil, alkali, or other deleterious substances.

E. Air-Entraining Admixture: ANSI/ASTM C260.

F. Water-Reducing Admixture: ANSI/ASTM C494, Type A and contain not more than 1% chloride ions.

G. Water Reducing: Accelerator Admixture L ASTM C494, Type C or E

Subject to compliance with requirements, provide one of the following:

Accelguard HE; Euclid Chemical Co.
Pozzolith 122-HE; Master Builders
Darex; W.R. Grace
Sikacrete; Sika Chemical Co.

2.1.2 DECORATIVE CONCRETE MATERIALS

A. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.
1. 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:
a. Bon Tool Co.
b. Brickform.
c. Butterfield Color.
d. ChemMasters.
e. Davis Colors.
f. Dayton Superior Corporation.
g. Decosup Inc.
h. Dynamic Color Solutions, Inc.
i. Elementis Pigments.
j. Hoover Color Corporation.
k. Lambert Corporation.
l. QC Construction Products.
m. Scofield, L. M. Company.
n. Solomon Colors, Inc.
o. Specialty Concrete Products, Inc.

p. Stampcrete International Ltd.
q. SureCrete Design Products.
r. Bomanite Corporation

2.2.1 NON-DECORATIVE CONCRETE RELATED MATERIALS:

A. Moisture Barrier: Provide moisture barrier cover over prepared base material where indicated. Use only materials which are resistant to decay when tested in accordance with ANSI/ASTM E 154, as follows:

1. Polyethylene sheet not less than 6 mils thick.

B. Non-Shrink Grout: CRD-C 588, factory pre-mixed grout.

C. Products: Subject to compliance with requirements, provide one of the following:

Type D, Non-metallic

"Masterflow 713"; Master Builders.
"Sonogrout"; Sonneborn-Contech.
"Euco-NS"; Euclid Chemical Co.
"Five-Star Grout"; U.S. Grout Co.
"Duragrout"; L & M Const. Chemical Co.

D. Curing Hardener, Sealer: Acrylic base compound equal to Sonneborne's Gray Kure-N-Seal. Use this material for curing and sealing of exposed finished concrete floors as noted in Finish Schedule as "Concrete (Sealed)".

E. Moisture-Retaining Cover: One of the following, complying with ANSI/ASTM C 171.

Polyethylene film. 6 Mil

F. Bonding Compound: Polyvinyl acetate, rewettable type.

Products: Subject to compliance with requirements, provide one of the following:

"Weldcrete"; Larson Products.
"Everbond"; L & M Construction Chemicals.
"EucoWeld"; Euclid Chemical Co.
"Daraweld C"; W.R. Grace.
"Sonocrete"; Sonneborn-Contech.

G. Admixtures:

1. Use accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees F.

2. Use Air-entraining admixture in exterior exposed concrete, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate.

3. Use admixtures for water-reducing and set-control in strict compliance with manufacturer's directions.

H. Slump Limit: Proportion and design mixes to result in concrete slum at point of placement as follows:

Ramp and Sloping Surfaces: Not more than 3".

Reinforced Foundation Systems: Not less than 3" and not more than 4".

Building Slab: refer to structural concrete specification.

Other Concrete: Not less than 4" and not more than 5".

I. If fly ash is used, not more than 20% of the cement, by weight, may be replaced by fly ash. Fly ash to be ASTM C-618, Class C.

J. Calcium chloride shall not be used.

K. When air temperature is between 85 and 90 degrees F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 degrees F reduce mixing and delivery time to 60 minutes.

L. In cold weather, concrete operation may be assisted by using hot water or by preheating the aggregates prior to mixing operation or a combination thereof to insure that concrete is maintained at a temperature of 40 degrees or more.

M. All concrete design mixes shall have the mix number indicated on the submittal to the Architect. The delivery ticket left at the job site shall also bear the design mix number.

N. Refer to drawings for compressive strength requirements.

2.2.2 DECORATIVE CONCRETE RELATED MATERIALS

B. Pigmented Powder Release Agent: Factory-packaged, dry combination of surface-conditioning and dispersing agents interground with color pigments that facilitates release of stamp mats. Use color pigments that are finely ground, nonfading mineral oxides interground with cement.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Advanced Surfaces Inc.; Release Agent.
      b. Artcrete, Inc.; Faux Brick Release Agent - Powder.
      c. Bomanite Corporation; Release Agent.
      d. Bon Tool Co.; True Color Release Agent.
      e. Brickform; Antique Release.
      f. Butterfield Color; Perma-Cast Antiquing Release.

g. Decosup Inc.; Decosup Release Powder.
h. Dynamic Color Solutions, Inc.; Dynamicast Color Release Agent.
i. QC Construction Products; [**QC Release Powder I**] [**QC Release Powder II**].
j. Scofield, L. M. Company; LITHOCHROME Antiquing Release.
k. Southern Color N.A., Inc.; Mosaics Antique Release.
l. Specialty Concrete Products, Inc.; SCP Powder Release Agent.
m. Stampcrete International Ltd.; Colored Release Agent.
n. SuperStone, Inc.; Pigmented Release Powder.
o. SureCrete Design Products; Powder Release.

C. Liquid Release Agent: Manufacturer's standard, clear, evaporating formulation that facilitates release of stamp mats and texture rollers.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Advanced Surfaces Inc.; Liquid Release.
b. Artcrete, Inc.; Faux Brick Release Agent - Liquid.
c. Bon Tool Co.; Liquiform Release Agent.
d. Brickform; Liquid Release.
e. Butterfield Color; Butterfield Color Clear Liquid Release.
f. Decosup Inc.; Decosup Liquid Release.
g. Matcrete Precision Stamped Concrete Tools; Liquid Release Agent.
h. Proline Concrete Tools, Inc.; Dura-Liquid Release Agent.
i. QC Construction Products;.
j. Scofield, L. M. Company; LITHOTEX Liquid Release.
k. Southern Color N.A., Inc.; Mosaics Clear Liquid Release.
l. Stampcrete International Ltd.; Stampcrete Liquid Release.
m. Superior Decorative by Dayton Superior; Pro Liquid Release.
n. SuperStone, Inc.; Bubble Gum Liquid Release.
o. Symons by Dayton Superior; Clear Liquid Release.

2.3 STAMPING DEVICES

D. Stamp Mats: Semirigid polyurethane mats with projecting textured and ridged underside capable of imprinting texture and joint patterns on plastic concrete.
1. 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:
a. Advanced Surfaces Inc.
b. Bomanite Corporation.
c. Bon Tool Co.
d. Brickform.
e. Butterfield Color.
f. Creative Urethane Concepts, Inc.
g. Matcrete Precision Stamped Concrete Tools.
h. Proline Concrete Tools, Inc.

i. Scofield, L. M. Company.
j. Southern Color N.A., Inc.
k. Stampcrete International Ltd.
l. Superior Decorative by Dayton Superior.
m. SuperStone, Inc.
n. SureCrete Design Products.

2.4 CONCRETE MIXTURES

E. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions.

PART 3 - EXECUTION

3.1 PREPARATION OF FORM SURFACES:

A. Coat contact surfaces of forms with a form-coating compound before reinforcment is placed.

B. Thin form-coating compounds only with thinning agent of type,and in amount, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

3.2 CONCRETE PLACEMENT:

A. Preplacement Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used.

B. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.

C. General: Comply with ACI 304, and as herein specified.

D. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.

E. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

F. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, roding or tamping.

G. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practices.

H. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

I. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation within limits of construction joints until the placing of a panel or section is completed.

J. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

K. Bring slab surfaces to correct level with straightedge and strike off. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.

L. Maintain reinforcing in proper position during concrete placement operations.

M. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.

When air temperature has fallen to or is expected to fall below 40 degrees F. (4 degrees C), do not place concrete.

N. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

O. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.

P. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305.

Q. Wet forms thoroughly before placing concrete.

R. Use water-reducing retarding admixture (Type D) when required by high temperatures, low humidity, or other adverse placing conditions.

S. If the testing laboratory technician, at the job site, determines that water is to be added to a load of concrete, the drum shall be turned 60 to 80 revolutions at 12 to 15 revolutions per minute after the water has been added. The slump is then to be rechecked.

3.3 FINISH OF FORMED SURFACES:

A. Rough Form Finish: For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired

and patched and fins and other projections exceeding 1/4" in height rubbed down or chipped off.

B. Smooth Form Finish: For formed concrete surfaces exposed-to-view, or that are to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, painting or other similar system. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.

C. Moisten concrete surfaces and rub with Carborundum brick or other abrasive until a uniform color and texture is produced. Do not apply cement grout other than that created by the rubbing process.

D. Rubbed Concrete: Provide rubbed finish to concrete surfaces which are in view in interior and exterior locations, or as indicated on the plans.

