

GONZALES MIDDLE RENOVATIONS & UPGRADES

FOR THE

**ASCENSION PARISH
SCHOOL BOARD**

GHC PROJECT NO.: 2408



**GOSSEN
HOLLOWAY
CORTEZ**

A Professional Architectural Corporation

Design Development:

These documents are issued for design development purposes only and are not intended, nor shall they be used, for construction. They are provided exclusively to assist the Construction Manager in developing pricing and cost evaluations on behalf of the Owner at this stage of the project.

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UPGRADES
FOR THE
ASCENSION PARISH SCHOOL BOARD**

ARCHITECT'S PROJECT NO. 2408

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MARCH 13, 2025

ARCHITECT

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Standard Specifications
for
Subdivision Waterline Construction

Consolidated Waterworks District No. 1
Terrebonne Parish, Louisiana

October 1, 2004

DIVISION I

GENERAL CONDITIONS

1.1.0 GENERAL:

1.1.1 It is the intention of these specifications to provide standards for the construction of a water distribution system within Development/Subdivision within Terrebonne Parish, Louisiana.

1.1.2 Where ever a standard specification is referred to, it is intended that the latest revision effective as of the date of plan approval shall apply.

1.1.3 The PROJECT ENGINEER shall consult with the DISTRICT for standards or materials not covered by these specifications.

1.1.4 For purposes of these specifications the following definitions shall apply:

1.1.4.1 Consolidated Waterworks District No. 1 (District): The political subdivision created by a resolution of the Terrebonne Parish Consolidated Government adopted on March 23, 1994 and governed by its Board of Commissioners, and commencing operations on July 1, 1994.

1.1.4.2 Contractor: Any person, group or corporation acting as a unit or an agent thereof, licensed as required by the State of Louisiana, engaging in the construction of a water transmission system to be connected to the public water supply of the District.

1.1.4.3 Owner: The subdivider or developer.

1.1.4.4 Project Engineer: An Engineer, registered in the State of Louisiana, retained by the sub-divider/developer to design and administer the construction of improvements in a subdivision/commercial development.

1.1.4.5 Project Representative: The PROJECT ENGINEER'S representative at the construction site.

1.2.0 PRODUCTS INFORMATION:

1.2.1 Manufacturer's warranty for all material and products to be furnished by the CONTRACTOR and to be incorporated into the completed work shall be furnished to the DISTRICT through the PROJECT ENGINEER.

1.2.2 The manufacturer of all material and products shall furnish complete information as to any special conditions or restrictions to be applied in the use of these items. Should

the manner or method of installation, specified performance or test results as set forth in these specifications be contrary to the manufacturer's recommendations for use of the project, the manufacturer shall at once notify the PROJECT ENGINEER who shall forward same to the DISTRICT for appropriate action. Lack of such notification shall be certification by the CONTRACTOR that specification requirements will be met by the material and products under project conditions.

1.2.3 Data submitted on all material shall include complete maintenance instructions and parts list in sufficient detail to facilitate ordering replacements.

1.2.4 Manufacturer's installation guide shall be followed during construction of pipelines. Before construction begins, three (3) copies of the installation guide shall be submitted to the DISTRICT. One copy bearing the DISTRICT'S approval shall be at the job site of installation and the instructions carried out by the foreman in charge of the crew.

1.3.0 SPECIAL CONSTRUCTION:

1.3.1 Special construction projects, such as submarine crossings, pile crossings, bulkheads, roadway crossings, etc. shall be submitted to the DISTRICT for approval prior to construction.

1.4.0 CHANGES IN PLANS:

1.4.1 Should it be necessary to change the location or elevation of the waterline or any other detail as shown in the drawings after receiving DISTRICT approval, then such change shall be brought to the DISTRICT for approval prior to making the change in the construction.

1.4.2 All change in construction from that shown in the approved drawings shall be shown on the record drawings submitted for the final approval.

1.5.0 RECORD DRAWINGS:

1.5.1 One (1) copy of the test reports, manufacturer's submittals, record drawings and one (1) computer disk of the record drawings, shall be submitted with the PROJECT ENGINEER'S letter requesting final approval and acceptance of the waterline project. Record drawings shall indicate the location and GPS coordinates on the waterline at reasonable intervals and on all valves, hydrants and fittings greater than 45 degrees. The depth at all conflicting utility or ditch crossings shall also be shown.

1.6.0 STORAGE OF MATERIALS:

1.6.1 Materials shall be stored so as to insure the preservation of their quality and fitness for the work, and in such a manner that leaves the material accessible for inspection by the DISTRICT.

DIVISION II

WATER PIPELINE MATERIAL

2.1.0 GENERAL:

2.1.1 Waterline material, as indicated on the plans, shall be Polyvinyl Chloride, bell and spigot type with single rubber gasket seals of the push-on type, or butt fused polyethylene pipe.

2.1.2 All pipe shall be in first class condition at the time it is installed in the work.

2.1.3 All pipe shall be designed for a minimum working pressure of 150 psi, plus a surge pressure of 100 psi and an overall minimum safety factor of 2.5. Design laying conditions shall be Class B, WPCF Manual of Practice No. 9 (Page 212) for a maximum cover as indicated on the plans. Design factors for pipe shall be furnished to the PROJECT ENGINEER.

2.2.0 POLYVINYL CHLORIDE PRESSURE PIPE:

2.2.1 All pipe 12-inches and smaller for the distribution system shall meet or exceed the requirements of ASTM D-1784, "Standard Specifications for Rigid Poly (Vinyl Chloride) compounds; and AWWA Specifications C-900, pressure rating class 150, SDR 18 with design factors as given in paragraph 1(c) herein. Pipe shall be Type I, Grade 1 (12454B) with a hydrostatic design stress of 2000 psi, designated as PVC 1120 or equivalent.

2.2.2 All plastic pipe shall have outside diameters equivalent to the OD of cast iron pipe.

2.2.3 Wall thickness and outside diameter subject to tolerance allowed in AWWA C-900 shall be as shown on the following table:

<u>Nominal Size</u>	<u>Average</u>	<u>OD Tolerance</u>	<u>Wall Minimum</u>	<u>Thickness Tolerance</u>
4" 4.80"	+0.009	0.267	+0.032	
6" 6.90"	+0.011	0.383	+0.046	
8" 9.05"	+0.015	0.503	+0.060	
12" 13.20"	+0.015	0.733	+0.088	

2.2.4 Polyvinyl chloride pipe shall be furnished in 20 foot lengths.

2.2.5 Rubber ring gaskets shall conform to ASTM D-1869. Couplings and gaskets shall provide automatic end separation without auxiliary spacing devices.

2.3.0 POLYETHYLENE (PE) PIPE:

2.3.1 All PE pipe and fittings shall be made from virgin resins exhibiting a cell classification of PE 345464C as defined in ASTM D3350 with an established hydrostatic-design-basis (HDB) rating of 1,600 psi at 73°F for water. All PE pipe and fittings shall be manufactured in accordance with AWWA C-906. The pipe shall be Series 4000, pressure Class 160, SDR11, unless specifically stated otherwise. The material shall be listed and approved for potable water in accordance with NSF Standard 61. All PE pipe shall have outside diameters (OD) equivalent to the OD of cast iron pipe.

2.3.2 Pipe joints shall be joined by means of zero leak-rate heat fusion or electrofusion method and shall be installed in strict accordance within the pipe manufacturer's recommendations.

2.4.0 DUCTILE IRON PIPE:

2.4.1 Pipe shall be designed in accordance with ANSI Specifications ANSI/AWWA C150/A21.50, "American National Standard for the Thickness Design of Ductile Iron Pipe". Pipe shall be designed for a working pressure of 150 psi and a minimum surge allowance of 100 psi, trench conditions Type 2, with width of d+2 feet and depth of cover 3 to 8 feet with overall minimum safety factor of 2.5.

2.4.2 Pipe shall be manufactured in accordance with AWWA Specifications ANSI/AWWA C151/A21.51 with minimum wall thickness subject to tolerance allowance allowed in said specification under Class 51 for pipe size indicated.

2.5.0 CAST IRON AND DUCTILE IRON FITTINGS:

2.5.1 Fittings shall be furnished in accordance with ANSI/AWWA C-110-A21.10 or C153-A21.53. Joints shall be of the type called for on the plans and shall be push-on or mechanical joints conforming to ANSI/AWWA C-111-A21.11. Consideration will be given to alternate joint configuration; however, such alternate shall receive approval of the DISTRICT prior to installation.

2.5.2 Fittings 12 inches and smaller shall be rated for 250 psi water working pressure.

2.6.0 LINING AND COATING OF FITTINGS:

2.6.1 All cast iron and ductile iron fittings shall have an inside cement mortar lining conforming with Specification for Cement Lining for Cast Iron Pipe and Fittings ANSI/AWWA C104-A21.4 or manufacturer's standard specifications for seal coated "enameline" type cement lining or equal. Outside coating shall conform with ASA Specifications for Coal-Tar Dip Coating for Cast Iron Pipe and Fittings (A21.5; A21.10), latest revision. Thickness shall be standard thickness.

2.7.0 DUCTILE IRON FITTINGS - SPECIAL COATINGS:

2.7.1 Ductile iron fittings may be lined and coated, in and out, with an approved aminecured epoxy resin. This epoxy resin is molecularly bonded to the metal assuring permanents without flaking and shall be of 12 mil thickness. This lining and coating shall be done by the manufacturer in order to insure uniformity.

2.8.0 P.E. FITTINGS:

2.8.1 Molded fittings shall be manufactured and tested in accordance with ASTM D 3261 and shall be so marked. Molded fittings shall be tested in accordance with AWWA C906.

2.8.2 Fabricated fittings shall be made by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock or molded fittings. Fittings shall be molded or fabricated of the same material and manufacturer as the pipe; and in no case shall have thinner walls than those of the pipe furnished. All custom fabricated fittings shall be pressure rated for the same internal pressure rating as the mating pipe. Fittings shall be of butt fusing design and shall be produced by the same manufacturer as the pipe being bid. Fabricated fittings shall be tested in accordance with AWWA C906.

2.8.3 If required, a sample of each type fitting shall be submitted for the PROJECT ENGINEER'S approval, and his approval must be obtained before purchase of the fittings.

2.9.0 ACCESSORIES:

2.9.1 The supplier of cast iron or ductile iron fittings shall furnish all glands and gaskets as recommended by the manufacturer and approved by the DISTRICT. All bolts and nuts shall be Corten, Teflon coated Corten or stainless steel. No direct payment will be made on these items; the cost of same to be included in weight paid for the fitting.

2.9.2 All tie rods shall be 316 stainless steel. When required, tie rods shall be used to secure all bends, ends of pipe, caps, plugs, etc. and all places where thrusting may produce "blow outs". These tie rods will be used in conjunction with properly sized bands which will attach circumferentially to the pipe. Hot-dipped galvanized bands shall be coated with an approved bitumastic coating before and after installation.

2.9.3 Adapters between PE pipe and flange fittings shall be made with a Harvey adapter or approved equal.

2.10.0 JOINTS:

2.10.1 Joints of the push-on type shall conform to ASTM Specifications C-111-ASA A21.11.

2.10.2 Mechanical joints shall be in accordance with ASA Specifications A21.11 with Corten, Teflon coated Corten or stainless steel bolts.

2.10.3 Joints of the restrained type shall be U.S. Pipe's TR FLEX restrained joint pipe, American's LOK-RING restrained joint, or CLOW'S Super-Lock joint pipe, or an approved equal.

2.10.4 Retainer glands, when allowed, for ductile iron pipe and PVC pipe 12-inches and smaller shall be EBAA, or NAAPCO glands with stainless steel set screws or approved equal.

2.11.0 FLANGED FITTINGS AND SPECIALS:

2.11.1 Flanged fittings shall conform in dimensions, methods of manufacture and tests to the "Standard Specifications for Cast Iron Pipe and Fittings", as adopted by ANSI Class 125.

2.11.2 All flanges and fittings shall conform in weight, thickness and drilling to the "Standard Specifications for Class 125 Cast Iron Flanges and Flanged Fittings", as adopted by ANSI. All flanges shall be faced and drilled, unless special drilling is required as detailed or specified on the plans. All drilling shall conform to the ANSI standards. Where cap screws or stud bolts are required by the plans or specifications, flanges shall be provided with tapped holes for such cap screws or stud bolts.

2.12.0 TAPPING SLEEVES:

2.12.1 Tapping sleeves shall be the stainless steel sleeve type. The body shall be a full circle band that meet or exceeds the Waterworks Specifications for repair clamps, stainless steel 18-8 type 304 with gridded overlapping virgin neoprene rubber gasket. The flange shall be 304 (18-8) stainless steel or ductile iron AWWA C207 Class D ANSI 150 lb. drilling recessed to accept a standard tapping valve. Taping sleeves shall be Rockwell 662 or approved equal.

2.12.2 Tapping sleeve valves shall be similar to the valves specified in Division IV.

2.12.3 All bolts and nuts shall be Corten, Teflon coated Corten or stainless steel.

2.13.0 TESTS AND INSPECTIONS:

2.13.1 All pipe and fittings shall be inspected and tested at manufacturer's plant during manufacture in accordance with manufacturer's standard test procedures at the manufacturer's expense.

2.13.2 For ductile iron fittings, chemical analysis shall be furnished indicating the use of 80-06-03 metal in accordance with ASTM Specifications A339.

2.13.3 For polyvinyl chloride (PVC) pipe, all pipe and couplings shipped must be accompanied by the manufacturer's certificates of test and conformity to applicable ASTM and AWWA Specifications.

2.13.4 Testing of PE pipe and fittings supplied under this specification shall be in accordance with ASTM D-3350.

2.13.5 A letter shall be submitted to the PROJECT ENGINEER by the PE material manufacturer certifying that materials to be furnished meets or exceeds the requirements of AWWA C-906.

2.13.6 The test reports shall be submitted by the PROJECT ENGINEER to the DISTRICT with the request for final acceptance. These test reports shall certify that material furnished under this contract is in compliance with these specifications.

2.13.7 For polyvinyl chloride pipe, quality control shall randomly select pipe to check SDR requirements. This shall be done by cutting the pipe and measuring the actual wall thickness by the use of a micrometer. Result of check shall be submitted to the Project Representative.

DIVISION III

WATER MAIN CONSTRUCTION AND INSTALLATION

3.1.0 GENERAL:

- 3.1.1 The construction of water lines includes the furnishing of all material in accordance with these specifications and all labor and equipment required for the installation of pipe, fittings, valves, road crossings, canal crossings, stream crossings, ditch crossings, and all incidental work required for completion of the water line system.
- 3.1.2 The installation of waterlines shall be in accordance with the manufacturer's pipe handbook and instructions.

3.2.0 DELIVERY OF MATERIAL:

- 3.2.1 Pipe shall be strung along the line of work in a manner that will not cause it to be a hazard to the public, block traffic or access to property, nor shall it be placed in a drainage ditch.
- 3.2.2 Protective coated fittings shall be received, stored and transported to a point of installation in a manner that will adequately protect the coating. Damaged coating will be cause for rejection of the fittings.
- 3.2.3 All pipe shall be removed from the transporting vehicle in a manner recommended by the manufacturer. Pipe removed from the vehicle in a manner not acceptable by the DISTRICT and/or manufacturer will be rejected.

3.3.0 CARE OF WORK AND MATERIAL:

- 3.3.1 The CONTRACTOR shall at all times handle, transport and install all material with the degree of care required to assure that these materials are in first class condition when installed.

3.4.0 INSPECTION OF MATERIALS:

- 3.4.1 The CONTRACTOR'S quality control representative shall inspect all materials before they are installed in the work, and shall ascertain that satisfactory test reports have been submitted to the PROJECT ENGINEER covering materials inspected. All material found to be defective shall be immediately removed from the work.
- 3.4.2 Should hidden or unobserved defects be discovered by the PROJECT ENGINEER after the material is in place or show up during testing, the

CONTRACTOR shall be required to remove the defective material and replace it with satisfactory material. The CONTRACTOR shall be solely responsible for the quality of the material he supplies for installation in the work and shall have the full responsibility of obtaining material meeting the requirements of these specifications.

3.5.0 DEPTH OF LINES:

3.5.1 All water mains shall be laid to line and grade as shown on the plans. In general, a minimum cover of thirty (30") inches and a maximum cover of forty-two (42") inches shall be required from the finished ground surface.

3.5.2 The alignment and/or grade may be altered by the PROJECT ENGINEER or his representative as required because of interference with other pipes or structures and to get below ditch bottoms. In general, a minimum of two (2') foot cover is required in a ditch, or canal crossings and a one (1') foot clearance is required below pipeline crossings. These alterations are within the scope of the contract and shall be provided at no extra cost to the OWNER. In the event of a major alteration resulting in a change in contract price, a change order will be issued prior to the execution of the construction work.

3.6.0 EXCAVATION:

3.6.1 Excavation shall be open cut with vertical sides unless in special cases the PROJECT ENGINEER shall permit sloping sides. The CONTRACTOR shall leave a berm on each side of trench to allow free passage and full working space for the PROJECT ENGINEER or his PROJECT REPRESENTATIVE.

3.6.2 The PROJECT ENGINEER shall have authority at any time to require the CONTRACTOR to discontinue use of any excavating machine or other appliance which in his judgement is not adapted to the situation in which it is being used. He may require last 4 inches in depth of excavation to be done by hand or by such machine as is acceptable to him and may forbid the use of such methods of excavation as seem likely to disturb the subgrade.

3.6.3 The CONTRACTOR shall confine his excavation to the least width that will allow the easy installation of the water main and its appurtenances; this width is here declared to be the distance between parallel vertical planes twelve (12") inches from each side of the outside of the barrel of the pipe unless the PROJECT ENGINEER shall specifically allow a greater or lessor width.

3.6.4 In case excavation is carried below grade as established by the PROJECT ENGINEER, the CONTRACTOR shall fill the bottom of excavation up to grade with suitable material and in a manner acceptable to the PROJECT ENGINEER without compensation for either the excavation or the refilling.

3.6.5 No greater length of trench shall be opened in advance of an installed, but not backfilled water main, than shall seem proper to the PROJECT ENGINEER, who will be guided by the circumstances in each case. The PROJECT ENGINEER, will at the request of the CONTRACTOR lay down a general rule to be followed but the right is reserved to the PROJECT ENGINEER to change this rule at his discretion.

3.6.6 If any stumps, roots, logs or other obstructions are encountered within the bounds of the trench, the obstruction shall be cut out to 6 inches below level of established bottom of the trench. The excess depth shall then be backfilled with good earth or aggregate, well tamped, in two layers.

3.6.7 Where there are large trees along the line of the work, large roots of these trees shall not be cut without authorization from the PROJECT ENGINEER. Wherever practicable trench shall be tunneled under such roots, which may require hand digging.

3.6.8 Excavation and piling of excavated material on lawns shall be done so as to cause the minimum of damage to shrubs and flower beds on lawns. Any damage that may result to shrubs and flower beds shall be the responsibility of the CONTRACTOR at no extra cost to OWNER.

3.6.9 Whenever pipe laying is stopped for the night, or for any other reason, the end of the pipe and openings on specials shall be closely secured with a cap or plug or otherwise to prevent the entrance of water, mud, insects, small animals or other obstructions. Unused openings shall be permanently plugged.

3.7.0 SHEATHING AND BRACING:

3.7.1 The CONTRACTOR must protect the sides of his trench by such shoring or bracing as may be necessary. He will be held fully responsible for all damage to property, pavement or underground structures, that may be caused by settlement or caving of the banks of the trench. No payment will be made for any shoring or bracing as such; its cost must be included in the price bid for laying water mains of such size. Sheathing Left-In-Place shall be done only after consulting with the PROJECT ENGINEER or his PROJECT REPRESENTATIVE.

3.8.0 FOUNDATION AND BEDDING:

3.8.1 Under average conditions, the soil at the bottom of the trench will be found to make a satisfactory foundation for the pipe. The bottom of the trench shall be leveled and pipe laid thereon. Bell holes shall be dug of sufficient size to let the whole length of the pipe barrel to be bedded as required and to allow proper assembling of joints.

3.8.2 When bottom of trench is not satisfactory for foundation, excavation shall be carried below level of established bottom of trench to a solid strata and backfilled to pipe grade with granular backfill material. Such extra excavation and backfill will be paid for at the unit price bid per cubic yard of granular backfill material.

3.9.0 LAYING POLYVINYL-CHLORIDE (PVC) PIPE OR POLYETHYLENE PIPE:

3.9.1 Trench width shall not exceed three (3') feet. The bottom of the trench shall be level to provide a uniform bedding for the pipe. Excavate underneath pipe ends to allow pipe to rest firmly on trench foundation. Provide pumps as necessary to dewater the trench and keep the pipe essentially dry until initial backfilling has been accomplished.