E. Combine one part Portland cement to 1-1/2 parts fine sand by volume, and mix with water to consistency of thick paint. Use of proprietary additives may be used at contractor's option. Blend standard Portland cement and white Portland cement, amounts determined by trail patches, so that final color of dry grout will closely match adjacent surfaces.

F. Thoroughly wet concrete surfaces and apply grout to coat surfaces and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least 36 hours after rubbing.

F. Related Uniformed Surfaces: At tops of walls, horizontal offsets surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.4 MONOLITHIC SLAB FINISHES:

A. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo, and as otherwise indicated.

B. After screening, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to a tolerance not exceeding 1/4" in 10' when tested with a 10' straightedge. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

C. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, paint or other think film finish coating system.

D. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding 1/8" in 10' when tested with a 10' straightedge.

E. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps and ramps, and elsewhere as indicated.

F. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Engineer before application.

3.5 CONCRETE CURING AND PROTECTION:

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than seven days.

C. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least seven days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

D. Provide moisture-cover curing as follows:

E. Cover concrete surfaces with moisture-retaining cover for curing concrete placed in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

F. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by using curing compound.

3.6 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 a non-staining form release agent that will not discolor or deface surface of concrete.

B. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric.

1. Concrete Paving (5”) ----------6 x 6 W2.9 x W2.9 (1 Layer)
2. Heavy-Duty Concrete Paving (7”) ----------6 x 6 W2.9 x W2.9 (2 Layers)
3. Heavy-Duty Concrete Paving (8”) ----------6 x 6 W2.9 x W2.9 (2 Layers)

C. Reinforcing Bars: Deformed steel bars, ASTM A 615, Grade 60.

D. Concrete Materials: Comply with requirements of applicable Division 32 sections for concrete materials, admixtures, bonding materials, curing materials, and others as required.

E. Expansion Joint Material: to be asphalt impregnated 2" thick meeting ASTM-D-1751.

F. Expansion Joint Cap: Greenstreak #941 plastic cap for 2" joints.

G. Joint Sealant: Sonneborn Sonolastic SL-2 Sealant or Dow Corning 890 Silicone. Color shall be concrete.

H. Curing and Sealing Compound: Conform to TT-C-800, with 30% solids content minimum.

I. Epoxy Resin Grout: FS MMM-G-650.

3.7 JOINTS:

A. All joints shall be installed as shown on the Joint Layout in the project plans unless otherwise directed by the Engineer. If contractor desires to install joints different than as shown on project plans, a drawing showing all joints with dimensions shall be submitted to the engineer for review. No concrete shall be placed until joint layout has been approved if different than project plans.

B. All joints (construction, control, and expansion) shall be sealed using joint sealant.

C. General: Construct expansion, weakened-plane (contraction), and construction joints true-to-line with face perpendicular to surface of concrete. Construct transverse joints at right angles to the centerline, unless otherwise indicated. When joining existing structures, place transverse joints to align with previously placed joints, unless otherwise indicated.

D. Tooled Joints: Form weakened-plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer.

E. Expansion Joints: Provide premolded joint filler for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structures, walks and other fixed objects, unless otherwise indicated. Extend joint fillers full-width and depth of joint, and not more than 2" or less than 1" below finished surface. Furnish joint fillers in one-piece lengths for full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together. Install expansion joint cap on premolded expansion joint material and protect until concrete has been placed on each side. Protect top edge of joint filler cap during concrete placement. Remove protection after concrete has been placed on both sides of joint.

E. Expansion Joint Sealers: Remove plastic cap and provide joint sealant in all expansion joints and comply with manufacturers instructions.

3.8 MISCELLANEOUS CONCRETE ITEMS:

A. Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as herein specified to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

B. All areas under concrete floor slab shall have moisture barrier with joints lapped at least 12". Take care to lay material smooth and even, and avoid tearing or puncturing. Seal tightly at all expansion joints and spaces around pipes, conduits and other penetrations using coal, tar, pitch, or asphalt mastic.

C. The general contractor is to VERIFY the sizes and locations of all required floor and roof openings, equipment supports, etc. with the various subcontractors. Any conditions which require revisions or additions to the structural framing are to be brought to the attention of the architect and structural engineer prior to any construction. Any cost for the required changes will be borne by the general contractor.

D. Reinforced Masonry: Provide pea gravel aggregate in concrete grout for reinforced masonry lintels and bond beams where indicated on drawings and as scheduled. Allow 6" slump. Maintain accurate location of reinforcing steel during concrete placement.

3.9 CONCRETE SURFACE REPAIRS:

A. ***If the Engineer determines that the installed concrete paving does not meet the specifications it will be the responsibility of the Contractor to drill test cores where directed by Engineer at the Contractor's expense. The Contractor will also be responsible for payment of testing by a certified testing laboratory to ensure all concrete paving is per the specifications. In the event that the concrete paving does not comply with the specifications after testing, the Contractor shall remove all areas not complying with specifications and replace at no additional cost to the Owner.***

B. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Engineer.

C. Cut out honeycomb, rock pockets, voids over 1/4" in any dimension, and holes left by tie rods and bolts, down to solid concrete but, in no case to a depth of less than one inch (1"). Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water and brush-coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.

D. For exposed-to-view surfaces, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

E. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Engineer. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins

and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.

F. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete to the satisfaction of the Engineer.

G. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface planes to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having required slope.

H. Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01" wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.

I. Correct high areas in unformed surfaces by grinding, after concrete has cured at least fourteen days.

J. Correct low areas in unformed surfaces during, or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching and floor leveling compounds may be used when acceptable to Engineer.

K. Repair defective areas, except random cracks and single holes not exceeding one inch (1") diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

L. Repair isolated random cracks and single holes not over one inch (1") in diameter by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than seventy-two (72) hours.

M. Use epoxy-based mortar for structural repairs, where directed by Engineer.

N. Repair methods not specified above may be used, subject to acceptance of Engineer.

3.10 PIGMENTED MINERAL DRY-SHAKE HARDENER

F. Pigmented Mineral Dry-Shake Hardener Finish: After initial floating, apply dry-shake materials to paving surfaces according to manufacturer's written instructions and as follows:
   1. Uniformly apply dry-shake hardener at a rate of 100 lb/100 sq. ft. unless greater amount is recommended by manufacturer to match paving color required.
   2. Uniformly distribute approximately two-thirds of dry-shake hardener over the concrete surface with mechanical spreader; allow hardener to absorb moisture and embed it by power floating. Follow power floating with a second application of pigmented mineral dry-shake hardener, uniformly distributing remainder of material at right angles to first application to ensure uniform color, and embed hardener by final power floating.
   3. After final power floating, apply the following finish:
      a. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
      b. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.
      c. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

G. Pigmented Powder Release Agent: Uniformly distribute onto dry-shake-hardened and still-plastic concrete at a rate of 3 to 4 lb/100 sq. ft..

H. Liquid Release Agent: Uniformly mist surface of dry-shake-hardened and still-plastic concrete at a rate of 5 gal/1000 sq. ft..

3.11 STAMPING

I. Mat Stamping: After floating and while concrete is plastic, apply mat-stamped finish.
   1. Pigmented Powder Release Agent: Uniformly distribute onto concrete at a rate of 3 to 4 lb/100 sq. ft..
   2. Liquid Release Agent: Apply liquid release agent to the concrete surface and the stamp mat. Uniformly mist surface of concrete at a rate of 5 gal/1000 sq. ft..
   3. After application of release agent, accurately align and place stamp mats in sequence.
   4. Uniformly load mats and press into concrete to produce required imprint pattern and depth of imprint on concrete surface. Gently remove stamp mats. Hand stamp edges and surfaces unable to be imprinted by stamp mats.

   Remove residual release agent according to manufacturer's written instructions, but no fewer than three days after stamping concrete. High-pressure-wash surface and joint patterns, taking care not to damage stamped concrete. Control, collect, and legally dispose of runoff.

END OF SECTION 32 1300

SECTION 32 1313.50 - CONCRETE FORMWORK – PAVING

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections apply to work specified in this section.

DESCRIPTION OF WORK:

Formwork for cast-in-place concrete with shoring, bracing and anchorage (this specification excludes concrete formwork related to building formwork). Form accessories and stripping forms.

QUALITY ASSURANCE:

Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified:

ACI 301 "Specifications for Structural Concrete for Buildings".

ACI 347 R-14 "Recommended Practice for Concrete Formwork".

PS 1 "Construction and Industrial Plywood"

Design, engineer, and construct formwork, shoring, and bracing to meet design and code requirements, so that resultant concrete conforms to required shapes, lines and dimensions.

The design and engineering of the formwork, as well as its construction, shall be the responsibility of the General Contractor and in accordance with ACI 301 and ACI 347.

Design formwork for loads, lateral pressures, and allowable stresses outlined in Section 102 and 103 of ACI-347 R-14. Recommended Practices for Concrete Formwork and wind loads so specified by the governing building code.

Forms shall conform to the shapes, lines, and dimensions of the members as called for on the plans, and shall be constructed as to ensure that the concrete surfaces will conform to the tolerances of ACI-347, Section 203.1.

PART 2 - PRODUCTS

FORM MATERIALS:

Lumber: Southern Yellow Pine species; #2 S4S grade with grade stamp clearly visible. Use only on unexposed surfaces.

Form for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material with sufficient thickness to withstand

pressure of newly-placed concrete without bow or deflection. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.

FORMWORK ACCESSORIES:

Form Ties: Removable and Snap-off metal of fixed or adjustable length; 1-1/2 inch break back dimension; free of defects that will leave holes no larger than one inch diameter in concrete surface. Use removable ties for exposed finish surface only.

Form Release Agent: Colorless material which will not stain concrete, absorb moisture; or impair natural bonding.

Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Size as required; of strength and character to maintain formwork in place while placing concrete.

PART 3 - EXECUTION

FORMS: Construct forms to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.

Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.

Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.

Chamfer exposed corners and edges as indicated, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

Form Ties: Factory-fabricated, adjustable-length, removable or snapoff metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.

Unless otherwise indicated, provide ties so portion remaining within concrete after removal is at least 1-1/2" inside concrete.

Unless otherwise shown, provide form ties which will not leave holes larger than 1" diameter in concrete surface.

Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms.

Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retighten forms and bracing after concrete placement is required to eliminate mortar leaks and maintain proper alignment.

INSTALLATION OF EMBEDDED ITEMS:

General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto.

Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.

PREPARATION OF FORM SURFACES: Coat contact surfaces of forms with a form-coating compound before reinforcement is placed. Thin form-coating compounds only with thinning agent of type, and in amount, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

REMOVAL OF FORMS: Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F. (10 degrees C.) for twenty-four hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

Formwork supporting weight of concrete, such as beam soffits, joints, slabs and other structural elements, may not be removed in less than fourteen days and until concrete has attained design minimum compressive strength at twenty-eight (28) days. Determine potential compressive strength of inplace concrete by testing field-cured specimens representative of concrete location or members.

RE-USE OF FORMS: Clean and repair surfaces of forms to be reused in work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.

When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Engineer.

END OF SECTION 32 1313.50

SECTION 37 1723 - PAVEMENT MARKINGS

PART 1 - GENERAL:

A. This work shall consist of furnishing and applying paint on the completed parking lot surface and roadways in reasonably close conformity with these specifications and the details shown on the plans or established.

PART 2 - MATERIALS:

A. Paint: Paint used for traffic markings (parking lot striping) shall be yellow, water-based latex traffic zone paint. Paint used for Handicap markings shall be installed in accordance with the guidelines of the American with Disabilities Act and shall be blue in color. Such paint, its components, composition, inspection, testing, certifications, acceptance or rejection shall be in accordance with the manufacturer's recommendations and/or warranties. ***No paint, however, shall be approved for use on this project until certification is given that the particular product proposed will bond properly to the surface and that no discoloration will occur to the paint.***

PART 3 - CONSTRUCTION REQUIREMENTS:

A. The work shall be performed to meet all applicable requirements of Section 619 of the Mississippi Standard Specifications for Road and Bridge Construction, 2004 Edition of the Mississippi State Highway Department.

END OF SECTION 37 1723

SECTION 328400 – PLANTING IRRIGATION

PART 1 GENERAL

1.1 SUMMARY

A. Extent of underground irrigation system is shown on Drawings and in the schedules.

B. Provide all labor, materials and equipment required by or inferred from Drawings and Specifications to complete the Work of the Section.

C. Provide additional Work and materials required by local authorities at no extra cost to Owner.

D. Contractor shall provide all permits, applications, licenses, and other qualifications to complete work at no additional cost to owner.

E. Reference Standards: American Society for Testing and Materials, Annual Book of ASTM Standards, latest edition.

F. Related work: Section 329300 – Plants, Soil, & Sod

1.2 CONTRACTS

A. Irrigation Work to a single firm specializing in irrigation installation, acceptable to Landscape Architect.

1.3 CODES AND STANDARDS

A. Perform Irrigation Work in compliance with applicable requirements of governing authorities having jurisdiction. County regulations supersede these specifications. Notify Landscape Architect in writing of all discrepancies immediately.

1.4 DO NOT MAKE SUBSTITUTIONS

A. If Contractor desires to make substitutions of materials, sufficient descriptive literature and material samples must be furnished to establish the material as an equal substitute. In addition, Contractor must state his reasons for desiring substitute materials. Submit this request and information to Landscape Architect.

1.5 APPROVAL AND SELECTION MATERIALS AND WORK

A. The selection of all materials and execution of all operations required under the Drawings and Specifications is subject to the approval of Owner and Landscape Architect. They have the right to reject any and all materials and any and all Work which, in their opinion, does not meet requirements of the Contract Documents at any state of operations. Contractor to remove rejected Work and or materials from Project Site and replace promptly.

B. "As-Built" Drawings: Any changes in layout and/or arrangements of the proposed irrigation system, or any other differences between proposed system and actual installed conditions are to be recorded by Irrigation Contractor in the form of an "As-Built" Drawings are to be clearly and neatly drawn on CAD drawing of original design provided by Landscape Architect. Provide Owner and Landscape Architect with a reproducible copy of the "As-Built" Drawings before Work under this Contract will be considered for acceptance. All automatic and manual valves, hose bibs or quick couplers and wire splice shall be shown with actual dimensions to reference points so they may be located easily in the field. Submittal of approved "As-Built" Drawings will preclude any Application for Final Payment by Contractor.

C. Delivery, Storage and Handling: Deliver material and equipment in such a manner as to not damage parts or decrease the useful life of equipment.

D. Store materials away from detrimental elements. Coordinate with General Contractor to secure a safe staging area.

E. Handle, load, unload, stack, and transport materials for irrigation system carefully to avoid damage. Handle pipe in accordance with Manufacturer recommendations.

1.6 VERIFY TAP

A. Test water conditions as they exist immediately down stream from tap: If they do not meet design demands, notify Landscape Architect immediately of existing conditions.

B. The irrigation system is designed to operate under the following conditions: a minimum of 60 psi of water pressure at tap and at least 45gpm available water supply tap & meter by Irrigation Contractor.

C. Job Conditions: Insurance on irrigation materials or equipment stored or installed as the responsibility of Irrigation Contractor. Such insurance shall cover fire, theft, and vandalism. Should Contractor elect not to provide for such insurance, he will in no way hold Owner responsible for any losses incurred by the aforementioned acts. The Contractor is responsible for all costs incurred in replacing damaged or stolen materials.

D. Obtain all required permits and pay all required fees, at no additional cost to Owner. Any penalties imposed due to failure to obtain permits or pay fees are the responsibility of the Contractor.

E. Provide and maintain all passageways, guard fences, warning lights and other protection devices required by local authorities.

F. Existing site improvements shall be performed in a manner which will avoid possible damage. The Contractor is responsible for any damage of a mechanical nature as well as damage resulting from leaks in irrigation system whether due to negligence or otherwise.

G. Damages resulting from irrigation installation to Work of other trades must be repaired at the expense of Contractor in a timely fashion.

H. Make adjustments to system layout as may be required and requested to provide complete coverage at no additional cost to Owner.

I. Keep project site clean and orderly at all times during construction.

1.7 WARRANTY

A. All Work for a period of one year, starting on Date of Substantial Completion, against defects in material, equipment, Workmanship, and any repair required resulting from leaks or other defects of workmanship, material, or equipment.

B. Repair unsatisfactory conditions promptly at no cost to Owner.

C. Emergency repairs may be made by Owner without relieving the Contractor of this warranty obligation.

D. Contractor to repair settling of backfilled trenches occurring during warranty period, including restoration of damaged plantings, paving or improvements resulting from settling of trenches or repair operations.

E. Respond to Owner's request for repair Work within ten days. If not, Owner may proceed with such necessary repairs at Contractor's expense. In addition, Contractor shall be held responsible for replacement of any plant material (tree, shrubs, sod, or seed) which becomes damaged or dies due to a lack of water during periods in which irrigation system is inoperable.

PART 2 PRODUCTS

2.1 SUMMARY

A. Specific requirements concerning the various materials and arrangements which are safe to be installed are shown on drawings.

2.2 QUALITY AND SIZE

A. Material specified by name and/or model number in the Specifications, on the site or detailed drawings are used for the purpose of identification of materials and to insure specific use of that material in the construction of the system. No substitutions will be permitted without approval. (See Substitutions).