3.9.2 Suitable tools and appliances for the safe and convenient handling and laying of the pipe shall be used.

3.9.3 All pipe shall be carefully examined for defects and may be subjected to extra tests as the PROJECT ENGINEER may deem necessary. If any defective pipe or specials should be discovered after having been laid, it shall be removed and replaced with a sound pipe or special without extra charge for the work or removing and replacing.

3.9.4 Caps, plugs and bends for C900 pipe shall be anchored by means of retainer glands, timber thrust block or tie rods and clamps in accordance with the details shown on the plans or other methods recommended by the manufacturer of the pipe.

3.9.5 Whenever pipe laying is stopped for the night, or for any other reason, the end of the pipe and openings on specials shall be closely secured with a cap or plug or otherwise to prevent the entrance of water, mud, insects, small animals or other obstructions. Unused openings shall be permanently plugged.

3.9.6 A blue, 4 mil, low density polyethylene tape as manufactured by New Source, Inc., Waterloo, Wisconsin, or approved equal shall be installed directly over the top center of the pipe approximately 12-inches above the pipe surface. Careful backfilling shall be required to retain tape in place during backfilling operations.

3.9.7 Tracer wire shall be a single No. 10 AWG, blue coated stranded conductor wire with UL approval direct burial insulation and shall be placed directly on top and center of the water main and service pipe. The tracer wire shall be taped to water pipe at 10-foot intervals.

3.9.8 Each mechanical joint, flanged joint, fitting, valves, restraining rods and bands shall be wrapped with a 6 mil thick polyethylene plastic wrap.

3.10.0 LAYING DUCTILE IRON WATERLINE:

3.10.1 All cast iron and ductile iron waterlines shall be protected by means of an 8 mil thickness polyethylene tube. Tubing shall be furnished and installed with the recommendation of the Cast Iron Pipe Research Association.

3.11.0 CONNECTIONS TO EXISTING WATER MAINS:

3.11.1 Work includes connections to existing water mains. Cutting-in operations shall be planned to cause a minimum of inconvenience to customers on existing mains and shall be done under the rules and regulations of the DISTRICT.

3.11.2 The CONTRACTOR shall not open or close any valve in an existing distribution system nor shall he open or close any valve set under this contract after a line has been placed in service, unless the DISTRICT has authorized him to do so.

3.11.3 Procedure for disinfecting at cut-in points shall be reviewed and approved by the DISTRICT.

3.12.0 THRUST RESISTORS:

3.12.1 All water mains, valves and fittings shall be blocked and/or restrained to resist thrust in conjunction with retainer glands in accordance with the manufacturer's recommendations for the individual pipe used. The cost of all labor and material required for thrust resistors shall be included in the unit price bid per foot for the water mains and fittings complete in place. Any timber used in connection with thrust blocks shall have wood preservative (pressure treatment) per AWDA Treatment C1 using water-borne ACA or CCA preservative with 0.25 percent retention.

3.12.2 Prior to backfilling, the PROJECT ENGINEER shall inspect all blocking techniques to ensure conformance with manufacturer's recommendations.

3.13.0 PLUGS:

3.13.1 All fittings and discontinuous pipes shall be capped with a suitable MJ plug or cap and properly blocked. PE pipe shall have a fused cap.

3.13.2 All plugs shall be paid for by the pound as fittings unless otherwise shown on the plans. All plugs shall include thrust resistors.

3.14.0 BACKFILLING:

3.14.1 Backfill shall be thoroughly but carefully compacted, under and around the pipe to the spring line. Selected backfilled free of rocks or jagged material shall be carefully compacted over the top of the pipe for a depth of one (1) foot.

3.14.2 Remainder of backfilling shall be completed by filling the trench with earth firmly packed by tamping, rolling or other method approved by the PROJECT ENGINEER, so as to secure as compact a trench as possible.

3.14.3 Backfilling of trench across driveways and streets shall not be delayed pending line tests, but shall be completed immediately after line is placed. If necessary to locate leaks, joints located under this backfill shall be exposed for testing.

3.14.4 All excess excavation shall either remain the property of the OWNER and be placed and rough spread on the adjacent property, or shall become the property of the CONTRACTOR and be hauled away from the site, as directed by the PROJECT ENGINEER.

3.15.0 SAMPLING TAPS:

3.15.1 Sampling taps shall be installed at locations along the water main not to exceed 1,000 feet on centers, or at locations approved on the drawings.

3.15.2 The requirements for a sampling tap are as follows:

3.15.2.1 New brass faucet with no internal or external threads (vendor where these can be purchased is the USA Bluebook at (800) 548-1234 item number 45325 and 45326. No cut off faucets without adequate neck.

3.15.2.2 Faucet is facing downward.

3.15.2.3 Faucet has shut-off handle to enable collector to close valve and flame tap.

3.15.2.4 Faucet must be secured to a stake, 32 - 40 inches above the ground.

3.15.2.5 Faucet must be clean.

3.15.2.6 Sample location must be free of grass, weeds and debris.

3.15.2.7 No sample points in ditches.

3.15.3 After a satisfactory sample test report has been received, the sampling taps shall be removed and plugged at the main.

3.16.0 PRESSURE TESTING:

3.16.1 As the work progresses, all sections of pipe shall be tested to a minimum hydrostatic pressure of 125 pounds per square inch for a minimum period of 4 hours. If after 4 hours, the pressure drop is less than 10 psi, the test is acceptable. If after 4 hours, pressure drops to 10 psi or more, but less than 25 psi, let the test on over night to determine what pressure the line will hold. If the pressure does not drop more than 25 psi, after 24 hours, the test is acceptable. If the pressure does drop more than 25 psi, within 24 hours, the test is not acceptable, and the line will be inspected for leaks and retested. (Any defective work revealed by the test must be repaired by the CONTRACTOR at his expense.) Test pressure shall not be exerted against a valve operated by the District. All test sections shall be sealed with plugs or caps.

3.16.2 There shall be a minimum of leakage in the lines under the stated pressure. Volume of leakage shall be determined from the quantity of water required to bring up the pressure and from direct meter readings on completed lines.

3.16.3 The entire cost of the test, including pumps, gauges, connection pipe, etc., will be made at the CONTRACTOR'S expense.

3.16.4 Potable water shall be used for testing and shall be obtained and paid for by the CONTRACTOR.

3.16.5 All hydrostatic pressure tests shall commence prior to 1:00 P.M. If the CONTRACTOR fails to reach the pressure of 125 psi by 1:00 P.M., the pressure test shall be postponed until the next regular working day.

3.16.6 CONTRACTOR shall submit to the PROJECT ENGINEER and the DISTRICT, a schedule of pressure tests which shall be revised as conditions require. The PROJECT ENGINEER and the DISTRICT shall be notified at least 24 hours in advance of the beginning of any test. It is imperative that testing be done immediately upon completion of each portion of the line. Failure to properly schedule and conduct tests will be sufficient cause for the PROJECT ENGINEER to prohibit the opening up of additional trench until all previously installed pipe and specials have been tested and all backfilling completed and work cleaned up. Work shall proceed in an orderly and expeditiously manner with all parts of the operation completion and cleaned up as the CONTRACTOR proceeds along the line.

3.17.0 STERILIZATION:

- 3.17.1 Procedure for disinfecting line shall be in accordance with paragraph 12:020-1 through paragraph 12:020-4, Chapter XII (Water Supplies) of the Louisiana State Sanitary Code dated March 20, 1984, or latest revision.
- 3.17.2 In general, after pressure tests have been made and any repairs found needed have been completed, the main shall be flushed as thoroughly as possible. When the initial flushing has been completed, pipes and all other parts of the system shall be thoroughly disinfected by the use of chlorine or chlorine compounds. The rate of application of chlorine shall be in such proportion to the rate of water entering the pipe or other appurtenances, such that the chlorine applied to the water shall be at least 50 ppm. Chlorinated water shall be retained in the pipe long enough to destroy all non-spore-forming bacteria, normally not less than 24 hours. After the chlorine treated water has been retained for the required time, the chlorine residual at pipe extremities and at other representative points shall be at least 5 ppm. If the residual is less than 5 ppm the disinfection procedure shall be repeated until a 5 ppm residual is obtained as required above.
- 3.17.3 At the end of 24 hours, the main shall again be thoroughly flushed. When flushing has been completed, the main shall be refilled with system water and allowed to stand for one (1) week. Samples shall then be taken by either a private laboratory or by the DISTRICT'S laboratory. Satisfactory test results are valid for forth-five (45) days from the date of sample collection.
- 3.17.4 The final inspection shall occur after receipt of satisfactory sample test reports, but within 15 days of sample collection. After an acceptable final inspection, the Development/Subdivision shall be opened to the public system and local service provided.
- 3.17.5 After the final inspection, the Development/Subdivision shall be submitted to the DISTRICT for acceptance within forty-five (45) days of sample collection.
- 3.17.6 If the system has not been accepted by the DISTRICT during this forty-five (45) day period, additional flushing, sterilization and sanitary testing may be required at the expense of the OWNER.
- 3.17.7 Mains containing water that does not meet standards of the DISTRICT shall be again disinfected and retested.
- 3.17.8 No special payment will be made for disinfecting. The entire cost of water, chemicals, equipment and testing shall be included in the unit price bid for laying pipe.

DIVISION IV

VALVES

4.1.0 GENERAL:

- 4.1.1 Watermains 12-inch and smaller shall have gate valves.
- 4.1.2 All valves shall open left (counter clock-wise).
- 4.1.3 Upon completion of construction, all valves shall be left in the open position.

4.2.0 GATE VALVES:

- 4.2.1 Gate valves 12-inch or smaller shall be cast iron, resilient wedge, non-rising stem with standard mechanical joint or flanged ends.
- 4.2.2 Gate valves shall be manufactured to AWWA C-509, Standard Specifications for Gate Valves for ordinary Waterworks Service.
- 4.2.3 Mueller, A2360 Series or approved equal.
- 4.2.4 Gate valves for hydrant supply lines shall have flanged by mechanical joint ends.
- 4.2.5 All interior and exterior cast iron valve bodies shall receive 10 mil fusion epoxy coating in accordance with AWWA C550.

4.3.0 VALVE BOXES:

- 4.3.1 Valve boxes for all valves shall be B & T Company, Tyler Company, or approved equal two-piece valve box.
- 4.3.2 Covers for valve boxes shall be round drop covers indicating "water".
- 4.3.3 All valve boxes shall be supplied with a centering seal.
- 4.3.4 The top of the installed valve box shall be flush with the surface of the finished property elevation.
- 4.3.5 All valve boxes shall have a 18-inch by 18-inch by 4-inch square, or 18-inch round plain concrete pad poured around the valve box flush with the level of the ground. Pads may be precast and sealed in place.

DIVISION V

FIRE HYDRANT INSTALLATION

5.1.0 FIRE HYDRANTS:

5.1.1 Fire hydrants shall meet all provisions of the current AWWA Specifications governing fire hydrants. Hydrants shall be of the "Traffic Model or Break Flange Type" so designed when the hydrant is subjected to severe impact, the special break flange ring will shear off at the ground line. Hydrant shall be constructed that it can be extended without the necessity of digging. "O" ring seals shall be used to prevent leakage.

5.1.2 All residential hydrants shall be three-way hydrants with two 2½ inch hose nozzles and one 4½ inch pump nozzle. Commercial hydrants shall have two 4½" pump nozzles. Valve opening shall be 5¼ inch.

5.1.3 Threading shall be National Standard, opening left with a 1-1/2" pentagon operating nut.

5.1.4 End inlet shall be mechanical joint with Corten, Teflon coated Corten or stainless steel bolts and nuts.

5.1.5 The term "bury" is defined as meaning the distance from the ground line to the bottom of the pipe. Average bury is approximately three feet, six inches (3'-6"). Before ordering hydrants, the amount of bury for each hydrant location shall be determined by the CONTRACTOR. The CONTRACTOR shall furnish labor and equipment needed for locating water line and establishing amount of bury.

5.1.6 All fire hydrants shall be water-tight when subjected to a hydraulic pressure test of 300 pounds per square inch. This test shall be applied to each hydrant by the manufacturer of the hydrant and certification that each hydrant has been tested shall be stamped on each hydrant by an approved testing lab.

5.1.7 Hydrants shall be Mueller "Centurian" or approved equal.

5.1.8 One spanner wrench shall be provided for each six (6) hydrants.

5.2.0 INSTALLATION OF FIRE HYDRANTS:

5.2.1 All hydrants shall be constructed in accordance with the drawing entitled "Typical Hydrant Setting".

5.2.2 All fire hydrants shall be connected to the distribution system through a 6-inch feeder valve. In those locations where the fire hydrants are being installed on an existing four-inch (4") main, a 4-inch by 6-inch increaser shall be installed on the tee.

5.2.3 Fire hydrants shall be set on and blocked by pressure treated (See 3.12.1) timber blocks placed on a bed of 6-inches of gravel or limestone. Hydrant shall be held in place by means of galvanized pipe straps, as shown on details or installed using a mechanical joint anchoring coupling. After straps or couplings are in place the hydrant joint and water line joint shall be wrapped with 6 or 8 mil polyethylene film, lapped so as to have two layers of film in each wrapping. Film shall be taped to pipe barrel on each of side of joint. Several holes shall be punched in film to allow drainage.

5.2.4 After wrapping is in place, limestone or gravel shall be used to fill around the inlet of the hydrant to a height of three inches (3") above the drain hole.

5.3.0 TAPPING SLEEVE AND VALVES:

5.3.1 When used, these shall be Mueller mechanical joint ends, or stainless steel tapping sleeve with test plug and stainless steel flange, Ford "SST" or approved equal.

5.3.2 All bolts and nuts used on mechanical joints shall be Corten, Teflon coated Corten or stainless steel.

5.3.3 Each mechanical and each flanged joint shall be wrapped with polyethylene film as specified for hydrant joint.

5.4.0 FIRE HYDRANT EXTENSIONS:

5.4.1 It is anticipated that in some locations the bury of the fire hydrant will be in excess of the standard depth specified. At these locations a fire hydrant extension shall be installed to bring the break-off of the fire hydrant above the ground level. The use of fire hydrant extensions shall be approved by PROJECT ENGINEER prior to ordering.

5.5.0 CUTTING INTO EXISTING LINES:

5.5.1 When it is necessary to install a fire hydrant on an existing water main, when tapping sleeves and valves are not used, the tie-in shall be made by cutting the existing water main and inserting a mechanical joint on other approved tees. The CONTRACTOR shall plan this operation in a manner that will cause a minimum interruption of water service. Cards will be prepared and delivered to residents of the area where water is to be cut off advising them when service will be cut off and the approximate duration of the interruption of service.

5.5.2 Cutting of waterlines shall be done with a hydraulic pipe cutter.

5.5.3 Fittings shall be standardized mechanical joint type and shall conform with AWWA Specifications C-110 for 250 psi working pressure (ASA A-21.10). Inside lining shall be "enamaline" type cement lining or approved equal. Outside coating shall be coal-tar dip (ASA A21.5). Bolts and nuts shall be Corten or stainless steel.

5.5.4 When a cut is made into a water line, excavation shall be kept dry to prevent water from entering pipe and to assist in keeping pipe and fittings clean. HTH or similar chemical for disinfection shall be dusted into each fitting, each piece of pipe and each hydrant as they are installed in the system.

5.6.0 STERILIZATION:

5.6.1 After hydrant installation is completed, water supply valve shall be opened just enough to fill the line and bleed air from line through the hydrant. As soon as water reaches hydrant, supply valve shall be closed and chlorinated water allowed to set in the hydrant supply line for 30 minutes, after which supply valve shall be opened and line flushed through the hydrant.

5.7.0 BACKFILLING AND CLEANING UP:

5.7.1 Excavation for hydrant installation shall be backfilled with best available material obtained from the excavation. Backfilling shall be done in layers not over nine inches (9"), each layer being thoroughly compacted. Before final inspection all hydrant location areas shall be redressed and cleaned-up.

5.8.0 COLOR CODING:

5.8.1 All fire hydrants shall be painted red and bonnet and nozzle caps of the hydrant and nozzle caps shall be color coded according to the measured flow from the hydrant. Color coding shall be as follows:

<u>FLOW RANGE</u>	<u>COLOR CODE</u>
Less than 500 GPM	Red (1210 Rust-O-Leum)
501 - 1,000 GPM	Yellow (659 Rust-O-Leum)
More than 1,000 GPM	Green (1282 Rust-O-Leum)

5.8.2 CONTRACTOR shall coordinate flow testing with fire company representative of DISTRICT where hydrant is being installed.

DIVISION XX

MEASUREMENTS AND PAYMENTS

20.1.0 GENERAL:

20.1.1 General contracts for waterlines are unit price contracts and all quantities are approximate quantities. The CONTRACTOR'S attention is directed to the items of work for which no payment item has been established. All work shown on the drawings and outlined in the specifications is to be completed in all respects, and the cost of all miscellaneous and associated work is to be included in the unit prices bid for the various items that payment items have been established for.

20.1.2 All quantities shall be measured and tabulated by both the PROJECT ENGINEER and CONTRACTOR. Requests for payment and supporting data shall be prepared by the CONTRACTOR and given to the PROJECT ENGINEER sufficiently in advance of payment date to permit thorough checking of all quantities.

20.1.3 CONTRACTOR shall submit a daily report and daily sketch sheet showing lines, fittings, valves, taps, etc., installed with sufficient data to accurately locate these items after trench has been backfilled.

20.1.4 The CONTRACTOR shall furnish the PROJECT ENGINEER whatever assistance is required, laborers, clerks and records that will enable the PROJECT ENGINEER to expeditiously check all estimates and especially the final "Record Drawing" quantities of the project.

PAYMENT ITEMS 1 - 4 WATERLINE PIPE AND FITTINGS

20.2.0 WATER PIPE:

20.2.1 Water pipe will be paid for by the linear foot according to size and type.

20.2.2 Method of Measurement: Water pipe will be measured by the linear foot of pipe placed, tested, sterilized and accepted without deductions for the space occupied by valves, fittings or specials.

20.2.3 Basis of Payment: Water pipe placed and accepted measured as provided above will be paid for at the contract unit price per linear foot for water pipe of the

various sizes, types and classifications, which price and payment shall be complete with thrust resistors, warning tape, tracer wire, plastic wrapping, testing and sterilizing the pipe and adapters; for excavation, backfilling and preparation of bed, compaction and removing surplus earth; and reshaping and dressing the surface; and for the furnishing of all equipment, tools, labor, and incidentals necessary to complete the item in accordance with the plans and specifications.

20.2.4 Payment Item:

Item No. 1 - Various Size Water Pipe

20.3.0 CAST IRON OR DUCTILE IRON FITTINGS:

20.3.1 Cast iron fittings or ductile iron fittings used in waterlines will be paid for by the pound. Adapters and retainers will not be paid for separately but will be included in the unit price bid per linear foot of pipe.

20.3.2 Method of Measurement: Fittings shall be measured in units of pounds of cast iron fittings, installed, tested, sterilized and accepted, and payment for mechanical joint, flange and push-on joint fittings, whether cast iron or ductile iron shall be made on the basis of ASA A21.10 published body weights for mechanical joint fittings exclusive of weight of gaskets and linings, glands and bolts.

20.3.3 Basis of Payment: Cast iron or ductile iron fittings used in waterline construction will be paid for by the pound. Adapters, retainers and plastic wrapping will not be paid for separately but will be included in the unit price bid per linear foot of pipe.

20.3.4 Payment Item:

Item No. 2 - Cast Iron and Ductile Iron Fittings

20.4.0 TIE-IN TO EXISTING MAIN OR VALVE:

20.4.1 Tie-ins to existing mains or valve will be paid for per each. Valves and fittings are measured and paid for under other item. This item will provide payment for removal, if necessary, of any existing fittings and existing timber and/or concrete blocking, for installation of new fittings and the reconnection of all lines as necessary. This price shall also include verification by CONTRACTOR of the existing waterline size. Tie-ins to cast iron or ductile iron pipe shall include cutting-in-sleeves.

20.4.2 Method of Measurement: Connections to existing mains or valves will be measured by an actual count of each connection according to type, size, installed, tested, sterilized and accepted.

20.4.3 Basis of Payment: Connections to existing mains or valves installed and accepted, measured as provided above, will be paid for at the contract unit price per each, which price and payment shall constitute full compensation for furnishing all equipment, tools, labor and incidentals necessary for the completion of the item in accordance with plans and specifications.