B. Plastic pipe for all main lines is schedule 40 PVC while laterals 1 ½" size and over is Class 200 PVC Type 1120 or 1220 as manufactured Cabot, John-Mansville (or approved equal) unless otherwise specified herein or on the drawings. All pipe, 1" size and less, is Class 160.

C. PVC pipe is to be continuously marked with Manufacturer's identification, type, class, and size and installed with these markings on the top of the pipe.

D. All fittings should be Schedule 40 PVC Type 1, of domestic manufacture and identified as to pressure rating or schedule.

E. Solvent Weld: Solvent weld for PVC pipe over 20’ length must be installed with standard 20’ length sections. Unnecessary joints or couplings are not acceptable.

F. Risers: Provide threaded Schedule 80 PVC risers. All risers above grade to be either dark gray or black PVC pipe.

G. Electric Wiring: All 110-volt AC wiring to controller must consist of three wires: one black, one white and one ground. Electrical service to be provided by General Contractor unless otherwise directed by Owner.

H. All splices in controller wiring shall be waterproofed by using Rainbird “Snap-Tite” wire connectors.

I. All control wiring shall be 24-volt solid wire U>L> approved for direct burial in ground. Minimum wire size: 14 gauge.

J. All control wiring and wiring connections from controller to valves shall be included in this contract.

K. Sprinkler Heads: Provide as indicated on the plan. Heads perform to Manufacturer’s specifications concerning radius of throw and gallon at given pressure.

L. Automatic Controller: Is to be installed in the location schematically shown on drawings but identified by owner’s representative in the field. The controller location will be accessible as shown on drawing for maintenance. Provide for the possibility of making minor timing adjustments to the controller in the field.

M. Provide controller specified on drawing, fully automatic capability as well as manual operation of the system.

N. Provide controller specified on drawing which operates on a minimum of 110 volts AC power input and is capable of operation of 24-volt AC electric remote-control valves, with a reset circuit breaker to protect from overload. Contractor is responsible for connection to 100V AC power to controller.

2.3 STATIONS

A. Each station shall have a time setting knob, which can be set for variable timing in increments from 6 to 60 minutes or set to omit the station from irrigation cycle.

2.4 THE CONTROLLER

A. The irrigation system shall be as specified on the drawings.

2.5 WATER METER

A. Type approved by City where shown on drawing. Verify location with owner’s representative in the field.

B. Costs of irrigation water meter(s) shall be included in the contractors bid.

2.6 BACKFLOW PREVENTER

A. Submit Double Check Assembly Backflow Preventer cut sheets for approval. The backflow preventer is a double check valve assembly type, capable of having a flow rate of 80 gpm, with a pressure loss not to exceed 5 psi and suitable for supply up to 150 psi. The backflow preventer body to be bronze, internal parts stainless steel and check valve assemblies with tight seating rubber. The backflow preventer assembly must include two-gauge valves for isolating unit and two ball valve test clocks for testing unit to insure proper operation.

2.7 PRESSURE REGULATOR

A. Provide Wilkins #600 or equal. Install outside of the building for easy access and adjustment.

B. Mastervalve: Rainbird # electric remote control valve w/brass body and bonnet. Valve shall be wired to open and close with each circuit valve. Size based on mainline.

2.8 VALVE BOXES

A. Ametek 12” rectangular valve box with cover or jumbo mechanical box with cover and Ametec 10” round valve box with cover as indicated on drawings. Place a minimum of 6” depth of gravel under each valve box, meter, pressure regular and backflow preventer box.

2.9 SLEEVES

A. Size and type as indicated on drawings.

2.10 HOSE BIBS

A. Hose bibs shall have an all-cast brass or bronze body. Hose bibs to be ¾” inside diameter and shall be installed below grade in Ametek 12” x 18” valve boxes. The cover over hose bib boxes shall be clearly marked with “non-potable water”.

2.11 CONTROL VALVES

A. Provide Rainbird Electric Remote-Control Valve (size as indicated on Plan). Valve to conform to Manufacturer’s Specifications concerning performance and at a given pressure.

2.12 SURGE PROTECTION

A. Provide General Electric Lightning Arrestor #GL 15 CC B 007 for controllers not equipped with primary surge protection.

B. Provide secondary surge protection installed on the 24V AC valve control wiring for systems controlling 24V AC solenoid operated valves.

C. The Irrigation Contractor is responsible for determining whether the above-mentioned surge protection equipment is provided for in controller as a “built-in” unit or if it must be supplied and installed separately.

2.13 ISOLATION VALVES

A. Provide all BALL valves for isolation purposes allowing full diameter opening when in full open Position. See Contract Drawings.

B. Manually operated valves shall be same size as mainline.

2.14 AUTOMATIC DRAIN VALVES

A. Install at low point for each lateral line “Rainbird 16AP” drain valve in gravel sump 12” x 12” in size and with a minimum of 18” of cover over sump. Miscellaneous System Components: Providerisers, reducers, couplings, adapters, fittings as necessary to complete irrigation system.

PART 3 EXECUTION

3.1 SUMMARY

A. Provide a competent superintendent and necessary assistants on the job while Work is progress. The Superintendent represents Contractor in all functions, and directives given to him by Owner are binding as if given to Contractor in person.

B. During the installation Landscape Architect may make regular site visits and reject any Work and materials which do not meet the Standards called for in Contract Documents. Rejected work must be promptly corrected and no time extension will be allowed for this reason.

3.2 INSPECTION

A. Inspect project area prior to start of Work to determine that all site conditions are acceptable for irrigation Work to begin. Inform Landscape Architect of unsuitable conditions. Do not proceed with installation of irrigation system until unsatisfactory conditions have been corrected in a manner acceptable to installer.

3.3 PREPARATION

A. Flag all existing underground utilities prior to trenching and/or boring operations. Obtain utility locations from Owner and/or General Contractor and Utilize utility locating services when necessary.

3.4 EXCAVATION

A. All excavation is unclassified and includes all materials encountered.

B. Prior to excavation, remove sod, preserve, and replace after backfilling is completed.

C. After excavation and backfilling is completed, regard trenched area consistent with surrounding area and re-establish with 100 percent pure of type grass existing. Maintain as necessary for establishment and survival of grass.

D. Backfill material to be free from rock, large stones and other unsuitable substances which could damage the pipe or create unusual settling problems. Back fill in 6" layers and tamp after each layer to prevent excessive settling.

E. Backfill trenches containing plastic pipe when pipe is cool to avoid excessive contraction in cold weather. Such backfilling can be done in early morning hours or pipe may be water cooled prior to backfilling procedures.

F. Backfill material evenly in lifts not to exceed 6" and compact to 100 percent of maximum density.

G. Contractor is responsible for establishing compaction in trenches equal to or exceeding overall compaction of paving base.

H. Minimum depth of cover of all pipe is as follows:
¾" – 1" pipe – minimum depth cover is 12"
1 ½" – 1 ½" pipe – minimum depth cover is 18"

3.5 SLEEVING

A. Location of sleeving shown on plans is schematic. Sleeving installation shall make adjustments necessary to accommodate existing vegetation, utilities, and other existing conditions. Repair of damage to existing utilities, structures or other construction resulting from installation of sleeves is the responsibility of Contractor.

C. Install PVC sleeves according to detail.

3.6 PIPE JOINTS

A. Flow Manufacturer's Recommendation.

B. Solvent weld PVC pipe, assemble according to Manufacturer's Recommendations, using appropriate PVC pipe cleaner/primer and solvent cement.

C. PVC to metal connection, Work metal connection first then use Teflon pipe fitting tape on thread PVC to metal joints. Use only light wrench pressure.

D. Main line shall be installed according to Manufacturer's Recommendations.

3.7 PIPE AND FITTINGS

A. Install according to Manufacturer's Recommendations including snaking-in of PVC pipe to prevent excessive strain when contracting in cold weather. Solvent weld fittings must conform to Schedule 40 or Schedule 80 PVC dimensions and specifications for solvent weld fittings and as manufactured by Lasco, Inc.

B. Lateral lines and risers shall be as follows:

Install according to Manufacturer's Recommendations using standard techniques.

Combine lateral lines and main supply lines in common trenches wherever possible with specified minimum depth of coverage over all pipe (see Backfilling).

Install riser such that no excessive movement occurs while sprinkler head is in operation.

Height of risers to be in accordance with planned and existing plant material. Height of all risers is subject to approval of Landscape Architect. Exchange of 4" pop-up to 12" high pop-in field by Landscape Architect is incidental.

Plug lines immediately upon installation to minimize infiltration of foreign matter.

Flush lateral lines and risers prior to installation of sprinkler heads.

Above ground risers must be dark gray or black in color.