20.4.4 Payment Item:

Item No. 3 - Various Types of Tie-ins

20.5.0 CUT AND PLUG EXISTING LINES:

20.5.1 As detailed on the plans, existing lines shall be cut and a plug or cap used to seal open line.

20.5.2 Method of Measurement: Payment for each unit under this item will be for furnishing all labor and materials to disconnect and plug existing lines where shown on the plans or called for in the specifications. The cost of the plug shall be included in unit price bid of cast iron fittings unless otherwise noted on plans.

20.5.3 Basis of Payment: The cutting and plugging of existing lines, measured as provided above will be paid for at the contract unit price bid per each, which price and payment shall constitute full compensation for all the material, equipment, tools, labor and incidental items necessary to complete the item in accordance with the plans and specifications.

20.5.4 Payment Item:

Item No. 4 - Cut and Plug Various Size and Type Lines

PAYMENT ITEM 21 VALVES

20.21.0 VALVES AND VALVE BOXES:

20.21.1 Valves and valve boxes together as a unit will be paid for per each.

20.21.2 Method of Measurement: Valves together with valve boxes, spool or smooth pieces and special foundation when shown on plans and concrete pads, all together as a unit will be measured by an actual count of each size, installed, tested, sterilized and accepted. The unit bid price shall include any necessary joint adaptors for connecting valves into the system.

20.21.3 Basis of Payment: The number of valves with valve boxes and accessories together as a unit, accepted, measured as provided above, will be paid for at the contract unit price per each, which price and payment shall constitute full compensation for furnishing, hauling, installing complete and testing and sterilizing, for excavation and backfilling, and for the furnishing of all equipment, tools, labor and incidentals necessary to complete the item in accordance with plans and specifications.

20.21.4 Payment Item:

Item No. 21 - Various Size Valves and Valve Boxes

PAYMENT ITEM 22 TRACER WIRE HOUSING UNITS

20.22.0 TRACER WIRE HOUSING UNITS:

20.22.1 Tracer Wire Housing Units shall be paid for per each.

20.22.2 Method of Measurement: Tracer Wire Housing Units complete will be measured by an actual count installed and accepted.

20.22.3 Basis of Payment: Payment for each will be for the furnishing of all labor, material and equipment to install the unit complete in accordance with the specifications.

20.22.4 Payment Item:

Item No.22 - Tracer Wire Housing Units

PAYMENT ITEMS 30 - 32 FIRE HYDRANTS, TEES AND EXTENSIONS

20.30.0 FIRE HYDRANT INSTALLATION:

20.30.1 Fire hydrant installation complete will be paid for per each according to the type and size connection provided for in the proposal. Standard burial shall be 3 feet, 6 inches.

20.30.2 Method of Measurement: Fire hydrant installation complete will be measured by the actual count of each fire hydrant, type and size connection installed and accepted. The unit price bid for each shall include the hydrant with boot as called for on the proposal.

20.30.3 Basis of Payment: Fire hydrant installation complete placed and accepted measured as provided above will be paid for at the contract unit price per each, which price and payment shall constitute full compensation for furnishing, hauling, installing completed, testing and sterilizing each hydrant, and for the furnishing of all equipment, tools, labor and incidentals necessary to complete the item in accordance with the plans and specifications.

20.30.4 Payment Item:

Item No. 30 - Various Size and Type Fire Hydrant Installations

20.31.0 FIRE HYDRANT TEE AND VALVE INSTALLATION:

20.31.1 Fire hydrant tee and valve installation will be paid for per each as detailed on the plans including supply pipe up to 4 feet in length. Supply pipe over 4 feet in length will be paid for under Payment Item No. 1 - Water Pipe.

20.31.2 Method of Measurement: Fire hydrant tee and valve installation will be measured by the actual count of each unit installed and accepted. The unit price bid for each shall include the necessary tee, valve and box, up to four (4') feet of supply pipe, the tie-in or connection, all as called for on the proposal, as well as the thrust block anchoring device, gravel pack and/or concrete base where required and polyethylene film.

20.31.3 Basis of Payment: Fire hydrant tee and valve installation placed and accepted measured as provided above will be paid for at the contract unit price bid per each, which price and payment shall constitute full compensation for furnishing, hauling, installing completed, testing and sterilizing each tee, with its associated valve, supply pipe and connection fittings; for excavation, backfilling and dressing and for the furnishing of all equipment, tools, labor and incidentals necessary to complete the item in accordance with the plans and specifications.

20.31.4 Payment Item:

Item No. 31 - Various Size Fire Hydrant Tees and Valves

20.32.0 FIRE HYDRANT EXTENSION:

20.32.1 Extra depth for fire hydrants will be paid for per vertical foot.

20.32.2 Method of Measurement: Extra depth for fire hydrant in excess of standard depth will be measured in increments of six inches (6").

20.32.3 Basis of Payment: Extra depth for fire hydrants in excess of standard depth, measured as provided above, will be paid for at the contract unit price per foot, which price and payment shall constitute full compensation for the furnishing of all equipment, tools, labor and incidentals necessary to complete the item in accordance with the plans and specifications.

20.32.4 Payment Item:

Item No. 32 - Fire Hydrant Extension

PAYMENT ITEMS 36 - 38 PIPE EMBEDMENT

20.36.0 LIMESTONE FOUNDATION:

20.36.1 When required by plans or specifications, standard limestone foundation shall be paid for by the linear foot in place. Unless otherwise shown or specified, limestone foundation for 4-inch through 12-inch waterline normally shall be 4 inches below the pipe and shall extend to the spring line of the pipe. The width of limestone base shall be the width of the trench.

20.36.2 Method of Measurement: Limestone foundation placed in accordance with the plans and accepted will be measured by the linear foot in place. No special payment will be made for additional material necessary to correct unauthorized over-width or over-depth excavation.

20.36.3 Basis of Payment: Limestone foundation in place and accepted, measured as provided above, will be paid for at the contract unit price bid per linear foot of limestone, which price and payment shall constitute full compensation for furnishing, hauling and installing all material and for furnishing all equipment, tools, labor and incidentals necessary to complete the item in accordance with the drawing and specifications.

20.36.4 Payment Item:

Item No. 36 - Limestone Foundation for Various Size Waterlines

20.37.0 FOUNDATION LUMBER:

20.37.1 When required by plans or specifications, foundation lumber shall be paid for by the thousand board feet or fraction thereof.

20.37.2 Method of Measurement: Foundation lumber will be measured by unit of one thousand board feet and fraction thereof as determined by using nominal sizes of lumber furnished.

20.37.3 Basis of Payment: Foundation lumber installed and accepted, measured as provided above, will be paid for at the unit price bid by the CONTRACTOR, which combined price and payment shall constitute full compensation for furnishing, hauling and installing all sheeting and bracing required to be left in place, and for furnishing all equipment, tools, labor, and incidental items necessary to complete the item in accordance with the plans and specifications.

20.37.4 Payment Item:

Item No. 37 - Foundation Lumber

20.38.0 GRANULAR BACKFILL MATERIAL:

20.38.1 This work shall consist of furnishing and placing granular material in accordance with the specifications when called for.

20.38.2 Method of Measurement: Granular material used to backfill trenches for the installation of pipe will be measured by the cubic yard of granular material placed, compacted and accepted. Granular material will be placed only at the direction of the PROJECT ENGINEER. Measurement for granular material will be made by the cubic yard in vehicles at the point of delivery. Yardages in vehicles will be measured at the point of delivery. The CONTRACTOR shall strike off and level the load and the checker or project representative shall inspect each load and check its yardage. Approved vehicle for this purpose may be of any size or type acceptable to the PROJECT ENGINEER provided the body is of such shape that the actual delivered contents may be readily and accurately determined and will remain constant. Unless all approved vehicle on the work are of uniform capacity, each vehicle must bear a plainly legible identification mark, indicating its specified approved vehicle. The Project Representative may reject all loads not hauled in approved vehicles. Two haul tickets shall be given the Project Representative for each load of granular fill used. The ticket shall be signed, the location where used noted on the tickets, and one ticket returned to the CONTRACTOR. Tickets for granular fill hauled to a storage site shall not be signed or honored.

20.38.3 Basis of Payment: Granular material in place, compacted, bladed and accepted; measured as provided above, will be paid for at the contract unit price per cubic yard, truck measurement, of granular material hauled and spread; which price shall constitute full compensation for furnishing, hauling, spreading and compacting of granular fill and or the furnishing of all equipment, tools, labor and incidental items necessary to complete the item in accordance with the drawings and specifications.

20.38.4 Payment Item:

Item No. 38 - Granular Backfill

20.66.0 SHEETING LEFT-IN-PLACE:

20.66.1 Sheeting Left-In-Place along with the bracing and shoring utilized in conjunction therewith will be paid for by the linear foot of trench according to category of depth.

20.66.2 Method of Measurement: Sheeting Left-In-Place at the direction of the PROJECT ENGINEER will be measured by the linear foot of trench as measured along the centerline of the trench.

20.66.3 Basis of Payment: Sheeting Left-In-Place, as directed by the PROJECT ENGINEER, installed and accepted, measured as provided above, will be paid for at the contract unit price bid per linear foot of trench, which price and payment shall constitute full compensation for furnishing, hauling and installing all sheeting required to be left-in-place; furnishing, hauling and installing all bracing and shoring required to meet OSHA requirements; removal of hydraulic or temporary bracing and shoring as backfill progresses; and for furnishing all equipment, tools, labor and incidentals necessary to complete the item in accordance with the drawings and specifications.

20.66.4 Payment Items:

Item No. 66 - Sheeting Left-In-Place

SECTION 333000 - SANITARY SEWAGE SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sanitary sewer drainage piping, fittings, accessories, cleanouts, and bedding.
 - 2. Connection of site sanitary sewer system to municipal sanitary sewer systems.
- B. Related Requirements:
 - 1. Section 02300 – Earthwork: Trenching, backfill, and compaction for utilities
 - 2. Section 02536 - Sewer Manholes, Frames, and Covers
 - 3. Section 03310 – Cast-in-place Structural Concrete

1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. ASTM International (ASTM):
 - 1. ASTM A74 - Cast Iron Soil Pipe and Fittings
 - 2. ASTM A746 - Ductile Iron Gravity Sewer Pipe
 - 3. ASTM C425 - Compression Joints for Vitrified Clay Pipe and Fittings
 - 4. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings
 - 5. ASTM C700 - Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated
 - 6. ASTM D2241 - Poly (vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
 - 7. ASTM D2657 - Heat-Joining Polyolefin pipe and Fittings
 - 8. ASTM D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
 - 9. ASTM D3035 - Polyethylene (PE) Plastic Pipe Using Flexible Elastomeric Seals
 - 10. ASTM D3139 - Joints for Plastic Pressure Pipe Using Flexible Elastomeric Seals
 - 11. ASTM D3261 - Butt Heat Fusion Polyethylene (PE) Plastic Fittings For Polyethylene Plastic Pipe And Tubing
 - 12. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe
 - 13. ASTM F1417 - Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air.
- C. American Water Works Association (AWWA):
 - 1. AWWA C111 - Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings
 - 2. AWWA C600 - Ductile-Iron Water Mains And Their Appurtenances
 - 3. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In, For Water Distribution
 - 4. AWWA C901 - Polyethylene (PE) Pressure Pipe, Tubing And Fittings 1/2 Inch Through 3 Inches, For Water Distribution
 - 5. AWWA C906 - Polyethylene (PE) Pressure Pipe And Fittings, 4 Inch Through 63 Inch, For Water Distribution

1.3 SUBMITTALS

- A. Project Record Documents:
 - 1. Submit manufacturer information on all pipe, fittings, seals, etc. that will be used for the installation of the system.
 - 2. Accurately record actual locations of pipe runs, connections, cleanouts, and invert elevations.
 - 3. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.

1.4 PROJECT CONDITIONS

- A. Coordinate work with termination of sanitary sewer connection outside building and connection to municipal sewer utility service.

PART 2 - PRODUCTS

2.1 SEWER PIPE, FITTINGS, AND JOINTS

- A. Polyvinyl Chloride Pipe (PVC): ASTM D 3034, rated SDR 35 unless otherwise specified by the utility company. Pipe shall be continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM D 3034 classification.
 - 1. Pipe joints: Integrally molded bell ends, ASTM D 3034, Table 2, with factory supplied elastomeric gaskets and lubricant.
- B. Vitrified Clay Pipe (VCP): ASTM C700: Use only if required by local jurisdiction.
 - 1. Fittings: ASTM C700
 - 2. Joints: ASTM C425
 - 3. Gaskets: ASTM C425. Gaskets shall be manufactured from high grade, properly vulcanized elastomeric compound consisting of either basic natural or synthetic rubber. Gasket manufacturing tolerances shall comply with Rubber Manufacturer's Association tolerances for gaskets.
 - 4. Lubricant: Suitable for lubricating joint components; no deteriorating effects on gasket or pipe material, will not support growth of fungi or bacteria, and shall be of type recommended by gasket manufacturer.
- C. Force Main:
 - 1. High-Density Polyethylene Pipe (HDPE): AWWA C901 and C906, ASTM D3035, SDR 11 for 150 psi pressure rating.
 - a. Fittings: Molded, AWWA C901 or C906.
 - b. Joints: Butt fusion, ASTM D2657, flanged gasket joints at interface
 - 2. Polyvinyl Chloride Pipe (PVC): For less than 4 inches in diameter, ASTM D2241 for push-on or solvent weld joints, and for pipe 4 inches in diameter and larger, AWWA C900, Class 150 with push-on joints.
 - a. Joints/Fittings: Push-on, ASTM D3139 with ASTM F477 gaskets.
 - b. Solvent Cement: ASTM D2564.
 - 3. Ductile Iron Pipe (DIP): ASTM A746, Class 50, inside nominal diameter as shown on the drawings, bell and spigot end.
 - a. Ductile Iron Pipe Joint Device: AWWA C111, rubber gasket joint devices.

2.2 PIPE ACCESSORIES

- A. Pipe Joints: Mechanical clamp ring type, stainless steel expanding and contracting sleeve, neoprene-ribbed gasket for positive seal.
- B. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps, etc.

2.3 CLEANOUTS AND MANHOLES

- A. Manholes shall conform to Section 02536.
- B. Lid and Frame: Provide in accordance with Section 02536. Provide traffic grade and rated covers and frames where cleanouts and manholes are within pavement, with the letters "SSCO" or "SANITARY SEWER" respectively cast into the cover.
- C. Shaft Construction: Cast iron shaft of internal diameter as specified on Construction Drawings with 2500 psi concrete collar for cleanouts.

2.4 APPURTENANCES

- A. Trace Wire: Magnetic detectable conductor (#12 copper), brightly colored plastic covering, imprinted with “Sanitary Sewer Service” in large letters.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that trench cut and excavation is ready to receive work and excavations, dimensions, and elevations are as indicated on Construction Drawings.

3.2 PREPARATION

- A. Hand trim excavations to required elevations. Correct over excavation with bedding material.
- B. Remove large stones or other hard matter that could damage pipe or impede consistent backfilling or compaction.

3.3 BEDDING

- A. Excavate trench and place bedding material in accordance with Section 02300.

3.4 INSTALLATION - PIPE

- A. Install type and class of pipe as shown on the drawings. Pipes shall be laid and maintained to the required line and grade with necessary fittings, bends, manhole risers, cleanouts and other appurtenances placed at the required locations. The pipe shall be installed with uniform bearing under the full length of the barrel of the pipe. The pipe shall be inspected for defects and cracks before being lowered into the trench. Defective, damaged or unsound pipe, or pipe that has had its grade disturbed after laying shall be taken up and replaced. Commence installation at lowest point with the bell end upgrade.
- B. No pipe shall be laid in water or when trench conditions are unsuitable for work.
- C. Pipe connecting to manholes or other structures shall terminate flush inside of the structure wall.
- D. Joints for PVC and CISP shall be thoroughly lubricated with an approved lubricant before pipe sections are slipped together. Open ends shall be fully protected with a stopper to prevent earth or other material from entering the pipe during construction. Carefully free interior of the pipe from dirt, cement and other deleterious material as the work progresses.
- E. Maintain separation of potable water main from sewer piping at crossings a minimum of 10 feet horizontal and 18 inches vertical.
- F. Install HDPE piping and fittings to AWWA C901 and C906. Butt fusion welded per ASTM D3261.
- G. Route pipe in straight line parallel to roads, buildings and adjacent utilities and as shown on the drawings.
- H. Establish elevations of buried piping with sufficient cover as recommended by pipe manufacturer to ensure not less than 3 feet of cover, except as noted on drawings.
- I. Form and place concrete for thrust blocks at each elbow of pipe force main. See construction drawing for details of construction.
- J. Backfill trench in accordance with Section 02300.
- K. Install trace wire continuous over top of non-metal pipe. Bury 6 inches minimum below finish grade, above pipeline.

3.5 INSTALLATION – CLEANOUTS AND MANHOLES

- A. Form bottom of excavation clean and smooth to correct elevation.
- B. For cleanouts, form and place cast-in-place concrete base pad with provision for sanitary sewer pipe to be installed to proper elevations.
- C. For manholes, construct inverts according to the following guidelines:
 - 1. Invert channel shall be smooth and accurately shaped to a semicircular bottom to match with the inside of the adjacent sewer section.
 - 2. Invert channels and structure bottoms shall be shaped with mortar and lean concrete.
 - 3. Changes in size and grade of invert shall be made gradually and evenly.
 - 4. Changes in the direction of the sewer entering branch or branches shall have a true curve of as large a radius as the manhole will permit.
- D. For manholes, provide manhole rings, frame, and cover as shown on the construction drawings.

3.6 FIELD QUALITY CONTROL

- A. Field quality control shall be conducted by the Contractor in accordance with Contract Documents.
- B. Pipes and joints shall not be completely backfilled until after inspection, testing, and approval by the Owner and local jurisdiction.
- C. Prior to testing for leakage, the pipe trench shall be backfilled to at least the spring line of the pipe. If required to prevent pipe movement during testing, additional backfill shall be added leaving the pipe joints uncovered to permit inspection.
- D. Exfiltration Test
 - 1. Each section of sewer line between successive manholes shall be tested by closing the lower end of the sewer to be tested and the inlet sewer of the upper manhole, using stoppers.
 - 2. Fill the manhole and pipe with water to a point which produces a maximum of 3 feet of head above the invert of the sewer at the center of the upper manhole; or if groundwater is present, 3 feet of head above the average adjacent groundwater level.
 - 3. The allowable leakage shall be 200 gal/inch of pipe diameter/mile/day
- E. Infiltration Test
 - 1. If excessive ground water is encountered in the construction of a section of the sewer, the exfiltration test shall not be used.
 - 2. The upper and lower ends of the sewer to be tested shall be closed sufficiently to prevent the entrance of water.
 - 3. Pumping of ground water shall be discontinued for at least 3 days; then infiltration shall be tested.
 - 4. Infiltration into each section of sewer between adjoining manholes shall not exceed that allowed for the exfiltration test, except that head conditions shall be a maximum of 6 feet.
- F. The Exfiltration Test may be limited to the manholes only when the authority having jurisdiction does not require the test and the construction manager waives the test. The Infiltration Test will always be required when excessive ground water is encountered in addition to the air test.
- G. Air Test: Gravity systems shall be air tested between manholes at 3.5 psi for 5 minutes per ASTM F1417 for plastic pipes.
- H. Deflection Test:
 - 1. Deflection tests shall be conducted on all plastic pipe using a mandrel with a diameter equal to 95 percent of the inside diameter of the pipe. The test shall be performed without mechanical pulling devices.
 - 2. Allowable Deflection: Maximum allowable pipe deflection shall not exceed 5 percent of nominal inside diameter.
 - 3. Mandrel: Mandrel, go/no-go, device shall be cylindrical in shape and constructed with either 9 or 16 evenly spaced arms or prongs. Mandrels with fewer arms will be rejected as not sufficiently accurate.

Contact length of mandrel's arms shall equal or exceed nominal inside diameter of sewer to be inspected. Critical mandrel dimensions shall carry tolerance of 0.01-inch maximum. Contractor shall provide mandrel and necessary equipment for mandrel test.

4. Procedure: Mandrel shall be hand-pulled through flexible pipe sewer lines no earlier than 30 days after trench has been completely backfilled. Sections of sewer not passing mandrel shall be uncovered and rebedded, rerounded, or replaced to satisfaction of Owner or governing agency. Repaired section shall be retested.
- I. Hydrostatic Test: Force main piping shall be hydrostatically tested at 150 psi in accordance with AWWA C 600.
- J. Provide measuring devices, meters, water, materials, and labor for making the required tests.
- K. Tests shall be conducted in the presence of the Owner or his designee. Test data shall be submitted to the Engineer for review and approval.