3.8 SPRINKLER HEADS

A. Low pop-up sprinkler heads shall be installed in such a manner that tip is 1" above finished grade. Where finish grade has not been established, extend a riser a minimum of 12" above existing grade to mark location of head. After finish grade is established, install heads at specified height on trip elbow swing joint, no flex pipe will be accepted.

B. High pop-up heads: High pop-up shrub heads shall have the finished height determined by Landscape Architect.

C. Backfill around sprinkler head assembly in such a manner that sprinkler head is stabilized so that no lateral motion is exhibited during operation.

D. Sprinkler Heads on Risers: Sprinkler heads on risers should be maintained on a schedule 80 PVC riser coupled by a Schedule 40 F.I.P.T. coupling (Lasco #420007) to polyethylene riser first out of lateral fitting. Height of all heads in bed areas to be determined in the field by Landscape Architect. (Riser heights may also be achieved by use of approved pvc extensions of head manufacturer)

E. Install control wire in orderly fashion, locate in main line trench. Bundle wires together and tape at 10' intervals. Position wires under main line.

F. Allow for contraction of wires by providing looped slack at directional changes in supply line.

G. Keep wire splices to a minimum. All splices shall be waterproofed by using "Rainbird Snap-tite" wire connectors. All splice locations to be indicated on "as-built drawings".

H. Pass Wires under existing or future paving, construction, etc. through PVC sleeves provided by (Irrigation Contractor/General Contractor).

I. Control Equipment: Install automatic valves and controller according to Manufacturer's Recommendations. Appropriate locations are shown on the drawings.

J. Valve Boxes: All valves are to be housed in valve boxes. Install according to Manufacturer's recommendations and according to details. Position boxes at a height that will not cause them to interfere with maintenance machinery (e.g., mowers) and such that soil and mulch do not wash into the box. Locate all valve boxes within plant bed areas wherever possible.

K. Install surge protection equipment on primary (110 VAC) power lines. Connect each surge protect unit to at least on 5/8" diameter by 9' long copper clad grounding electrode driven into the soil to its full depth. Place electrodes no closer than 2' from controller cabinet or any control or power wire. Be consistent in locating ground rods throughout installation with respect to controller position and not locations on "As-Built" Drawings.

L. Ground wire between surge protection device and grounding electrode to be single strand bare copper wire at least one size greater than wire supplying power to control unit. Route ground wire away from power and control wires where possible.

M. When it is necessary to pass through controller cabinet wall, use two #L-70 copper grounding lugs and brass bolt as noted in detailed drawings. Use #WE 5/8" ground rod clamp (single piece and bolt) to make connection between ground rod a minimum of 10". Cover the top of rod and clamp with a Toro #850-00 cover with lid at grade level.

N. Balancing and Adjusting: Balance and adjust the various components of system so that overall operation of the system is most efficient. This includes synchronization of controllers, adjustment to pressure regulators, part circle sprinkler heads and individual station adjustments on controllers. The Contractor has the right to call in the Designer or Owner's Representative to aid in balancing and adjustment of system.

3.9 OPERATIONAL TESTING

A. Upon completion of irrigation system and after head installation, test entire system for proper operation. Flush all air from system and check components for proper operation.

3.10 "AS-BUILT" DRAWINGS

A. "As-Built" Drawings are to include locations of all wire splices, valves (automatic and manual) with triangulated measurements to each location as well as any deviations in location of piping and heads as represented by Contract Documents.

B. A set of "As-Built" Drawings are to be provided by the contractor to the Architect or Landscape Architect in order to receive written substantial completion for this scope of work.

3.11 OWNER ORIENTATION

A. Upon completion of Work and final acceptance by Owner and Landscape Architect, Contractor is responsible for orientation of maintenance personnel in the operation, maintenance, and repair of system. Furnish copies of all available parts lists, trouble shooting lists and specification sheets to Owner prior to final payment.

B. Set initial watering schedules and programming on automatic controllers at the direction of Landscape Architect. Changes in schedules and programming and instructions on how to make such changes is the responsibility of Landscape Architect.

3.12 WINTERIZING THE SYSTEM

A. If Owner requires, irrigation piping must be winterized by first blowing system clear of water using compressed air (80 psi minimum) admitted into piping at a quick coupling valve or hose bib located at a higher elevation on the system piping. Activate individual zones, higher zones first, then proceed successively through the system towards lower elevations. Proceed through all zones twice. The air compressor used to winterize system must have an engine separate from compressor tanks to prevent high temperature air from being injected directly into PVC piping.

3.13 CLEAN-UP

A. During Irrigation Work, keep project site clean and orderly. Upon completion of Work, clear grounds of debris, superfluous materials, and all equipment. Remove from site to the satisfaction of Landscape Architect and Owner.

3.14 PROTECTION

A. Protect Irrigation Work and materials from damage due to irrigation operations, operations by other contractors, trades, and trespassers. Maintain protection until Date of Substantial completion.

B. Cover all openings into system as it is being installed to prevent obstructions in pipe and breakage, misuse, or disfigurement of equipment.

C. Contractor is responsible for theft of equipment and material at job site before, during and after installation, until Date of Substantial Completion of the Work in total.

3.15 INSPECTION AND ACCEPTANCE

A. Upon completion of Work, notify Landscape Architect and Owner at least three days prior to requested Date of Inspection for Substantial Completion. Prior to contacting Landscape Architect for the purpose of demonstrating all or any part of the system, thoroughly test the system for proper operation and make adjustments and replace any defective parts prior to inspection for Substantial Completion. Where inspected irrigation Work does not comply with requirements, replace rejected Work promptly, within two weeks of inspection. In unusual circumstances, a longer time period may be granted by Owner. If such replacements are not completed within time specified, Contractor may be considered to be in default of Contract and Owner may use Contract Retainage to hire other Contractors to finish the Work.

PART 4 ACCEPTANCE AND GUARANTEE

4.1 SUMMARY

A. Substantial Completion: Submit written requests for inspection for Substantial Completion to Landscape Architect at least three calendar days prior to anticipated Date of Inspection and Testing. Substantial Completion cannot be granted and at the same time no further applications for payment shall be approved for more than 85% of contract until there has first been a walk-thru for head coverage at which time a “punch list” will be written consisting of items to be addressed and corrected by Contractor immediately. Depending on the extent of the Work on the “punch list”, the Landscape Architect will determine the job to be Substantially Complete or pending the completion of the “punch list”.

B. Submit record drawings and maintenance manuals to Landscape Architect with written request for inspection.

D. Review “punch list” Work jointly with Owner and Landscape Architect for Substantial Completion of total (contract) Work. (See “General Conditions”, Article No. 9).

E. Upon satisfactory completion of repairs and replacements and completion of “As–Built” drawings, Landscape Architect and Owner will verify system for Substantial Completion and issue AIA Certificate of Substantial Completion if all items on “punch list” have been completed. If necessary, another “punch list” will be written to itemize any deficiencies still existing and will be attached to AIA Certificate. Contractor shall complete all “punch list” items, if possible, within 30 days while continuing maintenance.

4.2 DATE OF SUBSTANTIAL COMPLETION

A. Date of Substantial Completion will constitute beginning Date of One-Year Guarantee. This Date also constitutes the beginning of the warranty responsibilities and acceptance by Owner and Landscape Architect.

4.3 GUARANTEE

A. All Work, products, equipment, and materials for one year, beginning at Date of Substantial Completion as per (AIA Certificate of Substantial Completion/written letter of notification).

B. Make good any damage, loss, destruction, or failure. Repairs and replacements shall be done promptly and at no additional cost to Owner

C. Repair damage to grade, plants and other Work or property, as necessary.

D. If replacements are not acceptable during or at end of Guarantee Period, Owner may elect either subsequent replacement or credit. Replacement products shall have a similar one-year guarantee from time of replacement.

E. Guarantee applies to all unacceptable conditions or losses with exception of Master Irrigation Specifications

PART 5.0 METHOD OF MEASUREMENT

5.1 METHOD OF MEASUREMENT

A. The irrigation system shall be measured per these specifications and plans as a lump sum pay item.

PART 6.0 PAYMENT

6.1 PAYMENT

A. The Irrigation Pay Item shall be considered complete and shall include all material, equipment, labor, METERS, installation costs, overhead and profit. Bidder shall verify quantities by his own take-off from the Drawings and notify the Landscape Architect of discrepancies before submitting his Bid.

END OF SECTION 328400

SECTION 33 1100 -WATER UTILITY PIPING (SITE WORK)

1.0 GENERAL

A. This work shall consist of furnishing all labor, materials, and installation for water utility piping on the exterior of the building. See Project Plans for additional details regarding installation requirements..

2.0 CONSTRUCTION REQUIREMENTS

A. Trench Excavation: (Main Line) The pipe shall be laid in open cuts or trenches, except as hereinafter provided for, which shall be so excavated as to provide at least six inches (6") clearance between the side of the pipe and the sides of the trenches or the shoring materials. For service line excavation, width of trench for service shall in no case be greater than twelve inches (12").

B. The trench shall be so excavated that its sides will be as nearly vertical as possible. If it should appear necessary to slope the sides of the trench, such sloping shall be first approved by the Engineer and shall not unnecessarily increase the width and amount of paving or other surfacing to be replaced where such trenches are within street right-of-way.

C. The bottom of all trenches shall be carefully shaped, graded and aligned in accordance with the instructions of the Engineer and to his complete satisfaction before any pipe is placed. The trench shall be shaped or cut under and around all joints to provide adequate room for making the joint and to provide uniform and continuous contact and support throughout the entire length of each joint of pipe. Care shall be used to drain, pump, or bail out all water and to avoid loosening or working up the bottom of the trench unnecessarily by excessive tramping or otherwise.

D. The Contractor shall exercise diligence to see that the excavation is not carried below the grades established or directed by the Engineer. However, in the event this should occur, the bottom of the trench shall be filled back to grade with approved material and thoroughly compacted in a manner satisfactory to the Engineer, without extra compensation to the Contractor.

E. On each street the pipe line shall be kept at a uniform distance from the center-line of the street, in straight or easy curved lines, as directed by the Engineer.

F. Material excavated shall be deposited so as to interfere the least practicable with public traffic and convenience of adjacent residents. A berm at least two (2) feet in width shall be left along side of the trench to allow for free passage of the men engaged on the work.

G. Extreme care shall be exercised to avoid disturbance of any gas, sewer, or drain pipe, culvert, bridge, or other facility which may be encountered. Any such facility which may be molested in any way, either unavoidably, or otherwise shall be replaced in exactly the same condition as when found, without additional compensation.

H. At no time shall the excavation of trenches proceed greatly in advance of the completed pipe line nor shall excessive lengths of trench be left unfilled in the rear thereof. The Engineer shall have the right to specifically limit, as he deems advisable, the distance to which the trench may be opened. (See paragraph on "Backfilling".)

I. The trench shall, however, proceed far enough ahead of pipe laying to discover any obstruction which may cause the alignment, as deviations from a straight line, of more than one-foot in twenty-five (25) feet will not be permitted.

J. The depth of cover over the pipe shall, in general, not be less than three (3) feet at any point and the intention and effort will be to maintain this depth of cover as nearly uniform as possible. ***The Contractor shall ensure at least three (3) feet of cover exists between the proposed utility piping (main or service) and the proposed paving regardless of the depth of the existing grade. If additional items are necessary to ensure depths as stated, contractor shall include said items in the bid price.***

K. Number 12 Copper Tracer Wire shall be installed on all PVC and Ductile Iron pipe (main and services) to assist in future location of the water main. Cost of this tracer wire shall be included as part of the water main unit price. No extra allowance will be made for this wire. Detectable marking tape should also be installed on all new PVC water mains to aid in future location. The tape should be blue in color.

L. All material from the excavations shall be loaded onto trucks and hauled off site as the trench excavation is proceeding. The Contractor will not be allowed to store excavated material on site.

M. Sheeting and Bracing: The Contractor shall furnish and properly place such sheeting and bracing as may be required to support the sides of the trench, to protect the workmen and pipe or adjacent structures from possible injury. Such sheeting and bracing may be removed as the trench is backfilled or may be left in place where necessary to prevent caving or damage, but where left in place it shall not extend within one foot (1') of the surface. In no case will extra compensation be allowed for furnishing, placing or removing such sheeting and bracing. The cost of all sheeting and bracing, whether left in place or removed shall be included in the unit prices bid for installing the pipe. ***The Contractor will be solely responsible for ensuring compliance with all regulatory agencies regarding sheeting and bracing.***

N. Pipe Laying: Pipe, Specials and Fittings shall be carefully laid to the line and grade established or directed by the Engineer. Each length of pipe when placed shall have a uniform bearing for the entire length of pipe. The inside of all pipe and the outside at all joints shall be thoroughly cleaned before they are placed, and the inside of all pipes shall be kept clean and free of all obstructions and foreign matter until the work is completed and accepted.

O. Where pipe laying is stopped at the end of the day, or for any cause, the end of the pipe shall be securely closed to prevent the entrance of water, mud, or obstructions.

P. All pipe shall be carefully lowered into the trench so as not to damage the pipe or coating.

Q. Where pipes must be cut to bring valves, hydrants, or other connections to the required location, this work shall be done by the Contractor without extra compensation and in a manner satisfactory to the Engineer.

R. Setting Fittings, Valves, Hydrants, Etc.: All fittings, valves, and valve boxes, hydrants, and other appurtenances are to be set at the points indicated on the Plans, or as directed by the Engineer and omission to do so shall be corrected by the Contractor without extra cost to the Owner.

S. Hydrants shall be set on a stone or concrete base at least fifteen (15) inches square and four (4) inches thick. They shall stand erect and the proper length shall stand above the ground, extension sections being added if and as required.

T. Beneath and around each hydrant, and extending at least above the drip, shall be placed an adequate amount of bricks, rocks or coarse gravel. If the extension sections are added, the quantity of bricks, rocks or coarse gravel shall be proportionately increased. The ground shall be securely tamped up to the surface around each hydrant and smoothed over the same as for trenching.

U. Hydrants, valves and fittings (bends, tees, plugs, and caps) shall be mechanically restrained to prevent the possibility of blowing off under pressure.

V. Over each valve, a valve box shall be properly and firmly set so that its cover will be flush with the surface of the ground, or roadway, as the case may be.

W. Testing: Each section of new work (mains and service lines) shall be tested under a hydrostatic pressure of 125 lbs. per square inch. Where practical, such tests should be conducted between line valves or plugs spaced not over fifteen hundred (1500') feet apart. Such tests shall be made before backfilling at joints, except where otherwise required by necessity or public convenience. ***The duration of the test shall be twenty-four (24 hrs.) hours unless otherwise directed by the Engineer.*** All visible leaks at exposed joints, and all leaks evident on the

surface, where joints are covered, shall be eliminated, regardless of the total leakage shown by the tests. No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{S * D * P^{1/2}}{133{,}200}$$

in which L is the allowable leakage, in gallons per hour; S is the length of pipe tested, in feet; D is the nominal diameter of the pipe, in inches; and P is the average test pressure during the leakage test, in pounds per square inch gauge: (all in accordance with AWWA Standard C600-82). Lines which fail to meet tests shall be removed, if necessary or repaired and re-tested until compliance with test requirements is effected.

The Contractor shall meter the volume of water necessary to restore the pressure in the PVC main (or service line) to 125 p.s.i. and report that volume to the engineer in gallons for verification of leakage. All items necessary to meter the volume of water in gallons shall be included in the bid items.

These tests are to be made at the Contractor's expense, and he shall provide all necessary fittings and appliances therefore.

X. Backfilling: A sand material as approved by the Engineer shall be used for bedding in and around the pipe. This material shall be thoroughly tamped with such special tools as the Engineer may direct so as to form an even and compact bed. In all cases, however, the joints shall be left uncovered until the line has been tested as hereinbefore provided, unless the Engineer shall direct otherwise.

After the line has been tested and the Engineer has pronounced the joints satisfactory and all records of location of line and fittings have been recorded, the trench shall be filled around and over the joints as above provided. In areas outside of existing or proposed paving, the remainder of the trench may be backfilled with select on-site soil deemed suitable for reuse by the Engineer. In areas beneath existing or proposed paving, the remainder of the trench shall be backfilled with select fill (borrow excavation – contractor furnished) consisting of a PI between 8 and 12 with a LL not more than 25. Note that the entire trench shall be backfilled with contractor provided fill material meeting the specifications in said areas beneath existing or proposed paving. The contractor shall perform density testing at not less than one density test for each 100 feet of utility/drainage piping in areas beneath paving for each lift of earthwork/subgrade (including crushed stone). In the event that a section of utility main/drainage pipe is less than 100 feet in length, density testing shall be performed between bends/fittings and/or drainage structures. See earthwork specification for details on density requirements and testing procedures.

All surplus earth resulting from trenching or other excavation shall be removed and disposed of as directed by the Engineer as the work progresses.

After the above operations are completed, a backfilling gang shall be sent as often as necessary over the area in which work has been done under this contract, and the work areas shall be leveled up and cleared of objectionable material and rubbish; and the streets, sidewalks, gutters, crossings, driveways and other property, left in as good condition as when found by the Contractor, insofar as practicable.