END OF SECTION

SECTION 334000 - STORM DRAINAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Storm sewer drainage piping, fittings, and accessories.
 2. Storm drainage structures.

1.2 Related Requirements:

1. Louisiana Department of Transportation and Development (DOTD) Standards and Specifications (LSSRB), latest edition.
2. Section 02300 – Earthwork: Excavation, trenching, backfill, and compaction.
3. Section 02370 – Erosion and Sedimentation Control (Including SWPPP).
4. Section 02536 - Sewer Manholes, Frames, and Covers.

1.3 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. American Association of State Highway and Transportation Officials (AASHTO):
1. AASHTO M 170 – Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
 2. AASHTO M 190 - Bituminous Coated Corrugated Metal Culvert Pipe and Arches.
 3. AASHTO M 252 - Corrugated Polyethylene Drainage Tubing, 3 to 10 Inch Diameter.
 4. AASHTO M 294 - Corrugated Polyethylene Drainage Tubing, 12 to 60 Inch Diameter.
 5. AASHTO M 306 - Drainage, Sewer, Utility, and Related Casting
 6. AASHTO M 330 - Polypropylene Pipe, 300- to 1500-mm (12- to 60-in) Diameter
- C. ASTM International (ASTM):
1. ASTM A 74 - Cast Iron Soil Pipe and Fittings.
 2. ASTM A 185 - Steel welded Wire Fabric, Plain, for Concrete Reinforcement.
 3. ASTM A 615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 4. ASTM A 674 – Polyethylene Encasement for Ductile Iron Pipe for Water or Other Liquids.
 5. ASTM A 746 - Ductile Iron Gravity Sewer Pipe.
 6. ASTM A 760 - Corrugated Steel Pipe, Metallic-Coated For Sewers And Drains.
 7. ASTM A 796 - Structural Design Of Corrugated Steel Pipe, Pipe-Arches, And Arches For Storm And Sanitary Sewers And Other Buried Applications.
 8. ASTM A 798 - Factory-Made Corrugated Steel Pipe For Sewers And Other Applications.
 9. ASTM A 929 - Steel Sheet, Metallic-Coated By The Hot-Dip Process For Corrugated Steel Pipe.
 10. ASTM C 76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
 11. ASTM C 150 - Portland Cement.
 12. ASTM C 206 - Finished Hydrated Lime.
 13. ASTM C 443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
 14. ASTM C 564 - Rubber Gasket for Cast Iron Soil Pipe and Fittings.
 15. ASTM C 924 - Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.
 16. ASTM C 969 - Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
 17. ASTM C 990 - Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.
 18. ASTM C 1628 – Joints for Concrete Gravity Flow Sewer Pipe, Using Rubber Gaskets.
 19. ASTM D 2321 - Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications
 20. ASTM D 3034 - Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.
 21. ASTM D 3212 - Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

22. ASTM F 477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
23. ASTM F 949 - Poly (Vinyl Chloride)(PVC) Corrugated Sewer Pipe with Smooth Interior and Fittings.
24. ASTM F 1417 - Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air.
25. ASTM F 2306 - 12 to 60 Annular Corrugated Profile Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications.
26. ASTM F 2487 – Infiltration and Exfiltration Acceptance Testing of Installed Corrugated High Density Polyethylene Pipelines.
27. ASTM F 2736 - 6 to 30 in. (152 to 762 mm) Polypropylene (PP) Corrugated Single Wall Pipe and Double Wall Pipe.
28. ASTM F 2764 - 30 to 60 in. Polypropylene (PP) Triple Wall Pipe and Fittings for Non-Pressure Sanitary Sewer Applications.
29. ASTM F 2881 - 12 to 60 in. Polypropylene (PP) Dual Wall Pipe and Fittings for Non-Pressure Storm Sewer Applications

D. American Concrete Institute (ACI):

1. ACI 301 - Structural Concrete for Buildings.

E. UNI-Bell PVC Pipe Association:

1. UNI-B-6 – Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe.

1.4 SUBMITTALS

A. Project Record Documents:

1. Submit manufacturer information on all pipe, fittings, seals, etc. that will be used for the installation of the system.
2. Accurately record actual locations of pipe runs, connections, catch basins, cleanouts, and invert elevations.
3. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.

1.5 PROJECT CONDITIONS

- A. Coordinate work with termination of storm sewer connection outside building including connection to municipal storm sewer system.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

- A. Pipe and joint materials specified below for storm drainage shall be strictly limited to the extent shown or allowed on the drawings or as specified in Part 3 hereinafter.
- B. Reinforced Concrete Pipe (RCP): ASTM C 76, Class III unless noted otherwise on Drawings.
1. Joint Material: Provide joints to the extent allowable in Part 3 Joints.
 - a. Rubber O-ring Gasket: ASTM C 443, ASTM C 1628.
 - b. Bitumen or Butyl-Rubber Sealant: ASTM C990.
 2. Flared End Sections: ASTM C 76 or, for sections with toe wall, AASHTO M 170.
- C. Ductile Iron Pipe (DIP): ASTM A 746.
1. Fittings: Cast iron, ASTM A 74.
 2. Joint Material: Rubber Gasket, ASTM C 564 for compression joints.
- D. Polypropylene Pipe (PP): AASHTO M 330, ASTM F 2881, F2736, and F2764. Use only where specifically indicated on Drawings.
1. Joint Material: As shown in table in Part 3 for the type of joint allowed.
 - a. Rubber Gasket: ASTM F477
 - b. Rubber Gasket Joints: ASTM 3212.

- E. High Density Polyethylene Pipe (HDPE): AASHTO M 252 Type S or SP, M 294 Type S or SP, or ASTM F 2306 smooth interior/annular exterior. Use only where specifically indicated on Drawings.
 - 1. Joint Material: As shown in table in Part 3 for the type of joint allowed.
 - a. Rubber Gasket: ASTM F477
 - b. Rubber Gasket Joints: ASTM 3212.
 - c. Corrugated Coupling Bands: As recommended by manufacturer.
- F. Polyvinyl Chloride (PVC) Pipe: ASTM D 3034, rated SDR 35, or ASTM F 949 for Profile Pipe, continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM D3034 classification. Only permitted when specifically indicated on Drawings.
 - 1. Joint Material: As shown in table in Part 3 for the type of joint allowed.
 - a. Rubber Gasket: ASTM F477
 - b. Rubber Gasket Joints: ASTM 3212.
- G. Corrugated Steel (Metal) Pipe (CSP or CMP): ASTM A 760, pipe gauge shall be as shown on the drawings. Galvanized, aluminized (Type 1R), or bituminous coated as specified on Drawings. Use only where specifically indicated on Drawings. Corrugated steel pipe may be round pipe, arch pipe, or slotted drainpipe as indicated on Drawings. Slotted drainpipe shall have 1.75-inches wide drain waterway openings and 6 inches minimum height drain guide.
 - 1. CSP, bands and appurtenances shall be uniformly coated inside and outside with a 0.05 inch minimum thickness bituminous coating in accordance with AASHTO M 190.
 - 2. CSP shall be supplied with paved inverts or fully lined to provide a smooth interior, smooth flow lining only as indicated on the drawings.
 - 3. Joint Material:
 - a. Semi-corrugated "Hugger" type bands and "O" ring gaskets.
 - b. Semi-corrugated "Hugger" type bands.
- H. Spiral Rib Metal Pipe: ASTM A760 Type 1R or Type IIR. Coatings shall meet requirements of ASTM A 929 and shall be galvanized, aluminized, or bituminous coated as specified on Drawings. Use only where specifically indicated on Drawings.
 - 1. Pipe gauge shall be as shown on the construction drawings. Standard corrugated steel pipe (CMP or CSP) shall not be substituted for Spiral Rib Metal Pipe.
 - 2. Acceptable manufacturers: Provide the following or approved equal:
 - a. Ultra Flo or Ultra Flo II by Contech, Inc.
 - b. Max Flow by Southeast Culvert, Inc.
 - c. Max Flow by St. Regis Culvert, Inc.
 - d. Max Flow by Thompson Culvert, Inc.
 - 3. Joint Material: Provide joints to the extent allowable in Part 3 Joints.
 - a. Semi-corrugated "Hugger" type bands and "O" ring gaskets.
 - 4. Semi-corrugated "Hugger" type bands.
- I. Subdrains: Perforated, PVC or flexible corrugated HDPE pipe as specified herein of the size indicated on the drawings.

2.2 ACCESSORIES

- A. Encasement for Piping: ASTM A 674. Where required for corrosion protection for underground iron pipe and fittings.
 - 1. Material: High-density, crosslaminated polyethylene (PE) film of 0.004-inch (0.10-mm) minimum thickness.
 - 2. Form: Sheet or tube.
 - 3. Color: Black.

2.3 DRAINAGE STRUCTURES

- A. Manholes: Conform to Section 02536.

- B. Grates and Frames: Provide in accordance with details shown on Drawings or equivalent by one of the following acceptable manufacturers. Project needs vary depending on geographic region. To be connected with the best suited supplier, contact the manufacturer whose territory is nearest Project location.
1. Acceptable Manufacturers:
 - a. South, Southeast, East Central: [US Foundry](#) (An Eagle Manufacturing Co.). Contact Roy Kohlier, (800) 432-9709 or (786) 402-3435. rkohlier@usfoundry.com
 - b. Central, West Central, and East of Mississippi River: EJ Infrastructure Access Solutions d/b/a. [East Jordan Iron Works](#). Contact Joe Lazzati, Director of Sales, (410)-833-6100; mobile (443) 324-4589. joe.lazzati@ejco.com.
 - c. West, Northwest, Southwest, West Central: [D&L Foundry and Supply](#) (801) 785-5015.
 - d. Central, North Central: [Deeter Foundry](#). (800) 234-7466. sales@deeter.com
 - e. Northeast: [Neenah Foundry](#). (800) 558-5075.
 2. Standard Grates and Frames: Heavy duty grates, AASHTO M 306 load rating of H-20, with maximum slot width of 1-1/8" and minimum width of 1". Where project and regional conditions allow, provide one of the following:
 - a. Model 4230V-3 Grate and Frame by East Jordan (WM custom design).
Model 2512-1002 Grate (2 required) and 2512-0010 Frame by Deeter (WM custom design).
 3. Siphonic Break Manhole Grate and Frame: Heavy duty grate, AASHTO M 306 load rating of H-20, with maximum slot width of 1/2" and minimum net open area of 1.5 square feet. Where project and regional conditions allow, provide the following:
 - a. Model R-2750 Grate and Frame by Neenah (WM custom design).
- C. Concrete: Cast-In-Place concrete for drainage structures including manholes, inlets, catch basins, collars, support blocks, headwalls and paved ditches shall conform to the concrete requirements specified in Section 03311.
- D. Cement Mortar used for paving inverts, filling lift holes, joints, patching and anchoring castings shall consist of one part Portland cement, type I, ASTM C 150, 1/4 part hydrated lime, ASTM C 206 and 2-1/2 parts clean, well-graded sand and water free of suspended matter, alkali, and containing no industrial or domestic waste.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that trench cut and excavation is ready to receive work and excavations, dimensions, and elevations are as indicated on Drawings.

3.2 PREPARATION

- A. Hand trim excavations to required elevations. Correct over-excavation with bedding material.
- B. Remove large stones or other hard matter that could damage piping or impede consistent backfilling or compaction.
- C. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by licensed land surveyor and replaced, as necessary, by same.

3.3 INSTALLATION – PIPE

- A. Install type of pipe shown on the drawings. Where type of pipe material is not shown or restricted on the drawings, provide only RCP or DIP. Installation provisions herein shall apply to the extent as applicable to the pipe and joints allowed.
- B. Inspect pipe for defects and cracks before being lowered into the trench, piece by piece. Remove and replace defective, damaged or unsound pipe or pipe that has had its grade disturbed after laying. Protect open ends with a stopper to prevent earth or other material from entering the pipe during construction. Remove dirt, excess water, and other foreign materials from the interior of the pipe during the pipe laying progress.
- C. Excavate pipe trench and place bedding material in accordance with Section 02300.

- D. Install pipe in accordance with manufacturer's written recommendations.
- E. Thermoplastic Pipe: Install pipe in accordance with pipe manufacturer's installation instructions and ASTM D 2321 and as indicated on the drawings.
- F. Corrugated or Spiral Rib Metal Pipe: Install as indicated on the drawings, as recommended by the manufacturer, and in accordance with ASTM A 798 and A 796 as they apply.
- G. HDPE Pipe: Install pipe in accordance with pipe manufacturer's installation Guidelines for Culvert Storm Drainage Applications and as indicated on the drawings.
- H. Install polyethylene corrosion-protection encasement around iron piping as indicated on the drawings, as recommended by the manufacturer, and in accordance with ASTM A 674.
- I. Commence installation at the lowest point for each segment of the route. Lay RCP with the groove or bell end upstream. Place riveted CSP with the inside circumferential laps pointing downstream. Repair damaged bituminous coating on CSP by applying bituminous material conforming to AASHTO M190.
- J. Lay pipe to the required line and slope gradients with the necessary fittings, bends, manhole, risers and other appurtenances placed at the required location as noted on Drawings.
- K. Do not displace or damage pipe when compacting.
- L. Do not place pipe in water or when trench conditions are unsuitable for such work.
- M. Joints: Construct joints as described herein and in accordance with manufacturer's installation instructions. Provide pipe joint type for soiltight, silttight, or watertight silttight or watertight only watertight only joint performance in accordance with the following table. Rubber gasketed joints shall conform to ASTM D 3212. The table applies only to the extent as applicable to the pipe and joint type and the joint performance as shown or specified.

Pipe and Joint Type	Joint Performance		
	Watertight	Silttight	Soiltight
RCP			
Rubber O-Ring Gasket	x	x	x
Bitumen or Butyl Rubber Sealant			x
DIP			
Rubber Gasket	x	x	x
PP			
Rubber Gasket	x	x	x
HDPE			
Rubber Gasket	x	x	x
Corrugated Coupling Bands			x
PVC			
Rubber Gasket	x	x	x
CMP or Spiral Rib Aluminum Pipe			
Hugger Band w/ O Ring Rubber Gasket		x	x
Hugger Band			x

3.4 INSTALLATION – MANHOLES, CATCH BASINS, INLETS, AND JUNCTION BOXES

- A. Construct drainage structures in accordance with details shown on Drawings and in accordance with Section 02536 as applicable.
- B. Precast Sections:
 - 1. Install precast section with bases in accordance with Section 02300 and 02536 or as shown on drawings.
 - 2. Align pipe openings to that of the pipe entering and leaving the manhole, etc. Properly Pipe with connections to manholes, etc. as shown on the drawings.
- C. Invert channels shall be smooth and accurately shaped to a semicircular bottom conforming to the inside of the adjacent sewer section. Shape invert channels and structure bottoms with cement mortar. Changes in size and grade of invert shall be made gradually and evenly. Changes in direction of the sewer entering branch or branches shall have a true curve of as large a radius as the manhole will permit.
- D. Frames and Covers:
 - 1. Set frames and covers to the proper elevation. Firmly embed frames in mortar approximately 1 inch thick and align to fit the top section of the structure.
 - 2. Limit bricks set in mortar and used to adjust the frame to finished grade to no more than four courses.
 - 3. Adjustment rings used to make adjustments in grade shall be made with the initial ring embedded in mortar and the exterior of the rings parge with mortar not less than 1/2 inch thick. No adjustment made in this manner shall exceed 8 inches.
- E. Construct concrete cradles as shown on the drawings and in accordance with the strength requirements of the Architectural Structural Specification as needed when crossing over and under sewer pipe or utility lines.

3.5 SUBDRAINS

- A. Install subdrains in accordance with the details and at the locations shown on the drawings.

3.6 INSPECTION AND TESTING

- A. General:
 - 1. Clean, inspect, and test storm sewer systems and culverts, upon completion or at such time as directed. The system or culvert shall have a true grade and line. Actual elevations shall be within 0.08 feet of the elevations given on the drawings.
 - 2. After completion of the Work, or any part thereof, the job shall be tested to determine that it has been installed in accordance with the drawings and specifications. In general, the Work shall prove to be in good condition, installed in accordance with the drawings and specifications and ready for use.
- B. Cleaning and Testing:
 - 1. Visibly inspect and remove all debris and obstructions from storm pipe.
 - 2. Test for infiltration and exfiltration by hydrostatic testing per ASTM C 969. Manholes and concrete pipe shall conform to ASTM C 969 leakage criteria.
 - 3. Test watertight joints in accordance with the requirements of jurisdictional authorities, UNI-B-6 and the following:
 - a. Option: Test plastic piping according to ASTM F 1417 or ASTM F 2487.
 - b. Option: Test concrete piping according to ASTM C 924 or ASTM C 969.
- C. Alignment Test: After backfill has been placed and compacted to a depth not less than one foot above top of pipe, a visual inspection shall be made by flashing a light between manholes. Correct displacement or misalignment of invert.

END OF SECTION

SECTION 20 0213 - BASIC PIPING

PART 1 GENERAL

1.01 GENERAL

- A. Scope
 - 1. This section covers the minimum basic requirements of above ground piping systems. For details refer to APPLICABLE SECTIONS below.
- B. Codes
 - 1. The work performed shall comply with the applicable codes of ANSI, NFPA and the current edition International Plumbing Code.

PART 2 PRODUCTS

2.01 PIPING, FITTINGS AND VALVES

- A. Materials shall be in accordance with the Line Specifications appended to the APPLICABLE SECTIONS of these specifications.

2.02 HANGERS

- A. Refer to Section 20 05 29: HANGERS AND SUPPORT DEVICES.

PART 3 EXECUTION

3.01 GENERAL

- A. Connections, re-routing, and tie-ins to existing utilities shall be approved by and scheduled with the proper authorities to assure uninterrupted service throughout the facility. The Contractor shall be responsible for locating existing utility lines and will plan the relocation work so that service interruptions shall be of minimum duration.
- B. Pipe shall be accurately cut to insure square ends and to measurements established at the site and shall be worked into place without springing or forcing, properly clearing all openings and equipment.
- C. High points of the systems, other than refrigerant, shall be vented and low points provided with plugged drains, one-half inch (1/2") in size.
- D. Fittings shall be used for all changes of direction or branch take-offs in the piping system except where specifically shown otherwise on the drawings. Mitering pipe to form elbows, cutting into straight runs to form tees, or any similar construction, is not permitted.
- E. Dielectric joints shall be installed at all joining of dissimilar metals except valves.
- F. Bushings for changes in line size shall not be permitted unless specifically indicated on the drawings.
- G. Cutting or other weakening of structural members to facilitate piping installation will not be permitted unless approved by the Architect.
- H. Piping shall not be used to support equipment, connected or otherwise, unless the plans and specification require such installation. When necessary, adequate temporary supports shall be installed during erection so as not to over-stress piping, or equipment to which piping is connected. Except as indicated on drawing details or required by other limiting conditions, all piping and equipment within buildings shall be entirely out of the way of equipment, lighting fixtures, doors, windows and other openings. Overhead piping in buildings shall be run in the most inconspicuous positions and parallel to the walls of the structures unless otherwise indicated on the drawing.
- I. Adequate clearances shall be provided from walls, ceilings and floors to permit the assembly of joints. All control valves shall have ample clearance for disassembly without disturbing equipment or other piping.
- J. Pipe sleeves shall be provided where pipes pass through masonry or concrete walls, roofs and partitions. Sleeves in outside walls in floor and roof slabs, shall be zinc-coated steel pipe

unless otherwise specified. Sleeves in partitions shall be sheet steel of 26 gage minimum. Space between pipe, or insulation and sleeve shall not be less than 1/4 inch. Sleeves shall be held securely in proper position and location. All sleeves shall be of sufficient length to pass through entire thickness of walls, partitions or slabs.

- K. Take down joints shall be installed at all connections to equipment and fixtures; at all points where it is necessary to disconnect piping for repairs or maintenance; and on the control side of valves on branches and risers.
- L. Start-up strainers shall be installed up stream and adjacent to all items of equipment. They shall be in service and cleaned periodically for ten full days of operation and then permanently removed from the system.
- M. Painting and identification of piping, valves, hangers and supports shall be in accordance with SECTION 20 01 00 - GENERAL PROVISIONS. All exposed piping shall be painted and only black steel piping in concealed spaces shall be painted.