Y. Cleaning and Sterilizing: Before each section of work is placed in service, it shall be thoroughly flushed out to remove any dirt or other foreign material from inside the lines; and the inside of the lines shall be sterilized by pumping into and through them a solution of such amount and such manner as to meet the requirements of the State Board of Health. As a minimum, a 50 mg/l dosage of chlorine for 24 hours will be required. Other methods of cleaning and sterilizing may be used if approved by the Engineer. Disposal of highly chlorinated water from disinfection of the water lines may require a permit from the DEQ/Office of Pollution Control. Water being collected for testing should not have a chlorine residual higher than normally maintained in the water system. No chlorine should be present as a result of disinfection.

After completion of all work in designated sections of the distribution system, at least two samples of chlorine-free water shall be taken by the certified operator of the public water system for which the connection is made or a representative of the Mississippi State Department of Health, which shall be submitted to the State Board of Health for examination to determine if the system is free from organisms of the Coli-Aerogenous group. If such samples are not negative for organisms of the Coli-Aerogenous group, the system shall be disinfected and re-disinfected in a manner meeting the requirements of the State Board of Health until the system is freed of contamination.

Z. Service Lines: All service lines shall comply with sections 1.1.E and 1.1.G. Service lines will be provided with corporation stops at the main and with curb stops at the street right-of-way line.

Service lines shall be laid to the line and grade established or directed by the Engineer, but shall in no case be less than eighteen (18") inches below the surface of the finished grade for sizes less than 2” with 2” and greater sizes a minimum of (36”) inches below the finish grade surface.

3.0 MATERIALS

A. Pipe, Fittings, and Joints:

1. Ductile Iron Pipe: All ductile iron pipe used in the work shall be manufactured in accordance with ANSI Standard A21.51 (AWWA C151, A21.52 and Federal Specifications WW-P-421d. The pipe shall be new having push-on joints conforming to ANSI A21.11 (AWWA C111) of latest revisions and manufactured for a minimum of 200 psi working pressure. ***ALL DUCTILE IRON PIPING SHALL UTILIZE FIELD LOK GASKETS (AT ALL JOINTS) AS MANUFACTURED BY US PIPE (OR APPROVED EQUAL).***
Submittals required on all field lok gaskets if other than specified. All pipe shall be furnished in 16 or 18 feet nominal laying lengths.

   All ductile iron fittings shall be new fittings conforming to ANSI A21.10 (AWWA C110). The fittings shall have push-on joints conforming to ANSI A21.11 (AWWA C111). Pipes and fittings shall be cement lined and tar coated in accordance with the requirements of ANSI A21.4 and A21.5 respectively.

2. Concrete Pressure Pipe: All concrete pressure pipe furnished under this specification shall be prestressed concrete cylinder pipe, designed and manufactured in accordance with the latest revision of "AWWA Standard C301 for Prestressed Concrete Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids" as manufactured by Price Brothers Company of Hattiesburg, Mississippi.

   The pipe shall be furnished complete with gaskets, diapers, and lubricant as required for proper installation and completion of the line. Fittings shall be as described in AWWA C301. Outlets or other connections built into prestressed pipe sections shall be suitably reinforced. Long radius curves or small angular changes in the pipeline can be formed by deflecting joints of straight pipe or by using pipe sections with one end beveled not more than 4 1/2 degrees to the axis of the pipe. Flange outlets with blind flange covers shall be furnished complete with flange gasket, nuts, and bolts. The pipe supplier shall furnish all accessories needed when restrained joints are required.

   The pipe supplier shall provide to the Engineer shop drawings of the specials and fittings and shall make available a pipe schedule indicating sequence of installation of pipe, fittings, specials, and the elevations and stationing of the line at key points such as outlets, bends, and changes in grade.

   In the case of railroad crossings, the water main installation should conform to all requirements of the railroad company. In general, the carrier pipe should have mechanical joints while the casing pipe should be steel with welded joints. Permits have been obtained by the Owner and are available for review at the Engineer's office.

3. Polyvinyl Chloride (PVC) Plastic Pipe and Fittings (Size 3” and smaller):
   a. Specifications: Plastic pipe and fittings shall be National Sanitation Foundation approved, Type I, Grade I, PVC in accordance with ASTM Specification D-1784. All pipe shall be suitable for use at hydrostatic pressures of 200 P.S.I. or greater at 73°F, and shall meet the requirements of ASTM D2241 IPS Gasket Pipe made to SDR 21 dimensions. Marking and testing shall be in accordance with above specifications.

   b. PVC fittings, adapters, flanges, etc., shall be manufactured and/or supplied by the same manufacturer as that of the pipe and shall be standard weight Schedule 40, Type I, PVC or heavier suitable for working pressures as great or greater than that of the pipe and/or accessories with which they are used. All fittings shall be furnished and assembled with rubber ring gasket bells by the pipe manufacturer. Marking and testing shall be in a similar manner to that specified for PVC pipe.

4. Polyvinyl Chloride (PVC C-900) Plastic Pipe and Fittings (Size 4” thru 12”):
   a. Specifications: PVC pipe shall meet the requirements of AWWA C-900 "Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 12 in. for Water", and shall be furnished in cast-iron pipe equivalent outside diameters with rubber-gasketed separate couplings as listed in that standard. ***All C-900 pipe shall be suitable for use at a hydrostatic pressure of at least 200 P.S.I. and shall be DR 14.***
   b. PVC fittings, adapters, flanges, etc. shall be manufactured and/or supplied by the same manufacturer as that of the pipe and shall be suitable for working pressures as great or greater than that of the pipe and/or accessories with which they are used.

5. High Density Polyethylene Pipe (HDPE) Service Line and Appurtenances (2”)

   a. Corporation stops shall be ground key type; shall be made of bronze conforming to ASTM B 61 or ASTM B 62; and shall be suitable for the working pressure of the system. Ends shall be suitable for solder-joint, flanged lead joint, or flared tube compression type joint. Threaded ends for inlet and outlet of corporation stops shall conform to AWWA C800; coupling nuts for connection to flared copper tubing shall conform to ANSI B16.26.

   b. Service line pipe shall be Polyethylene Tubing conforming to ANSI/AWWA C901; minimum working pressure rating shall be 200 psi.

   c. Curb or service stops shall be ground key, round way, inverted key type; stops shall be made of bronze conforming to ASTM B 61 or ASTM B 63 and shall be suitable for the working pressure of the system. Ends shall be as appropriate for connection to the service piping. Arrow shall be cast into body of the curb or service stop indicating direction of flow.

d. Tapping valves shall be of the O-ring construction, Mueller H-667 or approved equal, and tapping sleeves shall be Mueller H-615 and H-612 (PVC Taps) or approved equal.

5. Payment:
   a. Pipe: Payment for all pvc water mains (domestic, fire protection, irrigation, etc.) including all necessary fittings, valves, etc. shall be included in the contract lump sum price.

B. Gate Valves and Boxes:
   1. Specifications: All gate valves shall be of cast iron body, bronze or brass mounted, double-disc, parallel seat type made strictly in accordance with the specifications of the American Water Works Association C500 (200 lbs. working pressure, 350 lbs. hydrostatic test). Valves furnished shall be AWWA Gate Valves, as manufactured by Mueller Company or approved equal. Valve boxes shall be either two-piece or three-piece, sliding type, cast iron valve boxes with plug type lids marked "WATER". The bell end of the lower section of all valve boxes shall be of sufficiently large diameter to fit over the stuffing box of the valve with which it is to be installed. Valve box shall be as manufactured by Mueller Company or approved equal and shall be suitable for use with valves installed on water lines having a nominal thirty-six (36") inch depth of cover over the pipe but capable of adjustment to such additional depth as conditions may require.
   2. Payment: Payment for all valves and boxes shall be included in the lump sum bid price.

C. Mechanical Restraints:
   1. Mechanical restraint devices shall be used at pipe joints near bends, tees, wyes and valves. Such devices must conform to manufacturer's recommendations for the type of pipe, fittings, and valve materials used.
   2. Restraint devices for mechanical joint fittings and appurtenances conforming to either ANSI/AWWA C111/A21.11 or ANSI/AWWA C153/A21.53, shall conform to the following:

C.2.A Design
a. Restraint devices for nominal pipe sizes 3 inch through 48 inch shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10.
b. The devices shall have a working pressure rating of 350 psi for 3-16 inch and 250 psi for 18-48 inch. Ratings are for water pressure and must include a minimum safety factor of 2 to 1 in all sizes.

C.2.B Material

a. Gland body, wedges and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536.
b. Ductile iron gripping wedges shall be heat treated within a range of 370 to 470 BHN.
c. Three (3) test bars shall be incrementally poured per production shift as per Underwriter's Laboratory (U.L.) specifications and ASTM A536. Testing for tensile, yield and elongation shall be done in accordance with ASTM E8.
d. Chemical and nodularity tests shall be performed as recommended by the Ductile Iron Society, on a per ladle basis.