3.02 HANDLING AND STORAGE

- A. Pipe and fittings shall be handled in such a manner as to prevent damage such as bending of metal pipes or cracking and breaking of plastic pipes. Care shall also be taken to keep both inside and outside free from dirt.
- B. Plastic pipe shall be stored on racks with a minimum support spacing of three feet if delivered loose and if delivered in lifts, the lifts shall not be stacked more than three high
- C. Fittings shall be kept free from dirt and stored indoors.
- D. Solvents cements and primers for plastic pipe shall be handled and stored and the empty containers disposed of in a manner that provides the maximum safety to personnel and property.

3.03 INITIAL CLEANING

- A. Minimum requirements for internally cleaning of piping systems shall consist of removing "loose" foreign materials such as scale, sand, weld spatter particles, cuttings, chips, etc. from inside of assembly by any suitable means such as a mechanically driven rotary cleaning tool or wire brush, etc; blowing out all loosened particles with dry compressed air; and inspecting the inside of pipe assembly for cleanliness.

3.04 SOLDERED JOINTS

- A. The outside surface of the pipe where engaged in the fitting and the inside surface of the fitting in contact with the pipe shall be cleaned to a bright surface with an abrasive material before soldering. Apply a thin coating of flux to both the pipe and interior of the fitting before telescoping the two parts together.
- B. Care shall be taken in the heating of the joints so that the solder will flash and provide a full solid joint.

3.05 THREADED JOINTS

- A. Threaded joints shall be the American Standard Taper Pipe Thread (NPT), and shall conform to ANSI B 2.1. Pipe threads shall be cut sharp and smooth, and threading dies and taps shall have a threading stop to prevent overcutting the thread length. Power threading equipment dies shall have a 5 negative front rake when set on plastic pipe. Hand threading dies for plastic pipe shall have a 5 to 10 negative front rake.
- B. In threading plastic pipe a tapered plug shall be inserted in the end of the pipe to provide support and prevent distortion to the pipe in the threaded areas. The liberal use of an external lubricant shall be used while threading.
- C. After cutting and threading, the pipe shall be end-reamed to full internal pipe diameter. Before applying sealant, thread shall be wiped clean of cuttings and grit.
- D. Thread tape sealant shall be used, applied on male threads only, and shall be PTFE type, Caulking of threaded joints to stop or prevent leaks shall not be permitted.

- E. Where galvanized pipe has been threaded and connected, the exposed threads at couplings, fittings and appurtenances shall have a coat of corrosion resistant paint applied.

3.06 SOLVENT CEMENTED - PLASTIC

- A. Apply primer to the pipe and freely in the socket keeping surface wet and applicator wet and in motion 5 to 15 seconds. Avoid puddling in the socket. Apply primer a second time to the fitting socket.
- B. For checking penetration, scratch or scrape a few thousandths of the primed surfaces away. Repeated applications to either or both surfaces may be necessary. Weather conditions affect priming action. In cold weather more time is required for proper penetration.
- C. Apply a full even layer of cement on the pipe O.D. for a distance slightly greater than the depth of the socket of the fitting. Coat the fitting socket with a medium layer, avoiding puddling. On belled end pipe, do not coat beyond the socket depth or allow cement to run beyond the bell. Put a second full even layer of cement on the pipe O.D. Cement layers must be without void and sufficient to fill any gap in the joints.
- D. Immediately upon finishing cement application and before it starts to set, insert the pipe to the full socket depth while rotating the pipe or fitting a 1/4 turn to insure complete and even distribution of the cement. Hold joint together for a minimum of 10 to 15 seconds to make sure that pipe does not move or back out of the socket.
- E. For pipe sized 6" and larger, a joining crew consisting of two men is required and the following additional steps necessary:
 - 1. Rotation of the pipe in the fitting may be omitted.
 - 2. Hold joint together for 1 to 3 minutes depending on pipe size.
 - 3. As an aid for joining in these larger sizes, it is recommended that a come-along or pipe joining tool be used.
- F. Immediately, after joining and before joint is set, gently place it back onto a level surface, wipe off all excess cement from the circumferences of the pipe and fitting.
- G. When the atmospheric temperature is above 90 F to avoid excessive evaporation of the solvent from the cement just prior to joining use one or a combination of the following:
 - 1. Shade or shelter the joint surfaces from direct exposure to the sun's rays for at least one hour prior to joining and during the joining process.
 - 2. Make cement joints during early morning hours.
 - 3. Apply cement quickly. On 6" and larger pipe, it is recommended that two men apply cement to pipe surface while the third applies it to the fitting socket.
 - 4. Join pipe to fittings as quickly as possible after applying cement.
- H. All potable water pipes, pipe related products, and materials that join or seal pipes conform to ANSI/NSF 61.
- I. All solvent cements and primers used to join and seal PVC materials shall comply with the requirements of ANSI/NSF 14.

3.07 PIPE SUPPORTS

- A. Refer to Section 20 05 29: Hangers and Support Devices

3.08 ORDINARY CLEANING

- A. Before cleaning a system such items as safety valves, level controls, orifice plates, strainers, rupture discs, all instruments not tagged or marked with a test pressure and all other items which may be damaged by the cleaning-flushing operation, shall be removed from the line.
- B. Prior to testing all piping systems shall be cleaned and purged to the satisfaction of the Architect. The purge point for liquid and gas piping systems shall be lowest and highest points respectively in the system unless otherwise specified. The Contractor shall exercise due care in filling, flushing, purging, venting and draining piping systems. The Contractor shall be responsible for damage resulting from excess vacuums when draining piping systems.

- C. All piping systems shall first be purged with compressed air at a pressure not greater than half of the system operating pressure. Purge duration shall continue until there is no visible discharges from openings or 10 minutes, whichever is greater.
- D. All piping systems shall secondly be purged with the flow medium of the system. Flushing shall continue for 5 minutes or until the discharge is free of particulate matter, whichever is greater.

3.09 TESTING

- E. The contractor shall furnish all test gauges, accurate relief valves to prevent over test-pressuring, the test medium, piping of the test medium, and where required, the necessary pumping device to develop and maintain the proper test pressure. Test gauges shall be supplied by the contractor and shall have dial diameters of at least 6 inches with scale capacity for test pressures. The gauge used on any test shall have a scale capacity of as close as possible to twice the specified test pressure using standard dials. All test gauges shall be checked on a dead-weight tester or shall be compared against a certified master gauge.
- F. The Contractor shall be responsible for the removal of water used in testing from all piping systems including attached vessels. Where ditches or temporary lines to ditches are necessary, the Contractor shall provide same, and after use, such ditches or lines shall be removed, leaving the area in its original or equal condition as determined by the Engineer.
- G. During hydrostatic testing, provision shall be made for the venting of trapped air at all high points and other places in the system where air pockets may occur.
- H. A safety or relief valve may be used at the pressure source to protect systems under test. Pressure applied on any system shall not exceed the specified test pressure by any amount and any damage resulting from neglect of this requirement shall be the responsibility of the Contractor.
- I. All the piping of the plumbing system shall be tested with water or air. After the plumbing fixtures have been set and their traps filled with water, the entire drainage system shall be submitted to final tests. The pressure has reached all parts of the system.
- J. The water test for the plumbing system shall be applied to the drainage system either in its entirety or in sections. If applied to the entire system, all openings in the piping shall be tightly closed, except the highest openings and the system filled with water to point of overflow. If the system is tested in sections, each opening shall be tightly plugged except the highest openings of the section under test, and each section be filled with water, but no section shall be tested with less than a ten foot head of water. In testing successive sections at least the upper ten feet of the next preceding section shall be tested, so that no joint or pipe in the building (except the uppermost 10 feet of the system) shall have been submitted to a test of less than a ten foot head of water. The water shall be kept in the system, or in the portion under test for at least fifteen minutes before inspection starts; the system shall then be tight at all points.
- K. The air test for the plumbing system shall be made by attaching an air compressor or testing apparatus to any suitable opening and after closing all other inlets and outlets to the system, forcing air into the system until there is a uniform gauge pressure of five pounds per square inch or sufficient to balance a column of mercury ten inches in height. This pressure shall be held without introduction of additional air for a period of at least fifteen minutes.
- L. The potable water system in its entirety or sections shall be tested in strict provisions of the International Plumbing Code, Current Edition.
- M. SMOKE TEST - Contractor to smoke test all sewer vent piping prior to wall being closed up. For all CMU block walls smoke test to be performed when walls are 50% formed up.
 - 1. When smoke testing a sanitary sewer system it is helpful to partially block off the section of sewer to be tested from the city main service line. This can be done by using a pneumatic sewer plug or rubber balloon for sealing off the building connections from main lines. Completely blocking the line can cause water to back up and prevent smoke from escaping through defects. Smoke testing may not be done after rain or when ground water is unusually high as this may also prevent detection of defects.
 - 2. Smoke is created using either a smoke bomb or liquid smoke. Smoke bombs are lit and placed on a grate or in a holder on top of each fan, while liquid smoke is injected into the

fan via a heating chamber. The fans create a pressure differential that forces the smoke into the sewer at a pressure just above atmospheric. With properly installed plumbing, the traps will prevent the smoke from entering the building and redirect it out the plumbing vents. Defective plumbing systems or dry traps will allow smoke to enter the inside of the building.

3. The area around the section being tested is searched for smoke plumes. Plumes coming from plumbing vents or the interface between the fan shroud and cleanout rim are normal; however, smoke plumes outside of the cleanout rim are not. Plumes are marked, usually with flags, and defects are noted using measurements from stationary landmarks like the corners of the building. The plumes or markers may also be photographed.
4. Procedure: Equipment Required for building connections and laterals:
 - a. Smoke bomb cartridges
 - b. Electric blower producing 180 CFM @ 1.3 static pressure is recommended.
 - c. Pneumatic sewer plug or rubber balloon for sealing off the building connections from main lines.
 - d. Vent cap with open center hole to restrict the flow of air and smoke.
5. Building Connections
 - a. It is not absolutely necessary to have the building line blocked off from the main, but doing so will increase test efficiency. In most cases there is a cleanout opening through which a plug or balloon can be inserted between the opening and the main, and then inflated. A length of windshield hose or similar type tubing can be attached to the balloon to facilitate inflation. Vents can be partially blocked allowing the air/smoke mixture to flow through the plumbing system.
 - b. Connect the blower to the line at a cleanout and start introducing the smoke through the intake side. NOTE: A properly sized blower is important. Use of a blower with lesser capacity will not generate sufficient pressure to disclose all faults in a line and a blower with too great a capacity may blow water from traps.
 - c. Check the interior of the building for smoke. Any smoke should be quickly ventilated by opening doors and windows. Notations should be made of leak locations. Next the yard should be checked for smoke and the location of any smoke marked for later correction of faults.
 - d. Smoke will leave no visible residue to damage interior of buildings. It is irritating to breathe, but any irritation will quickly disappear once exposure has ceased. Of course special precautions should be taken with persons having respiratory problems of any kind.
 - e. All buildings connected to the lines being tested should be checked for smoke. If a concentration of smoke is present, occupants should be evacuated and the building ventilated. If unvented, smoke will settle out of the air without leaving residue.

END OF SECTION

9-2-25

PROVISIONS RELATING TO EQUAL BRAND PRODUCTS

In conformance with Title 38 of the Louisiana Revised Statutes (Public Bid Law), whenever a specification refers to a particular brand, make, manufacturer, or definite specification, such reference is intended only to establish the quality standard of the product desired. It is not to be construed as limiting competition to the specific brand, make, manufacturer, or specification named. Equivalent products may be accepted, provided they meet the style, type, character, and quality required.

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

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

SECTION 01 11 00 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 SCOPE

- A. Generally, the work under this Contract shall be for all work done primarily within the construction/demolition work area and the construction/demolition of the following:
Project: **GONZALES MIDDLE RENOVATIONS & UPGRADES**
Architect's Project No.: 2408
Location: 1502 W Orice Roth Rd, Gonzales, LA 70737
- B. As described by the Contract Documents prepared by Gossen-Holloway-Cortez, A Professional Architectural Corporation, 315 East Second Street, Thibodaux, Louisiana, such work includes but is not necessarily limited to new construction as indicated and described by the bidding documents in Divisions shown below:
1. Architectural documents
 2. Civil documents
 3. Structural documents
 4. Mechanical documents
 5. Electrical documents
 6. Food Service documents
- C. Provisions and installation of specialty items, equipment and furnishings as specifically shown in the architectural, structural, mechanical, plumbing, electrical etc. as indicated and described by the bidding documents, etc. This shall include provisions of utility hook-ups, rough-ins, anchors, blocking, structural support, substructure and/or other work.
- D. The General Contractor, also referred to as the Contractor in the plans and specifications, shall be responsible for a complete and finished final product. He shall provide and furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishings and installation complete of all work under this contract as described above, in accordance with the provisions of the Contract Documents and completely coordinated with that of all other trades. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, safe, and complete installation shall be furnished and installed as part of this work. **The Contractor shall also provide all Subcontractors with a complete set of Contract Drawings and Specifications. Contractor and Subcontractors shall be responsible for their portion of work indicated on any drawing or in any specification included in the Contract Documents. Any Contractor or Subcontractor item shown or indicated on the Contract Drawings or described in the Contract Specifications shall be provided by the Contractor whether or not the items have been included on the shop drawings. (Note: Shop drawings are not part of the Contract Documents. The purpose of shop drawings is to serve as an aid to the Contractor, Subcontractors and Material Suppliers.)**
- E. **The General Contractor shall be responsible for providing positive and appropriate slope to drain all balconies, decks, patios, walks, driveways, grade adjacent to buildings, foundation drains, swales, interior slabs with floor drains, showers and shower seats, and built-up roofs, regardless whether the plans indicate the above areas or graphically portray or indicate slope. The final construction shall not permit ponding of water in any of the foregoing areas or any areas normally drained.**
- F. **The General Contractor shall take particular care during construction to provide all flashing placement. The General Contractor shall be required to take digital shots of flashing before covered or enclosed. The General Contractor shall also sign a statement indicating that all flashing required in the roof, at doors, at windows, walls, and any areas normally receiving flashing, etc. has been installed.**

- G. The General Contractor shall employ a full-time, qualified superintendent who is experienced in the field of construction. This superintendent must coordinate all phases of the project and shall remain on this project until final payment. **Superintendents working with tools will not be permitted.**
- H. The construction as shown and described in the Contract Documents consists of the following: (This is a partial list. Refer to the rest of this specification and drawings for additional notes and information.)
1. This project entails the building of a new one (1) story cafeteria building that will include a new kitchen for the campus along with a new platform and dining hall. The building will consist of the following spaces:
 - a. Dining Hall
 - b. Platform
 - c. Kitchen
 - d. Boys and Girls restrooms.
 - e. nonfood and food storage
 - f. Chair and table storage
 - g. Support spaces are mechanical room, sprinkler room, elec/data room, and janitor room.
 2. This building shall be sprinklered.
 3. The construction materials for the exterior construction shall be:
 - a. Running bond sealed modular brick.
 - b. Pre-finished composite wall panels.
 - c. Three coat true crack resistant stucco system at most exterior walls.
 4. The structural system is steel frame with light gage steel studs supporting a steel joist and corrugated roof deck structure.
 5. Interior walls consist of light gauge steel studs and painted gypsum board.
 6. The roof is a modified bitumen roof over a gypsum recover board over polyisocyanurate insulation board attached to metal roof deck anchored to bar joists at a 1:48 slope. The roof shall be guaranteed for a full 20 years with an unlimited penal sum (no dollar limit). Coverage of this guarantee shall include roof membrane, composition / base flashing, roof insulation system, and base sheet fasteners specified. This guarantee shall not be prorated.
 7. The ceilings will be constructed out of suspended acoustical tiles and grid.
 8. DEMOLITION
 - a. There is an existing basketball courts that have equipment that will need to be salvaged and reinstalled at another location on site.
 9. This project also entails the renovation of the existing cafeteria into new classrooms and building of a new one story classroom in addition to the existing building. The building will consist of the following spaces:
 - a. Classrooms
 - b. Teacher's work room
 - c. Boys and Girls restrooms
 10. The construction materials for the exterior construction shall be:
 - a. Pre-finished composite wall panels.
 11. The structural system is steel frame with light gage steel studs supporting a steel joist and corrugated roof deck structure.

12. Interior walls consist of light gauge steel studs and painted gypsum board.
 13. The roof is a modified bitumen roof over a gypsum recover board over polyisocyanurate insulation board attached to metal roof deck anchored to bar joists at a 1:48 slope. The roof shall be guaranteed for a full 20 years with an unlimited penal sum (no dollar limit). Coverage of this guarantee shall include roof membrane, composition / base flashing, roof insulation system, and base sheet fasteners specified. This guarantee shall not be prorated.
 14. The ceilings will be constructed out of suspended acoustic tiles and grid.
 15. DEMOLITION
 - a. There is an existing cooler freezer building that will need to be demolished and removed from the site in order to construct the new classroom addition.
 - b. The entire existing cafeteria will be demolished per the plans in preparation for the new classroom buildout.
 16. SITE
 - a. There is site lighting as part of this project.
 - b. There is site subsurface drainage as part of this project.
 - c. There is site seeding and sodding as part of this project.
 - d. There are aluminum canopies as part of this project.
 - e. There are site sidewalks as part of this project.
 - f. There are basketball courts as part of this project.
 - g. There are both aluminum and steel fencing systems as part of this project.
 - h. There are split face fencing walls as part of this project.
- I. **All construction workers on the project site shall be required to wear a plastic laminated badge clipped to their clothing at all times. This badge shall include the construction worker's/personnel's full name, company name, and a photo of construction worker/personnel. All construction workers on the project shall wear a hard hat when within the security fencing area that encloses the perimeter of the construction site. Note: All construction workers shall sign-in with the superintendent of the project. A copy of this sign-in sheet shall be emailed to the Architect's office monthly after all workers have signed in for each week of that month. If additional workers arrive during the day that had not signed the morning sign-in sheet, these additional worker's names shall be included in the monthly email. This shall occur for every workday until the completion of the project. (A copy of the monthly log can be provided to the Architect at the monthly meeting in lieu of emailing the log to the Architect.)**
- J. **The General Contractor shall have a representative of their company, preferably the job supt., attend the Ascension Parish School Board Facilities Planning Meeting that is held once a month to review construction projects. The successful contractor shall be responsible to contact the Ascension Parish School Board, monthly, to find out the exact date of this committee meeting.**
- K. **A FULL SUBMITTAL, INCLUDING A COMPLETE SET OF ENGINEERING CALCULATIONS ILLUSTRATING THE PROPOSED CANOPY COMPONENTS MEET THE CURRENT BUILDING CODES, SHALL BE SUBMITTED AS SHOP DRAWINGS. THESE CALCULATIONS SHALL INCLUDE FOOTING DESIGNS, WITH STEEL AND CONCRETE REQUIRED TO MEET THE 129 MPH (V ult) WIND REQUIREMENTS. THESE CALCULATIONS AND FOOTING DESIGNS SHALL HAVE AN ENGINEER'S STAMP AFFIXED TO THE CALCULATIONS AND DRAWINGS.**
- L. **FOR INSPECTIONS ON CONCRETE REINFORCING STEEL, CAST-IN-PLACE CONCRETE, ETC. THE CONTRACTOR SHALL GIVE THE ARCHITECT, OWNER, STRUCTURAL ENGINEER, CIVIL ENGINEER AND OWNER'S TESTING LAB A**

MINIMUM OF 24 HOURS ADVANCE NOTICE BY EMAIL AND PHONE. EMAIL ADDRESSES WILL BE PROVIDED AT THE PROJECT PRE-CONSTRUCTION MEETING. ALSO, THE FORM WORK AND STEEL SHALL BE REVIEWED BY THE APPROPRIATE CONSULTANT (48 HOUR MINIMUM NOTICE) BEFORE GIVING THE 24 HOUR NOTICE FOR A POUR. IF A MINIMUM OF 24 HOUR NOTICE IS NOT GIVEN OR THE CONCRETE SLUMPS ARE OUT OF SPECS, THE POUR IS SUBJECT TO BEING REJECTED. CONCRETE CORES MAY BE REQUIRED BY THE OWNER. ANY CORES THAT ARE PERFORMED AT THE SUBJECT AREA SHALL BE PAID FOR BY THE CONTRACTOR WHETHER OR NOT THEY MEET THE CONTRACT DOCUMENT DESIGN STRENGTH.

1.2 DIVISION OF RESPONSIBILITY

- A. These specifications are prepared in such a way as to distinguish as much as is possible the responsibilities and work of the Contractor, Subcontractor and Material Suppliers generally using the CSI Master Format. **It shall be the responsibility of the Contractor to determine whether all phases of the work are included in his proposal at bid time and during construction who has the actual responsibility to perform the work as long as all parties are capable, so far as experience and ability are concerned, to do so.**
- B. If there are certain items that shall be either furnished by the Owner or furnished under separate contracts, the General Contractor shall be responsible for determining his responsibilities under this contract in regard to materials, equipment, and/or work not in the contract. The General Contractor **shall be responsible for coordination with the Owner's separate Contractors** because the Owner's separate Contractors operations will be conducted simultaneously with work under the Prime Contract being performed by the General Contractor. Instructions are generally included within these specifications under the specific items or work to be done and/or on the contract drawings. Some of the work to be done under separate contracts are as follows:

1. OWNER PROVIDED / OWNER INSTALLED ITEMS

- a. The Owner shall provide and install cameras. (Rough-in boxes and conduits and **CABLING** shall be part of this project and taken care of by this Contractor, not the Owner's Contractor. Refer to electrical sheets in the Contract Documents for work performed by this Contractor.)
- b. Owner provided door access system:
1. Contractor to provide rough-in for future Owner provided access system. All other exterior doors, noted on electrical sheets, shall have keypad rough-ins (Contractor shall provide conduit concealed in wall, rough-in box and pull string. Refer to electrical sheets in the Contract Documents for work performed by this Contractor.)
- c. The Owner will have an independent geotechnical engineer testing soils.
- d. The Owner will have an independent construction testing company which the Contractor will have to coordinate with.
- e. The Owner will have an independent testing and balancing (TAB) company, which the Contractor will have to coordinate with.
- f. **The Owner shall provide and install their own pest control pre-treatment beneath the foundation. The Prime Contractor of this project shall coordinate with the Owner's pest control company.**
- g. All of the moveable equipment as indicated by "Not in Contract (NIC)" in Contract Documents is Owner Provided and Installed. The Prime

Contractor of this project shall coordinate with the Owner or Owner's Contractor. (Refer to Electrical and Mechanical for additional information concerning equipment service / utilities.)

2. OWNER PROVIDED / CONTRACTOR INSTALLED ITEMS

a. Review plans for locations of Owner-furnished and Contractor installed products. The work shall include providing rough-in and support systems to receive Owner's equipment, connecting equipment, plumbing, mechanical and electrical connections. The following are procedures for Owner-furnished products:

1. Owner will arrange for and deliver shop drawings, product data and samples to Contractor.
2. Owner will arrange and pay for delivery of Owner-furnished items according to Contractor's construction schedule.
3. After delivery, Owner will inspect delivered items for damage. Contractor shall be present for and assist in Owner's inspection.
4. If Owner-furnished items are damaged, defective, or missing, Owner will arrange for replacement.
5. Owner will furnish Contractor the earliest possible delivery date for Owner-furnished products. Using Owner-furnished earliest possible delivery dates, Contractor shall designate delivery dates of Owner-furnished items in Contractor's construction schedule.
6. Contractor shall review shop drawings, product data, and samples and return them to the Architect noting discrepancies or anticipated problems in use of product.
7. Owner is responsible for receiving, unloading, and handling Owner-furnished items at project site.
8. Contractor is responsible for protecting Owner-furnished items from damage after installation by the Contractor.
9. If Owner-furnished items are damaged as a result of the Contractor's operations, Contractor shall repair or replace them.

C. The General Contractor shall cooperate fully with Owner's separate Contractors so work being performed on separate contracts may be carried out smoothly without interfering with or delaying work under the Prime Contract of this Contractor.

D. OWNER-FURNISHED PRODUCTS REQUIRING CONTRACTOR ROUGH-IN

1. Review plans for locations of Owner-furnished and Contractor rough-in products. The work shall include providing rough-in and support systems to receive Owner's equipment.

1.3 WARRANTY PERIODS

A. Unless specified otherwise for individual and particular parts of the work, all workmanship, materials and equipment included in the work of the contract shall be unconditionally guaranteed for a period of one (1) year from the date of substantial completion of the project.

Final acceptance of the project shall be the date established by the Architect as the date when final payment to the contractor is due.

This one (1) year warranty shall have no effect on other longer warranties required elsewhere in these specifications and drawings (Contract Documents).

- B. During the warranty period, if any phase of the work is found to be defective in quality or workmanship, the Owner or his representative may, upon demand, require that the Contractor correct the defect by repair or entire replacement of equipment and/or materials as the situation demands. **When this becomes necessary, the warranty period, for the defective work only, shall be extended for a period of one (1) year from the date of acceptance of the new work.**
- C. **UNLESS SPECIFIED OTHERWISE IN SECTIONS OF THESE SPECIFICATIONS, WARRANTIES OR GUARANTEES SHALL BEGIN ON THE DATE OF SUBSTANTIAL COMPLETION OF THE PROJECT.**

1.4 PERMITS AND CODES

- A. The General Contractor shall be responsible for all permits, licenses, fees, and other requirements by Federal, State, Parish, and Local agencies, governments, etc. of specific interest to the General Contractor in the **GONZALES MIDDLE RENOVATIONS & UPGRADES**.
- B. The General Contractor shall be responsible for compliance with all codes, regulations, ordinances and laws specifically of interest is the disposal of trash and debris, burning on site and transportation through the local Parish or County. Familiarization with all special restrictions and requirements is the sole responsibility of the General Contractor prior to bidding.
- C. Occupational Safety and Health Administration (OSHA) is for the workplace and those working in it. The regulations are naturally a **prime responsibility of the contractor** including OSHA Regulation 1926.52 for lead removal. In matters of the interpretation of the meaning of the regulations not specifically set forth, it is the contractor's responsibility to determine the correct specified interpretation of the means and methods he chooses to use on this project.
- D. Familiarization with all special restrictions and requirements is the sole responsibility of the General Contractor prior to bidding.

1.5 ORDERING AND DELIVERY OF PRODUCTS

- A. **It is important for Contractor, Subcontractors, and Materials Suppliers to order products specified to be used in the project as soon as possible. Failure to order promptly any products specified, especially those with long delivery dates, may cause the project to be delayed and will not constitute a valid reason for substitution of a different product in order to save time. It is the responsibility of those who furnish the products, to this project, to order them promptly and problems caused by their procrastination will also be an assumed responsibility.**

1.6 EXEMPTION FROM STATE AND LOCAL TAXES

- A. The Contractor, Subcontractors, and Material Suppliers on this project shall be exempt from State and Local Sales and Use Taxes.
- B. The Contractor is informed that effective July 12, 1999, Act 1288 (see copy below) that the purchase of materials and supplies by Contractors and/or subcontractors are exempt from local and state sales taxes on public works contracts by public entities.

- C. The Ascension Parish School Board (Owner) shall enter into a separate contract with the Contractor with the Guaranteed Maximum Price supplied by said contractor a designated agent of the Owner which will thereby make the Contractor, Subcontractors and Material Suppliers exempt from payment of local and state sales taxes for the purchase of materials and supplies to be incorporated into the project: **GONZALES MIDDLE RENOVATIONS & UPGRADES**. Said separate contracts will be entered into by the Owner and any Subcontractors or Suppliers as may be required to insure and maintain said tax exemption. A copy of the contract title "Contract for LA R.S. 47:301 (8)(C) Tax Exemption" is included herein.

ACT No. 1288

HOUSE BILL NO. 1381

(Duplicate of Senate Bill No. 882)

BY REPRESENTATIVE MONTGOMERY AND
SENATOR LANDRY

AN ACT

To enact R.S. 38:2212 (R), relative to the Public Bid Law; to exempt certain purchases of materials and supplies by certain contractors and subcontractors awarded public works contracts by a public entity; and to provide for related matters.

Be it enacted by the Legislature of Louisiana:

Section 1. R.S. 38:2212 (R) is hereby enacted to read as follows:

§2212. Advertisement and letting to lowest responsible bidder

* * *

R. The provisions of this Section shall not apply to purchases of materials and supplies by contractors awarded public works contracts by a public entity; or to subcontractors of said contractors, who have been appointed or designated agents for the purchase of materials and supplies to be incorporated into a public work pursuant to a contract properly bid in accordance with this Chapter when acting pursuant to said appointment or designation.

* * *

Approved by the Governor, July 12, 1999.

A true copy:

W. Fox McKeithen
Secretary of State

- D. The Contractor is informed that effective September 11, 1991, Act 1029 of the 1991 Regular Session of the Legislature exempts that state, cities, parishes and other political subdivisions and their agencies, boards and commissions from state and local sales and use taxes. The Contractor should be aware that materials and equipment which are affixed to and made a part of the project such that they become immovable property and permanently incorporated into the project or work may qualify for the exemption. The Contractor shall apply for an exemption from state and local sales and use taxes as agent of and on behalf of the Contracting Agency. The Owner and Contractor agree to execute any and all forms required to obtain or maintain tax exemption. The contractor is still responsible for payment of all taxes on nonexempt items necessary in the construction of the project.
- E. In keeping with Louisiana Revised Statute 47:301 (8) (C) (Act 1029 of the 1991 Regular Session), the contractor shall not pay any State, Ascension Parish or Ascension Parish School Board, (hereinafter referred to as "Local") sales taxes or State or local use taxes on materials and equipment which are affixed to and made a part of the real estate of the project or work (hereinafter referred to as "exempt items").

- F. The Contractor is hereby made aware that materials and equipment which are affixed to and made a part of the project such that they become immovable property and permanently incorporated into the project or work may qualify as "exempt items". The Contractor shall apply for an exemption from state and local sales and use taxes as agent of and on behalf of the Contracting Agency for the **GONZALES MIDDLE RENOVATIONS & UPGRADES**. To the extent required by any taxing authority (State or local), all subcontractors and material suppliers of the Contractor shall each, respectively and individually, apply for said tax exemption and execute any forms required to obtain/maintain the exemption. The Contractor is still responsible for payment of all taxes on nonexempt items necessary in the construction of the project.
- G. All purchases of "exempt items" for the project shall be made by the Contractor or subcontractor or material supplier on behalf of the Ascension Parish School Board (hereinafter referred to as the Owner) for the **GONZALES MIDDLE RENOVATIONS & UPGRADES**.
- H. The contractor and his subcontractors and material suppliers shall record all purchases of materials and equipment to be permanently installed or permanently incorporated in the work. Preparing, maintaining and preserving these records shall be in accordance with applicable State laws and local ordinances and resolutions except that the records shall be preserved for not less than three (3) years from date of acceptance of the project by the Contracting Agency. In addition to making the records available to the Louisiana Department of Revenue and Taxation and/or local taxing authorities, copies of the records shall also be made available to the Contracting Agency upon request.
- I. The contractor is required by the Louisiana Department of Revenue and Taxation and/or local taxing authorities to supply certification that all vendors, subcontractors and material suppliers on this project are exempt from paying state and local sales and use taxes on the "exempt" items on this project. This certification is accomplished with the use of state approved forms. The current approved forms are listed below and are subject to change. Contractor, Subcontractor, Materials Supplier, and Owner agree to execute any and all forms required to obtain or maintain the sales and use tax exemption during the life of the project, including but not limited to any such forms that may be required by any State or local taxing authority.
1. Designation of Construction Contractor as Agent of a Governmental Entity.
 2. Sales Tax Exemption Certificate
and/or
 3. Certificate of Sales/Use Tax Exemption/Exclusion Covering Purchases by Political Subdivisions of the State of Louisiana
- J. Copies of the above forms are included herein.
- K. The contractor and his subcontractors shall pay all other taxes which are required to be paid on materials, equipment and services supplied or purchased by the contractor or subcontractors for use on this project.

1.7 COORDINATION OF WORK

- A. **Most of the demolition and new construction will be performed during the school year. Care should be taken by the successful contractor when working on the demolition and new construction due to construction noise and safety issues:**
1. **Noisy work shall be accomplished in coordination and approved with the school administration (Gonzales Middle School) and Physical Facilities Manager, not disrupting the normal functions of the school since it will be occupied for most of the new construction. The administration and Physical Facilities Manager shall be consulted for any possible conflicts anticipated during construction with school schedules and events. (A copy of the anticipated Ascension Parish School Board calendars and any testing schedule that the high school has prepared shall be acquired by the successful contractor from the school administration.)**

- B. The Contractor shall be advised that portions of the existing site (buildings, canopies, and pedestrian students/athletes traffic) adjacent to the two (2) story Classroom Addition may remain occupied during the summer months if summer activities are scheduled for this school site. The Administration will need to be coordinated with to accomplish the Contractor's access to Contract Document work areas. All activities shall be coordinated and scheduled in such a way as to minimize disruption to the educational/sports environment of the facility whether work is being performed during the summer or during the school year.
- C. **The Contractor is solely responsible for securing and protecting the adjacent Gonzales Middle School physical plant, stored materials, equipment, and people in the work area. The Contractor shall maintain all existing means of egress and all existing fire protection features at all times during construction.**
- D. All details shown are derived from existing, original documents and, which were available, and onsite visual evaluations and professional judgements. Actual details may vary from those anticipated. As soon as variations are discovered, any modifications to the design replacement detail must be verified and coordinated with the Architect before work can be completed.
- E. Since the project is on existing school board property it is designated as a "Smoke-Free Zone", no smoking will be allowed on the school campus. No tobacco products whatsoever shall be onsite. This includes chewing tobacco. The school campus is also a "Drug-Free, Alcohol-Free and Firearm-Free Zone" of which there will be no exception. Interaction with students is not allowed and shall be strongly enforced. All construction workers shall be required to sign-in each day. The General Contractor shall keep a daily log of all personnel present on the site and shall produce this log at the Owner's/Architect's request. (Refer to Specification Section 01 11 00 – 1.1 J. for more information.)



Public Projects Contractor/Subcontractor
Sales Tax Certification and Exemption Application
Louisiana Revised Statute 47:305.7(A)(1)(b)

For questions about this form, please contact:
Louisiana Department of Revenue
Taxpayer Compliance - SES Division
Phone: (855) 307-3893
Email: LDRSales.ExemptionApplications@la.gov

This form is for use by contractors and subcontractors when applying for certification and exemption from the collection of sales tax in accordance with La. R.S. 47:305.7(A)(1)(b).

Please complete the application below and return it via email to LDRSales.ExemptionApplications@la.gov along with a copy of the executed contract.

Applicant Information			
Contractor Legal Name		LDR Sales Tax Account Number	
Contractor Trade Name			
Physical Address	City	State	ZIP
Mailing Address	City	State	ZIP
Contact Person	Contact Number		
Email Address			

Public Entity Information	
Public Entity	LDR Sales Tax Account Number (if applicable)

Contract Information		
Contract Number	Contract Beginning Date (mm/dd/yyyy)	Contract End Date (mm/dd/yyyy)
Contract Description		

Please select the legal status of the public entity listed above:

☐ State agency, board, or commission	☐ Parish school board or public school
☐ Municipal government or instrumentality thereof	☐ Law enforcement district
☐ Public charter school (La. R.S. 17:3971-4001)	☐ Waterworks district
☐ Hospital service district	☐ Parish and municipal libraries
☐ Public housing authority	☐ Other
☐ Parish government or instrumentality thereof	

Under the penalty of perjury, I declare that I am authorized to sign this application on behalf of the above named contractor, and that I have examined this application, and to the best of my knowledge, it is true, correct, and complete.

Name (Please print)	Title
Signature	Date (mm/dd/yyyy)

A copy of the contract with all parties' signatures must be attached to the application. Failure to provide a copy of the contract will result in delays in the evaluation process.



**Purchases by Political Subdivisions of
the State of Louisiana**
Sales Tax Exemption Certificate
Louisiana Revised Statute 47:305.7(A)(1)

**For questions about this form,
please contact:**
Louisiana Department of Revenue
Phone: (855) 307- 3893
Email: Sales.Inquiries@la.gov

Purchases of tangible personal property, digital products, and taxable services, and/or leases and rentals of tangible personal property and digital products by the political subdivision referenced below are totally exempt from the sales tax levied by the State of Louisiana as provided by La. R.S. 47:305.7(A)(1). The Louisiana Constitution, Article VI, §44(2) defines a political subdivision as "a parish, municipality, and any other unit of local government, including a school board and a special district, authorized by law to perform governmental functions." Political subdivisions making purchases from vendors requiring a certified exemption certificate may apply by completing Form R-1057, *Political Subdivision Certification*.

PLEASE PRINT OR TYPE

Political Subdivision		LDR Account Number (if applicable)	
Address			
City	State	ZIP	

The above referenced entity does hereby certify that the entity is a public agency of the State of Louisiana with legal status as one of the following:

☐ State agency, board, or commission	☐ Parish school board or public school
☐ Municipal government or instrumentality thereof	☐ Law enforcement district
☐ Public charter school (La. R.S. 17:3971-4001)	☐ Waterworks district
☐ Hospital service district	☐ Parish and municipal libraries
☐ Public housing authority	☐ Other
☐ Parish government or instrumentality thereof	

Purchases of tangible personal property, digital products, and taxable services, and/or leases and rentals of tangible personal property and digital products by the above referenced political subdivision are totally exempted from the sales tax levied by the State as provided by La. R.S. 47:305.7(A)(1). The Louisiana Constitution, Article VI, §44(2) defines a political subdivision as "a parish, municipality, and any other unit of local government, including a school board and a special district, authorized by law to perform governmental functions".

The authorized person for the political subdivision certifies that the entity meets the criteria for the sales tax exclusion under La. R.S. 47:305.7(A)(1), and if sales tax is later found to be due, the entity will be responsible for any tax liabilities.

Notice to Dealer: Report this sale on Schedule A of your sales tax return as an allowable deduction for sales to U.S. government and Louisiana state and local government agencies. This form is valid until December 31, 2030.

Signature of Authorized Agent	
Authorized Agent	Title
Signature	Date (mm/dd/yyyy)



Designation of Construction Contractor as Agent of a Governmental Entity and Exemption Certificate

General Information

Purpose of the R-1020 Form: Agencies and instrumentalities of federal or Louisiana state or local government may designate a construction contractor as its authorized agent for the purpose of purchasing construction materials, leasing and renting tangible personal property, and purchasing taxable services. Form R-1020 serves as the documentation by which the government entity and contractor document the agency relationship to vendors of materials and services. It also serves as documentation that the contractor's purchases are sales tax exempt, and therefore serves as an exemption certificate, which the vendor must retain on file to support the deduction he will claim on his sales tax return. Effective 11-1-2004, the R-1032 exemption certificate will no longer be necessary.

Use of the R-1020 Form: The form must be signed by both parties, contractor and governmental entity. After signature, both the contractor/agent and the governmental entity must keep an original copy of the form on file, along with other documents that pertain to the construction project. (Effective 11-1-2004) Do not send a copy of the R-1020 form to the Louisiana Department of Revenue. Retain your copy of the original certificate on file. The contractor/agent must reproduce the original copy as needed to attach a copy to each purchase order for materials for the project. The reproduced copy will serve as the exemption certificate that will document the exempt sale of materials to the contractor/agent.

Subcontractors. A designated contractor may not re-designate his subcontractors as authorized agents for the governmental entity. Each subcontractor must obtain its own designation from the governmental entity.

Title to Property: Any materials purchased by the agent through the use of this certificate immediately become the property of the governmental entity upon delivery to the contractor/agent.

Restrictions as to Vendors: The governmental entity may choose to restrict the agent/contractor to making purchases from a pre-selected list of vendors and providers of services. This restriction, if applicable, must be incorporated into a contractual agreement between the governmental entity and the designated agent. If there are no vendor restrictions, the contractor/agent may use the R-1020 Exemption Certificate to make sales tax exempt purchases from any vendor.

**STATE OF LOUISIANA
PARISH OF ASCENSION**

CONTRACT FOR LA R.S. 47:301 (8)(C) TAX EXEMPTION

WHEREAS _____, general contractor, has been awarded a contract with _____ (School Board), a public entity/political subdivision, in accord with the LA Public Bid Law for the following public project:

Referred to as the Project:

WHEREAS the company in its execution of the Project will use and/or purchase tangible property and/or goods which will be consumed in completing the Project or which will be incorporated into the Project;

WHEREAS the company in bidding on the Project, did not include sales and use taxes on tangible property and/or goods which will be consumed in completing the Project or which will be incorporated into the Project;

WHEREAS the company and the School Board wishes to avail itself of the sales and use tax exemption afforded to it by LA R.S. 47:301 (8) (C);

WHEREAS the School Board wishes to fulfill its duty to act as a prudent administer of the public funds under its jurisdiction;

WHEREAS the School Board wishes to avoid paying sales and use taxes when it has no legal obligation to do so;

WHEREAS the School Board's unnecessary payment of sales and use taxes could be a violation of its duty to prudently administer the public funds in its charge;

WHEREAS the parties may avoid the unnecessary payment of sales and use taxes if the company acts as the School Board's agent/or instrumentality for the purchase and/or use of tangible property which will be consumed in completing the Project or which will be incorporated into the Project;

WHEREAS the company and the School Board mutually agree to a contract of agency and/or instrumentality between them for the purchase and/or use of tangible property which will be consumed in completing the Project or which will be incorporated into the Project and thereby avoid the unnecessary payment of sales and/or use taxes;

NOW THEREFORE the School Board appoints the company as its agent and/or instrumentality for purposes of the purchase and/or use of tangible property which will be consumed in completing the Project or which will be incorporated into the Project subject to the following conditions:

STATE OF LOUISIANA
PARISH OF ASCENSION
CONTRACT FOR LA R.S. 47:301 (8) (C) TAX EXEMPTION
(Continued)

All purchases under this contract shall be made from the public funds paid to the company and shall be charged to the contract price for the Project. The company shall obtain invoices for all purchases made under this contract. The invoices shall bear the name and number of the Projects as listed above. All materials and equipment shall be purchased by the company in the name of the School Board using funds that are accounted for to the School Board and that are traced to public funds.