C.2.C Traceability

a. An identification number consisting of year, day, plant and shift (YYDDD)(plant designation)(Shift number), shall be cast into each gland body.
b. All physical and chemical test results shall be recorded such that they can be accessed via the identification number on the casting. These Material Traceability Records (MTR's) are to be made available, in hard copy, to the purchaser that requests such documentation and submits his gland body identification number.
c. Production pieces that are too small to accommodate individual numbering, such as fasteners and wedges, shall be controlled in segregate inventory until such time as all quality control tests are passed. These component parts may then be released to a general inventory for final assembly and packaging.
d. All components shall be manufactured and assembled in the United States. The purchaser shall, with reasonable notice, have the right to plant visitation at his/her expense.

C.2.D Installation

a. Mechanical joint restraint shall require conventional tools and installation procedures per AWWA C600, while retaining full mechanical joint deflection during assembly as well as allowing joint deflection after assembly.
b. Proper actuation of the gripping wedges shall be ensured with torque limiting twist off nuts.

C.2.E Approvals

a. Restraint devices shall be Listed by Underwriters Laboratories (3" through 24" inch size) and Approved by Factory Mutual (3" through 12" inch size).
b. Mechanical joint restraint shall be Megalug Series 1100 produced by EBAA Iron Inc. or approved equal.

C.2.F Coating System

a. Coating for restraint devices shall consist of the following:
b. All wedge assemblies and related parts shall be processed through a phosphate wash, rinse and drying operation prior to coating application. The coating shall consist of a minimum of two coats of liquid thermoset epoxy coating with heat cure to follow each coat.
c. All casting bodies shall be surface pretreated with a phosphate wash, rinse and sealer before drying. The coating shall be electrostatically applied and heat cured. The coating shall be a polyester based powder to provide corrosion, impact and UV resistance.
d. The coating system shall be MEGA-BOND by EBAA Iron, Inc. or approved equal. Requests for approved equal must submit coating material and process details for review prior to bid.

4.0 SEPARATION OF WATER AND SEWER MAINS

A. Horizontal Separation: Water main shall be laid at least 10 feet, horizontally, from any existing sewer main (or service line). Should local conditions prevent a lateral separation of 10 feet, the water main may be laid closer than 10 feet to the sewer main if it is laid in a separate trench.

B. Vertical Separation: A minimum of 18 inches shall be maintained below the bottom of the water main and the top of the sewer. The water main shall be constructed with push-on or mechanical joint ductile iron pipe or prestressed concrete cylinder pipe for a distance of 10 feet on each side of the sewer. One full length of water main shall be centered over the sewer so that both joints will be as far from the sewer as possible.

END OF SECTION 33 1100

SECTION 33 4000 - STORM DRAINAGE UTILITIES

PART 1 - GENERAL

RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification sections, apply to work of this section.

DESCRIPTION OF WORK:

A. Extent of sewer collection system work is shown on drawings.

B. Sewer collection system work includes, but is not limited to, the following:

1. Storm sewer conduits.
2. Catch basins, frames and gratings.
3. Junction Boxes
4. Curb Inlets and Covers

C. Excavation and backfilling for storm sewer collection system is specified in "Section 31 0000 – Site Earthwork".

D. Comply with the requirements of applicable sections for excavation and backfilling required in connection with storm sewer collection system work.

E. Refer to applicable Division 32 sections for concrete work related to storm sewer collection systems.

PART 2 - PRODUCTS

CONDUIT MATERIALS:

A. General: Furnish ells, tees, reducing tees, wyes, couplings, increasers, crosses, transitions and end caps of same type and class of material as conduit, or of material having equal or superior physical and chemical properties as acceptable to the Engineer.

B. Reinforced Concrete Pipe: ANSI/ASTM C 76, with modified tongue-and-groove compression gasket joints complying with ANSI/ASTM C 443.

C. High Density Polyethylene (HDPE): Material in accordance with ASTM F 405 or ASTM F 667. "High density polyethylene pipe shall be **SMOOTH LINED** and meet the requirements of AASHTO M294 Type S.

D. High-Performance Polypropylene (HP): Material in accordance with ASTM F2881 or ASTM M330. HP pipe shall be **SMOOTH LINED**

D. Corrugated Poly Vinyl Chloride (CPVC):

PIPE: PVC corrugated pipe with a **SMOOTH INTERIOR** shall conform to the requirements of ASTM Designation F 949 (latest revision). The pipe and fittings shall be homogeneous throughout and free from visible crack, holes, foreign inclusions or other injurious defects. Minimum pipe stiffness when measured in accordance with ASTM Test Method D 2412 shall be 46 psi. The pipe shall be made of PVC compound having a minimum cell classification of 12454 as defined in ASTM Specification D 1784.

FITTINGS: All fittings for PVC corrugated sewer pipe with a smooth interior shall conform to ASTM F 949 (latest revision) Section 5.2.3. To insure compatibility, the pipe manufacturer shall provide all fittings.

JOINTS:
All joints shall be made with integrally formed bell and spigot gasketed connections. All gaskets shall be a single gasket that has two sealing surfaces and indexes two corrugation valleys to ensure water tightness and prevent rolling during installation. Manufacturer shall provide documentation showing no leakage when gasketed pipe joints are tested in accordance with ASTM Test Method D3212. Elastomeric seals (gaskets) shall meet the requirements of ASTM Designation F477.

INSTALLATION:
PVC corrugated pipe shall be installed in strict accordance with ASTM D2321. Class I material shall be used in the bedding, haunch zone and initial backfill zone to an elevation 6” over the top of the pipe.

MANUFACTURER:
All CPVC pipe shall be manufactured by Contech Construction Products Inc. or approved equal.

METAL ACCESSORIES:

A. Catch Basin Frames and Gratings: Grey cast iron, heavy-duty.
B. Curb Inlet Manhole Covers: Grey cast iron, heavy-duty.

PART 3 - EXECUTION

INSTALLATION OF CONDUIT:

A. General: Install conduit in accordance with governing authorities having jurisdiction, except where more stringent requirements are indicated. Inspect conduit before installation to detect apparent defects. Mark defective materials with white paint and promptly remove from site. Lay conduit beginning at low point of a system, true to grades and alignment indicated with unbroken continuity of invert. Place groove end of concrete conduit facing upstream. Install bituminous plastic cement in accordance with manufacturer's recommendations.

B. Concrete Pipe: Install in accordance with applicable provisions of American Concrete Pipe Association "Concrete Pipe Field Manual", unless otherwise indicated.

C. Cleaning Conduit: Clear interior of conduit of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed.

1. Place plugs in ends of uncompleted conduit at end of day, or whenever work stops.

2. Flush lines between catch basins if required to remove collected debris.

D. Joint Adapters: Make joints between cast iron pipe and other types of pipe with standard manufactured cast iron adapters and fittings.

E. Roof Drain Connections: Contractor shall utilize adapters as necessary to connect the proposed building drains to the proposed site piping (including CPVC and HDPE) as shown on the construction plans.

F. Closing Abandoned Utilities: Close open ends of abandoned underground utilities which are indicated to remain in place. Provide sufficiently strong closures to withstand hydro-static or earth pressure which may result after ends of abandoned utilities have been closed.

G. Interior Inspection: Inspect conduit to determine whether line displacement or other damage has occurred.

1. Make inspections after lines between manholes, or manhole locations have been installed and approximately two feet of backfill is in place and at completion of project.

2. If inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects, correct such defects to satisfaction of Engineer.

UNDERGROUND STRUCTURES:

A. Catch Basins, Junction Boxes, Curb Inlets: Construct concrete catch basins to the sizes and shapes indicated. ***Precast catch basins, junction boxes, curb inlets, etc. are acceptable; however, all precast drainage structures shall utilize cast in place tops. No precast tops will be allowed.***

1. Use concrete which will attain a 28-day compressive strength of not less than 3500 psi.

2. Set cast iron frames and gratings to elevations indicated.

TAP CONNECTIONS:

A. Make connections to existing conduits and underground structures, so that finished work will conform as nearly as practicable to requirements specified for new work.

B. Use commercially manufactured wyes for branch connections. Field cutting into conduit will not be permitted unless authorized by the Engineer. Spring wyes into existing line and encase entire wye, plus 6" overlap, with not less than 6" of 3,000 psi 28-day compressive strength concrete.

C. Branch connections made from side into existing 12" to 21" conduit shall have a wye sprung into the existing line, and entire wye encased with not less than 6" of 3000 psi 28-day compressive strength concrete.

BACKFILLING:

A. General: Conduct backfill operations of open-cut trenches closely following laying, jointing and bedding of pipe, and after initial inspection and testing are completed.

END OF SECTION 33 4000