Title to all property purchased under this contract shall immediately pass to the School Board at the time of the purchase, but the company shall be the depository or custodian of the property until the School Board accepts the Project as substantially complete at which time this contract shall terminate.

In the event that the company is subject to a sales or use tax audit by either the State of Louisiana or a local government subdivision and the taxing authority assess taxes on any materials or equipment incorporated into the Project or use in its work, the School Board shall be responsible for defending the tax-exempt status of the purchases at issue. Moreover, should the taxing authority prevail in imposing its sale or use tax, the School Board shall be ultimately liable for remitting to the taxing authority the taxes, interest, and penalties ultimately found due unless the company has failed to comply with this contract.

This contract does not limit or otherwise alter Contractor's responsibilities (1) to fully insure materials and equipment to be furnished by Contractor: (2) to insure the work at all times prior to substantial completion: (3) to fully warrant all materials and equipment furnished by Contractor: (4) to alter the method or time frames for payments established under the Project: (5) to change the rights of the School Board to accept or reject the work or any engineer of the architect on behalf of the School Board: (6) to provide for the safety and protection of materials and equipment whether in storage on or off the site and regardless whether titled to the contracting agency as a part of the work: (7) to maintain liability and property insurance, specifically including coverage for damages to the materials and equipment prior to final acceptance and claims for damages because of bodily injury, sickness, or death of any the company's employees or any person other than the company's employees: (8) to properly correct the work as required by the engineer or the architect or diminish the School Board's and engineer's or architect's right to reject any portions of the work.

STATE OF LOUISIANA
PARISH OF ASCENSION
CONTRACT FOR LA R.S. 47:301 (8) (C) TAX EXEMPTION
(Continued)

COMPANY

_____ accepts its appointment as indicated by the signature
of its authorized agent on the date shown below.

Signature

Name and Title

Witness Date

Witness Date

Sworn to and subscribed before me on this _____ day of _____

Notary Public

PUBLIC ENTITY: _____

Witness Date

Witness Date

Sworn to and subscribed before me on this _____ day of _____

Notary Public

SCHOOL CALENDAR 2025-2026

FIRST & LAST DAYS OF SCHOOL					GRADING PERIOD ENDINGS				
HOLIDAYS					HIGH SCHOOL GRADUATIONS				
DISTRICT DATES					PARENT-TEACHER CONFERENCE DAY				
AUGUST 2025					JANUARY 2026				
				1			1	2	
4	5	6	7	8	5	6	7	8	9
11	12	13	14	15	12	13	14	15	16
18	19	20	21	22	19	20	21	22	23
25	26	27	28	29	26	27	28	29	30
SEPTEMBER 2025					FEBRUARY 2026				
1	2	3	4	5	2	3	4	5	6
8	9	10	11	12	9	10	11	12	13
15	16	17	18	19	16	17	18	19	20
22	23	24	25	26	23	24	25	26	27
29	30								
OCTOBER 2025					MARCH 2026				
		1	2	3	2	3	4	5	6
6	7	8	9	10	9	10	11	12	13
13	14	15	16	17	16	17	18	19	20
20	21	22	23	24	23	24	25	26	27
27	28	29	30	31	30	31			
NOVEMBER 2025					APRIL 2026				
						1	2	3	
3	4	5	6	7	6	7	8	9	10
10	11	12	13	14	13	14	15	16	17
17	18	19	20	21	20	21	22	23	24
24	25	26	27	28	27	28	29	30	
DECEMBER 2025					MAY 2026				
1	2	3	4	5					1
8	9	10	11	12	4	5	6	7	8
15	16	17	18	19	11	12	13	14	15
22	23	24	25	26	18	19	20	21	22
29	30	31			25	26	27	28	29

AUGUST 2025
4th—Official Opening of School
4th–6th—Professional Preparation Days
7th—First Day Students Attend

SEPTEMBER 2025
1st—Labor Day
12th—Staff Development (Students Off)

OCTOBER 2025
8th—First Grading Period Ends
13th–14th—Fall Break
20th—Parent-Teacher Conference Day
(Parent & Middle Schools-Students Off)

NOVEMBER 2025
24th–28th—Thanksgiving Break

DECEMBER 2025
19th—Second Grading Period Ends
22nd–January 2nd—Christmas/Winter Break

JANUARY 2026
5th—Professional Preparation Day
(Students Off)
6th—First Day Students Return to School
19th—Dr. Martin Luther King, Jr.'s Holiday

FEBRUARY 2026
6th—Staff Development (Students Off)
16th–18th—Mardi Gras Holidays

MARCH 2026
12th—Third Grading Period Ends
23rd—Parent-Teacher Conference Day
(Parent & Middle Schools - Students Off)

APRIL 2026
3rd–10th—Easter/Spring Break
29th—Last Day Seniors Attend

MAY 2026
7th—Dutchtown High Graduation
8th—Prairieville High Graduation
14th—St. Amant High Graduation
15th—East Ascension High Graduation
15th—Donaldsonville High Graduation
21st—Last Day Students Attend
22nd—Fourth Grading Period Ends
22nd—Official Closing of School



1100 Webster Street, Donaldsonville, LA 70346 | (225) 391-7000 | AscensionSchools.org

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 11 00

**SECTION 01 31 13 - PROJECT COORDINATION
(MEETINGS, SCHEDULES, AND REPORTS)**

PART 1 - GENERAL

1.1 SCOPE

- A. Meetings, schedules, and reports shall be required to promote an orderly review during the progress of the work and to provide for a systematic discussion and solution to difficulties and problems encountered on the job. The Architect shall conduct all project meetings and receive for distribution all schedules and reports.
- B. Refer to the General Conditions, Specific Conditions, and other parts of the contract documents for information on bonds, pre-bid conferences, surveys, warranties, guarantees, initial progress schedules, schedules of values, list of subcontractors, reports, shop drawings and other meetings, schedules or reports required.
- C. **NOTE: THE CONTRACTOR SHALL NOTIFY THE ARCHITECT WHEN THE PROJECT IS 60%, 75%, AND 90% COMPLETE SO THAT THE OWNER'S TESTING AND BALANCING CONSULTANT CAN PERFORM HIS WORK.**

1.2 SPECIFICS

- A. **Monthly Progress Meeting:** At a time and place set by the Architect, at the convenience of the Contractor, Owner and the Architect, there shall be a monthly progress meeting. When possible, the time and meeting place shall be consistent, and the date shall be approximately the same (Example: first Monday of the month). The Contractor will be notified once of the date, time, and place and thereafter, no notice shall be required as the meetings shall be prescheduled, and the Contractor will be responsible for his attendance and that of his representatives.
 - 1. The Contractor SHALL HAVE AN UPDATED COPY OF THE PROGRESS SCHEDULE (see 3.10 General Conditions) WHICH SHALL SHOW CURRENT PROJECT COMPLETION DATES including all phasing and a list of all questions, problems, coordination requirements, complaints, etc. which may affect the work. It is suggested that a Subcontractors meeting be held between the General Contractor and Subcontractors prior to the progress meeting. **MAJOR SUBCONTRACTORS ARE REQUIRED TO ATTEND PROGRESS MEETINGS. IF A MAJOR SUBCONTRACTOR IS NOT PRESENT AT THE MEETING, THE GENERAL CONTRACTOR SHALL RELATE THAT PARTICULAR SUBCONTRACTOR'S PROBLEMS OR QUESTIONS WHICH MAY INVOLVE THE OWNER OR ARCHITECT.** This meeting shall not be used to conduct business of a nature which does not include the attention of the General Contractor, Owner or Architect. However, it is important that all parties necessary for discussion on any particular item be present. Those present **SHALL** have authority to commit to solutions agreed upon in the project meeting.
- B. **Construction Schedules:** The General Contractor shall prepare a current and accurate projected construction schedule monthly. This schedule should show all past progress, percentage of work completed to date, days ahead or behind schedule and projected completion dates. All areas and phases of the work shall be presented individually, and a specific estimate of the overall project progress shall be given. The schedule presented shall be such that a reasonably accurate picture of the work in progress can be seen. See 3.10 General Conditions.
 - 1. **When the project is behind schedule, a written explanation of means and methods required to expedite construction schedule to meet the project completion date shall be provided to the Architect. If the Work is delayed for causes attributable to the Contractor or Sub-Contractor, the Contractor shall provide increased Work forces and overtime Work forces, (including weekdays and holidays), at no additional cost to the Owner until the Project is Substantially Completed.**

- C. **Delays and Bad Weather Log:** The General Contractor shall prepare and keep a daily log of every day's weather and a log of all allowable delays to the completion of the project which shall be submitted in writing for review by the Architect. Allowable delays, as can be documented, will be approved in writing by the Architect who will prepare a change order extending the contract time. Allowable delays are defined in 8.3 Delays and Extensions of Time, General Conditions, 4.3.7.7 and 8.3.4 of the Supplementary Conditions. The Architect shall be the final authority on the appropriateness of claims for delay. The General Contractor shall submit a report monthly at the progress meeting. However, any claim for extension of time shall be made as follows:
1. **4.3.7.7: The Ascension Parish School board has a strict policy for the reporting of claims for rain days. Board meetings are scheduled on the first and third Tuesday of each month. All Contractor requests and documentation for extensions in time for rain for a particular month shall be delivered to the Architect promptly prior to the second Tuesday of the following month. (For example, for a claim for rain days in July, if the first day of August is on a Tuesday, the second Tuesday is August 8, hence, all claims for rain days for July would be delivered to the Architect prior to the 8th of August.) No consideration will be granted by the Owner for claims for rain days when the Contractor does not submit claims on time as specified above.**
 2. **8.3.4: All requests for extensions in time for a particular month shall be delivered to the Architect for review not later than the second Tuesday of the following month. The Owner or the Architect may reject any requests for extension of Contract Time received untimely (after the second Tuesday of the following month as specified above) based solely on the fact that the requests was untimely.**
 3. **The Contractor shall utilize www.wunderground.com in calculating bad weather log/days.**
- D. **Special Meetings:** As required by circumstances on the job and/or related to the work, special meetings may be called by the General Contractor, the Architect or the Owner. All special meetings shall be administered by the Architect. To the maximum extent practicable, the Architect shall be notified of the request for a meeting and the agenda 48 hours minimum in advance. Emergency meetings may be called with less than minimum notice.
- E. **Pre-Construction Conference:** After the contract has been executed, the Architect shall arrange with the owner and contractor and conduct a pre-construction conference to be held at the project site. The contractor shall be responsible to see that his principal subcontractors are in attendance and shall furnish six (6) copies to the Architect a finalized list of:
1. **Schedule of Values:** A breakdown of the Contract Cost shall be as required by APSB and the Architect. This schedule of values shall be broken down based on the divisions of the CSI Master Format (**THE TABLE OF CONTENTS SHALL BE USED FOR THE SCHEDULE OF VALUES**) with some additional breakdowns as they relate to the Architect's Consultants. No payments will be made to the Contractor until this breakdown is received in a form that APSB and the Architect have approved.
 2. **A final list of subcontractors and material suppliers:** A final list of subs with their proprietary names and the suppliers of principal items or systems of materials and equipment proposed for the work shall be required. **A preliminary list is required in Article 6.1.2 of the Instructions to Bidders, which states that the successful bidder shall provide a list of subcontractors and material suppliers WITHIN 72 HOURS. At this pre-construction meeting, the Contractor SHALL SUBMIT HIS FINAL, COMPLETED LIST OF SUBCONTRACTORS AND MATERIAL SUPPLIERS.** There is additional information required under 6.1.2 that the Contractor needs to review such as the resume of the bidder's proposed project superintendent and key personnel.
 3. The construction schedule.

4. Fixed job site overhead cost itemized with documentation to support daily rates.
5. Bond Premium Rate with supporting information from the General Contractor's carrier.
6. Labor Burden by Trade for both Subcontractors and General Contractor.
7. Internal Rate Charges for all significant company owned equipment.

NOTE: The Contractor shall not receive any payments until all information is received.

- F. **Monthly Report by General Contractor:** The enclosed form or facsimile shall be submitted with appropriate attachments at each monthly meeting as well as the monthly request for payments. All pending business shall be listed including but not limited to:
1. unresolved problems of construction
 2. status of outstanding change orders
 3. status of project samples and shop drawings not received
 4. status of record documentation (drawings and specifications) along with deviations of plans and actual conditions - **Record Documentation shall be present for each monthly meeting for review with the Architect or his representative.**
 5. status of test and reports
 6. status of construction schedule along with delays
 7. status of Application for Payments
 8. other items that the Contractor requires discussion / solution
 9. any pending business between Owner, Architect, and/or Contractor
- G. **Application and Certificate for Payment:** As indicated in 9.3 of the General Conditions, copies of requisitions (receipts) from subcontractors and material suppliers and proof of specific insured stored offsite materials shall accompany all Applications and Certificates for Payment. Applications for payment shall not be processed if lacking the above detailed information required.
- H. **Construction Testing Sign-In / Sign-Out Sheet:** The enclosed form shall be submitted at the end of each week that the construction testing is occurring. The Contractor shall have copies of this form in the job shack available to the Construction Testing Representative to sign-in and sign-out each and every time that they are on the site. The Construction Testing Representative shall fill out the form information completely. This form shall be the basis for payment verification of construction testing. (A copy of the month's filled out forms shall be given to the Architect at the monthly meeting.)
- I. **FOR INSPECTIONS ON CONCRETE REINFORCING STEEL, CAST -IN-PLACE CONCRETE, ECT. THE CONTRACTOR SHALL GIVE THE ARCHITECT, OWNER, STRUCTURAL ENGINEER, CIVIL ENGINEER, AND OWNER'S TESTING LAB A MINIMUM OF 24 HOURS ADVANCED NOTICE. ALSO, THE FORM WORK AND STEEL SHALL BE REVIEWED BY THE APPROPRIATE CONSULTANT BEFORE GIVING 24 HOUR NOTICE FOR A POUR. IF A MINIMUM OF 24-HOUR NOTICE IS NOT GIVEN, THE POUR IS SUBJECT TO BEING REJECTED. CONCRETE CORES MAY BE REQUIRED BY THE OWNER. ANY CORES THAT ARE PREFORMED AT THE SUBJECT AREA SHALL BE PAID FOR BY THE CONTRACTOR WHETHER OR NOT THEY MEET THE CONTRACT DOCUMENT DESIGN STRENGTH.**

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

DATE: _____

PROJECT: _____

PROJECT NUMBER: _____

PREPARED BY: _____

MONTHLY REPORT BY GENERAL CONTRACTOR (To be presented to Architect on site.)

A. CONTRACT SUM STATUS

1. Original Contract Sum: _____
2. Approved Change Order Amount to date (cumulative): _____
3. Current Contract Sum: _____
4. Total Amount Completed and Stored to date (including retainage): _____
5. Total Contract Percentage paid/pending: _____

B. CONTRACT TIME STATUS

1. Notice to Proceed date: _____
2. Contract Time: _____
3. Contract Days Elapsed: _____
4. Projected Days to Completion: _____
5. Percent of Time Elapsed: _____
6. Delay and Bad Weather Days Granted to Date: _____
7. Delay and Bad Weather Extension Days Requested this Report: _____

C. To be included in this report (Please check):

- () Updated Construction Schedule (5 copies)
- () Delays and Bad Weather Log (all claims shall be made in writing to the Architect)
- () Application for Payment (3 Notarized and 2 Copies) (See paragraph 1.2.H above.)
- () Review of items modified on record drawings
- ()
- ()
- ()

Comments, questions and pending business (Please list):

1. Unresolved problems of construction -
2. Outstanding change orders -
3. Project samples and shop drawings not received -
4. Deviation of plans and actual conditions along with status of Record Documentation -
5. Tests and reports -
6. Construction Schedule and Possibilities of delays -
7. Application for Payments -
8. Any pending business -

NOTE: THE CONTRACTOR SHALL NOTIFY THE ARCHITECT WHEN THE PROJECT IS 60%, 75%, AND 90% COMPLETE SO THAT THE OWNER'S TESTING AND BALANCING CONSULTANT CAN PERFORM HIS WORK.

GONZALES MIDDLE RENOVATIONS AND UPGRADES
GHC PROJECT NO. 2408

CONSTRUCTION TESTING SIGN-IN / SIGN-OUT SHEET

PLEASE PRINT LEGIBLY

DATE	NAME OF TESTING INSPECTOR	ARRIVAL TIME	DEPART TIME	TEST(S) PERFORMED

END OF SECTION 01 31 13

SECTION 01 33 23 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 - GENERAL

1.1 SCOPE

- A. The General Contractor shall be responsible for the furnishing and submittal of shop drawings and samples as required for the work. These shall be in accordance with 3.12 of the General Conditions. All shop drawings and samples shall be submitted directly from the General Contractor to the Architect.
- B. **Any and all shop drawings not reviewed, stamped, dated and signed by the General Contractor prior to submittal to the Architect will be returned as rejected.** The General Contractor shall be responsible for all dimensions, quantities, assortments and accuracies of the shop drawings. Generally, notes and markings on the shop drawings by the Contractor placed after the review by the Architect shall be null and void unless again reviewed by the Architect.
- C. Samples submitted shall remain on file in the office of the Architect and may not be returned.
- D. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity. Also coordinate the transmittal of different types of submittals for related parts of the work so processing will not be delayed because of the need to review submittals concurrently for coordination.
1. **The Architect reserves the right to withhold action on any submittals requiring coordination with other submittals until the related submittals are received from the Contractor.**
- E. **NOTE: Any changes on shop drawings submitted, from the Contract Documents shall be highlighted in yellow on the shop drawings. (Dimensions, size, colors, etc.)**
- F. **Contractor agrees that all shop drawings required for the project shall be submitted 30 calendar days after Official Notice to Proceed for the Construction Phase. Failure to submit all shop drawings within the stipulated time period, through no fault of the Architect or Owner, the Contractor will be charged Liquidated Damages in the amount of \$200 for each calendar day beyond 30 calendar days or as indicated in the schedule below. (The \$200 Liquidated Damage amount shall be assessed by deducting from monies, which may become due and payable to the Contractor.):**

Original Contract Amount (Dollars)		Additional Calendar Days
From More Than	To and Including	Calendar Days After the Initial 30 Calendar Days
\$0	\$1,000,000	0
\$1,000,000	\$3,000,000	15
\$3,000,000	\$5,000,000	30
\$5,000,000	\$10,000,000	45
\$10,000,000	\$15,000,000	60
\$15,000,000	\$20,000,000	75
\$20,000,000	\$30,000,000	90
\$30,000,000	\$40,000,000	105

NOTE: IN A WORSE CASE SCENARIO, IF A SHOP DRAWING IS SUBMITTED, WHETHER IT BE A NEW SHOP DRAWING OR RESUBMISSION, ON THE FINAL DATE ALLOWED IN THE ABOVE SCHEDULE FOR SUBMISSION, THAT SUBMITTAL SHALL HAVE 10 CALENDAR DAYS FROM THE DATE THAT THE ARCHITECT RETURNS THE REVIEWED SHOP

DRAWINGS TO THE CONTRACTOR AND NOT THE DATE ON WHICH THE CONTRACTOR RECEIVED THEM. AFTER THIS FINAL 10 CALENDAR DAY PERIOD, PARAGRAPH 1.1 F. ABOVE APPLIES. ALL NEW SHOP DRAWINGS OR RESUBMISSIONS SUBMITTED AFTER THE FINAL DATE SHALL BE ASSESSED ACCORDING TO PARAGRAPH 1.1 F. ABOVE.

NOTE: ANY REJECTED SHOP DRAWINGS SHALL BE RE-SUBMITTED WITH ALL CORRECTIONS WITHIN 10 CALENDAR DAYS FROM THE REJECTION DATE.

1.2 SUBMITTAL PROCESSING TIME

- A. The Architect will endeavor to review and return each submittal as quickly as possible. The processing time shall start upon Architect's receipt of submittal as follows:
 - 1. Allow the Architect fourteen (14) working days for review of each submittal.
 - 2. Allow an additional five (5) working days for structural, mechanical, electrical and civil submittals.
 - 3. If a submittal requires coordination with other submittals, additional time for processing of the submittal will be required. The amount of days will depend upon the submittal and coordination requirements.
 - 4. Allow seven (7) additional working days for the return of submittals to the Contractor on either of the abovementioned situations.
 - 5. The General Contractor shall be solely responsible for the timely delivery of submittals and shop drawings, samples and colors. Submittals shall be made far enough in advance of scheduled dates of installation (45 calendar days) to provide time required for reviews, revisions, re-submittals, placing orders, fabrication and delivery. This includes the distribution of shop drawings, product data, and samples to all subcontractors, material suppliers, etc. by the Contractor. **Incomplete submittals are considered "NO SUBMITTAL".**

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Furnish Architect with PDF's of every sheet required. **(PDF's ARE TO BE REVIEWED, STAMPED APPROVED AND DATED BY THE CONTRACTOR BEFORE SUBMITTING TO THE ARCHITECT.)** PDF's will be reviewed by the Architect and noted. One approved set shall be kept on job site at all times.
- B. The General Contractor shall keep a log recording shop drawing items, dates submitted and status of shop drawings. A similar log shall be kept on the jobsite.

2.2 SUBMITTALS

- A. The General Contractor shall furnish and submit shop drawings and samples as shown in the various sections of the specifications. **NOTE: Any changes from the Contract Documents shall be highlighted in yellow on the shop drawings. (Dimensions, size, colors, etc.)**

2.3 SUBSTITUTIONS

- A. After the bid, do not substitute materials, equipment or methods unless such substitution has been specifically approved in accordance with 3.3.1 thru 3.3.9 of the Instructions to Bidders and Section 01 33 24 - Substitutions.

- B. "or equal": Where this phrase or similar phrases occurs in the contract documents, do not assume that materials, equipment or methods will be approved as equal unless the item has been specifically reviewed and so approved, in writing, by the Architect prior to bid opening. The decision of the Architect shall be final.

2.4 PURPOSE

- A. The purpose of shop drawings is to serve as an aid to the Contractor, Subcontractor, and Material Suppliers which furnishes more detailed information specifically tailored to the uniqueness of each project with respect to the job conditions. **Variations from the contract document drawings shall be specifically pointed out and labeled "Design Variation"**. Architect shall review shop drawings in accordance with 4.2.7 of the General Conditions. Failure to provide shop drawings may cause delays, mistakes, misinterpretations and other problems which are the sole responsibility of the Contractor to solve.
- B. The shop drawing review is only for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Corrections or comments made on the shop drawings during this review do not relieve contractor from compliance with the requirements of the plans and specifications. Approval of a specific item shall not include approval of an assembly of which the item is a component. Contractor is **solely** responsible for: dimensions to be confirmed and correlated at the jobsite; information that pertains solely to the fabrication processes or to the means, methods, techniques, sequences and procedures of construction; coordination of the Work of all trades and for performing all work in a safe and satisfactory manner.

2.5 ASBESTOS CONTAINING BUILDING MATERIALS (ACBM)

- A. Contractor shall certify on shop drawings that the materials used as part of the shop drawings submitted, to knowledge, does not contain ACBM. If during the course of the project, Asbestos is discovered in any products used or to be used in this project he must notify the Architect immediately.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 33 23

SECTION 01 33 24 – SUBSTITUTIONS

PART 1 - GENERAL

- 1.1 Substitutions made prior to bidding are set forth in the paragraph 3.3 of the Instructions to Bidders.
- 1.2 For substitutions by the Contractor after the signing of the contract the Architect will only consider such substitutions under the following circumstances:
 - A. The Owner has given written instructions to the Architect to approve such substitution(s).
 - B. The manufacturer of the product specified is unable to supply the product.
 1. The Architect will require written proof from the manufacturer or reliable source that this situation exists.
 - C. The Architect discovers that the product specified is inappropriate, in the opinion of the Architect, to perform in the project.
- 1.3 After the Contract has been executed, the Owner and the Architect will consider a formal request for the substitution of products in place of those specified only under the conditions set forth in the General Conditions, Instructions to Bidders, and as mentioned above or as mentioned in this section.
- 1.4 By making requests for substitutions based on Subparagraph 1.3 above, the Contractor:
 - A. represents that the Contractor has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified;
 - B. represents that the Contractor will provide the same warranty for the substitution that the Contractor would for that specified;
 - C. certifies that the cost data presented is complete and includes all related costs, and waives all claims for additional costs related to the substitution which subsequently become apparent;
 - D. will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects; and
 - E. **represents that the Contractor has personally investigated that the product he indicates is no longer being manufactured and has, in fact, been discontinued by the manufacturer or that the manufacturer is out of business. Contractor stating that his subcontractor is indicating that the product is no longer manufactured or the manufacturer is out of business, is not considered personally investigating the product by the Contractor.**
- 1.5 Should a Contractor propose a substitute material or method assembly that is of questionable quality to the Architect, suitable tests may be required to establish a basis for acceptance or rejection. Such tests will be paid for by the Contractor and conducted in accordance with Article 13.5, Tests and Inspections of General Conditions.
- 1.6 Architect's decision on all substitution requests is final and binding.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 33 24

SECTION 01 50 00 – TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SCOPE

- A. The General Contractor shall provide the following temporary facilities on the immediate work site and maintain the same for the duration of the work:
 - 1. Temporary field offices
 - 2. Temporary utilities
 - 3. Sanitary conditions
 - 4. Storage shed and/or yard
 - 5. Protection of the site
 - 6. Temporary Roads and Paved Areas
 - 7. Temporary Site Fencing (As Required)
- B. Related work: See General Conditions, Supplemental Conditions, and other sections of the contract documents for additional information on temporary facilities, safety barricades, coordination with existing site and/or building facilities, trash removal, etc.
- C. Locate field office, storage facilities, sanitary facilities and other temporary and support facilities with the Owner and the Architect for easy access. Maintain support facilities until substantial completion. Personnel remaining at the site after substantial completion will be permitted to use the permanent facilities, under conditions acceptable to the Owner.
- D. The General Contractor shall be responsible for the orderly arrangement and usage by his subcontractors, of their temporary facilities and maintaining control of the site as an orderly and safe stage for construction.

1.2 MATERIALS

- A. **Temporary Field Office:** The General Contractor shall furnish and set up a suitable temporary air-conditioned office to be used by the job superintendent, his personnel engaged in construction activities and the Architect. Said office shall be weathertight, lockable, air conditioned and of sufficient size to accommodate office personnel / meetings (minimum of 12 people) and shall also be sized to store job-site contract documents, samples, permits, shop drawings, job correspondence, record documents, etc. This office shall be equipped with electrical power and the capability to transmit data to a printer that prints a minimum sheet size of 8-1/2 x 11. **(THIS CAN BE ACCOMPLISHED BY THE USE OF A CELL PHONE AND A PRINTER, AN I-PAD AND A PRINTER, OR ANY OTHER TYPE OF TECHNOLOGY THAT WILL PROVIDE AN 8-1/2 X 11 PRINT SHEET. THE ARCHITECT NEEDS THE CAPABILITY OF PRINTING A DRAWING OR TEXT DOCUMENT TO THE TEMPORARY FIELD OFFICE. THE CELL NUMBER OF THE JOB SUPT. SHALL BE GIVEN TO THE ARCHITECT AS SOON AS POSSIBLE.)** Temporary field office shall be kept clean and orderly throughout the duration of the project. This office shall not be used for the storage of building materials or project tools. Although an appendage to the temporary field office would be allowed for this type of storage.
- B. **Temporary Utilities:**
 - 1. **Electrical Power Service:** The General Contractor's use of the Owner's existing electrical service shall be allowed; however, the Contractor shall minimize its use and limit only to what is needed for the project. (If the Owner realizes an unusual spike in the electrical bill for the time/duration that the Contractor is on site, the Owner may require reimbursement for the difference in the average electrical bill.) Any damage to the Owner's electrical service shall be repaired immediately so as not to disrupt the Owner's activities and shall be repaired at the Contractor's expense.

2. **Water Service:** The Contractor's use of the Owner's existing water service shall be allowed; however, the Contractor shall minimize its use and limit only to what is needed for the project. (If the Owner realizes an unusual spike in the water bill for the time/duration that the Contractor is on site, the Owner may require a reimbursement for the difference in the average water bill.) Any damage to the Owner's water service shall be repaired immediately so as not to disrupt the Owner's activities and shall be repaired at the Contractor's expense.
- C. **Sanitary Conditions:** The General Contractor shall provide and maintain temporary sanitary conditions for the duration of the work. In no case shall any personnel be allowed use of either existing or new toilets, bathrooms, washrooms, sinks, lavatories, showers, tubs, water fountains, kitchen equipment, etc. The General Contractor shall be responsible for monitoring all personnel including subcontractors and installers to prevent usage of owner sanitary facilities, furnishings and equipment. Contractor supplied sanitary facilities and surrounding areas shall be maintained in a sanitary condition at all times. Provide temporary self-contained toilet units, as required, that are shielded to insure privacy.
- D. **Storage Shed or Yard:** The General Contractor shall provide and maintain a secure and safe area for the protection of all stored materials and equipment for the project. The contractor may use a shed or storage trailers and/or yard in size as required to accommodate construction tools, materials, and equipment. All storage sheds / trailers shall be sufficiently secured and protected from damage by weather and vandalism. In any case, all items remain the responsibility of the General Contractor and shall be stored in such a manner to comply with all pertinent safety and other regulations and codes. **The Architect and Owner will decide, in coordination with the Contractor, concerning the storage shed or yard that shall be utilized during the project.**
- E. **Protection of Site:** The General Contractor shall be solely responsible during the work of this contract for the security and safety of both the site, physical plant, stored materials, equipment and of people in the work area. Refer to Section 10 of the General Conditions for additional information. In any case, the site and its contents remain the responsibility of the General Contractor and shall be kept in such a manner to be secure and safe and to comply with all pertinent safety and other regulations and codes.
- F. **Temporary Roads and Paved Areas:** If needed for construction, construct and maintain temporary roads, parking, etc. adequate to support loads and to withstand exposure to traffic during the construction period. Any culverts and site drainage required, due to the installation of temporary access roads and parking, shall be provided. All temporary drives and paved areas shall comply with all codes and ordinances of the parish in which the project is being built. **(Any area disrupted by temporary roads and paved areas shall be brought back to the finish standards that existed before temporary roads and paved areas were installed and shall meet the standard within the construction work area after project is complete.)**
- G. **Temporary Site Fencing:** The General Contractor shall be responsible for security / safety at the site for the duration of the project. The Contractor shall provide and maintain a temporary fence to prevent entry into the work area by the public as follows:
 1. The General Contractor shall provide and maintain a temporary barrier and / or fence of a design and type to prevent entry into the work area by the public with the use of a chain link fence enclosure.

The fence mentioned above shall be located around the construction site and secure areas vulnerable to vandalism or those areas of potential danger to the public. The contractor shall provide the size required to accommodate construction operations. The temporary fencing shall be installed in a manner that would discourage people from easily entering the staging area except by an entrance gated area. Refer to Section 10 of the General Conditions for additional information.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

- 3.1 Maintain temporary facilities throughout the duration of the work. Keep clean, neat, orderly, and comply with all safety and regulatory codes, ordinances, and laws.
- 3.2 Remove all temporary facilities promptly at the completion of the project. Leave the final project in a spotless condition.
- 3.3 During the execution of the work, comply with all codes and regulations in manner of execution, especially safety regulations. All property and facilities adjacent to the work area and/or in the work area but not in the contract shall be disturbed as little as possible. **(Any area disrupted shall be brought up to original condition within the construction work area. The Owner shall be the judge of original condition.)**

END OF SECTION 01 50 00

SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 Related Documents

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Divisions of the Specification sections, apply to this section of the specifications. In general, the provisions of all the Contract Documents are part of this section.

1.2 General Requirements

- A. This section includes administrative and procedural requirements for the contract closeout including, but not limited to, the following:
 - 1. Project Review Procedures
 - 2. Record Documentation
 - 3. Operations and Maintenance Manuals, Bonds and Guarantees
 - 4. Fire Marshal Information
 - 5. Demonstration and Training of Owner's Personnel
 - 6. Final Project Cleaning
- B. Divisions 11, 20, 23, 26, and 27 have related information concerning Operation and Maintenance Data, Guarantees / Warranties, Demonstration and Training, along with specific closeout and special cleaning requirements.
- C. The Contractor shall start accumulating required Substantial Completion manuals, guarantees / warranties, materials, equipment, and other closeout items as early as during the shop drawings, product data, and samples review process.

1.3 Project Review Procedures

- A. Substantial Completion Review
 - 1. Preliminary Requirements: **Before the Contractor requests a project observation for determining date of Substantial Completion**, the following list of items shall be completed:
 - a. **Prepare a list of uncompleted items and items to be corrected by the Contractor or his Subcontractors and reasons why the work is not completed or corrected. The list shall include the following:**
 - 1. Prepare list of spaces in sequential order, starting with the exterior of the building and site and proceed to the interior starting from the first floor to the highest floor.
 - 2. Prepare list of items for each space by major elements such as floors, walls, ceiling, millwork, equipment, and building systems.
 - 3. The following information shall be listed at the top of the first page:
 - a. The Architect's project name and number, the date, the name of the Architect, the name of the Contractor along with a page number for each sheet.
 - b. The Contractor shall discuss with the Owner and Architect anticipated insurance change over dates and requirements.
 - c. Submit guarantees / warranties, maintenance service agreements, final certifications and similar documents.
 - d. Obtain and submit any releases permitting the Owner unrestricted use of the project and access to all services and utilities. Include in the submission Occupancy Certificates and any similar releases.
 - e. Prepare and submit record documentation.
 - f. Deliver any tools, spare parts, extra materials, and similar items to the Owner at the location designated. Label all of these items with manufacturer's name and model numbers.

- g. Complete change-over of permanent locks and deliver all keys to the Owner.
 - h. Complete startup testing of all systems.
 - i. Submit test / adjustments and balancing records.
 - j. Remove all temporary facilities on the project site, along with mock-ups, construction tools and similar temporary elements of the project.
 - k. Advise Owner the anticipated date of change-over of all utilities.
 - l. Submit change-over information related to the Owner's occupancy, use, operation, and maintenance.
 - m. Complete all final cleaning requirements for the project.
 - n. Touch-up and repair / restore damaged finishes to eliminate any visual defects.
2. Project Review and Final Completion: Submit a written request for a project review for substantial completion. Upon receipt of written request, the Architect will either proceed with the project review or notify the Contractor of unfulfilled requirements. **The Architect and his Consultants shall not make trial project reviews to see if the project is substantially complete.** If Substantial Completion is not granted within the contract time, the Contractor shall be prepared to pay liquidated damages. The Architect will prepare a Certificate of Substantial Completion after a successful project review or will notify the Contractor of items, either on the Contractor's list or additional items identified by the Architect, that shall be completed or corrected before the Certificate of Substantial Completion will be issued.
- a. Additional Project Review: Request additional project review when the items listed in previous project review, as incomplete or incorrect, have been completed or corrected.
 - b. Multiple Project Reviews: **Should multiple project reviews of the work be required due to failure of the Contractor to remedy punch list defects listed, the Owner shall deduct the expense of any additional inspections of the Architect and his Consultants from the Contractor's Contract Amount. The additional expense shall be based on the hourly rate shown for additional services in the Owner/Architect agreement.**
 - c. The Contractor shall pay for and cause the Certificate to be recorded in the Clerk of Court's office of the parish in which the work has been done within 72 hours of issuance with the Clerk of Court in the Parish of Ascension, Louisiana and provide the recording information to the Owner and Architect. The Contractor shall notify the Owner and Architect of the number and folio where said Certificate is recorded. Issuance of the Certificate of Substantial Completion does not constitute acceptance. If the Substantial Completion document has not been recorded 72 hours after issuance, the Owner may record the certificate at the Contractor's expense.
 - d. When the Architect finds the work acceptable under the Contract Documents and the Contract fully performed, the Architect will review the Contractor's final Certificate of Payment and send to Owner, in writing, that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's observations, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due to the Contractor, and noted in said final Certificate, is due and payable. The Architect's review of the Contractor's final Certificate for Payment will constitute a further representation that the conditions listed in Subparagraph 9.10.2 of the Supplementary Conditions as precedent to the Contractor's being entitled to final payment have been fulfilled.
 - e. Before the project is turned over to the Owner and considered ready for occupancy or partial occupancy two (2) weeks shall be allocated for Owner to move in.
 - f. The Contractor shall submit a certified copy of the Architect's Substantial Completion review list of items to be completed or corrected (punch list)

endorsed and dated by the Architect. The certified copy of the punch list shall state that each item has been completed or resolved for acceptance of the work.

- g. Insurance coverage complying with the insurance requirements for the project shall be carried until final completion.
- h. The Contractor shall provide instruction for Owner's personnel in the operation, adjustment, and maintenance of products, equipment, and systems. The Contractor shall schedule instruction times in coordination with the Owner so that the required personnel will be available for the instruction. (Note: The Owner may decide to video tape the instruction sessions.)
- i. The Contractor shall submit the following documents:
 - 1. **Clear Lien Free Certificate from Clerk of Court**
 - 2. **Contractor's Affidavit for Payment of Debts and Claims**
 - 3. **Contractor's Affidavit of Release of Liens**
 - 4. **Consent of Surety to Final Payment**
 - 5. **Consent of Surety to Reduction or Partial Release of Retainage**
- j. Start planning for Substantial Completion with all parties related to the project when submitting shop drawings, product data, samples, etc.

1.4 Record Documentation

- A. Record Documents: Contractor shall maintain, during the entire project, the following Record Documents and **shall bring Record Drawings to each monthly meeting for review** with the architect and owner's representative:
 - 1. Record Drawings: Maintain a complete set of blue / black line prints of Contract Drawings, Shop Drawings, Change Order Drawings for record mark-up purposes throughout the contract time.
 - 2. Mark-up drawings during the course of the work to show changes and actual installation conditions, sufficient to form a complete record for the Owner's future use. Give particular attention to work which will be concealed and difficult to measure and record at a later date, and work which may require servicing or replacement during the life of the project. The Contractor shall be required to annotate the record conditions in red ink by hand.
 - 3. Require entities marking prints to sign and date each mark-up. The Contractor shall be required to annotate the record conditions in red ink by hand.
 - 4. Accurately record information in an understandable and legible drawing technique. Record changed data immediately after data is received.
 - 5. Record Construction Change Directive Numbers, Change Order Numbers, and similar identifications in appropriate areas on the Record Drawings.
 - 6. Do not indicate in any area of the drawing or correspondence concerning the project the words "as-built drawings". All Record Documentation shall be referenced with the indication "Record Drawings and Record Specifications."
 - 7. **Record Documents shall be available for review with the Architect and his Consultants at each monthly meeting until the completion of the project. All changes, including Change Orders, shall be indicated on Record Documentation (drawings and specifications).**
 - 8. **Record Drawings shall be provided to the Architect in colored PDF format on a CD or Flash Drive at the end of the project. (Three copies of each format shall be provided.)**
- B. Record Specifications: Contractor shall maintain, during the entire project, the following Record Specifications and **shall bring Record Specifications to each monthly meeting for review** with the architect and owner's representative:
 - 1. Submit one (1) copy of the project's specification, including addenda, supplemental instructions, and contract modifications. Mark project specifications to indicate the actual product installation where the installation has changed from the original project specifications, addenda, supplemental instructions, and

contract modifications. The Contractor shall be **required to annotate the record conditions in red ink by hand.**

2. Give particular attention to products which will be concealed and installations that cannot be readily identified and recorded at a later date.
3. Mark Record Specification changes to include the proprietary name and model number of products, materials, and equipment including substitutions selected.
4. **Record Specifications shall be available for review with the Architect and his Consultants at each monthly meeting until the completion of the project. All changes, including Change Orders, shall be indicated on Record Documentation (drawings and specifications).**
5. **Record Specifications shall be provided to the Architect in colored PDF format on a CD or a Flash Drive at the end of the project. (Three copies of each format shall be provided.)**

- C. **Prior to final payment**, the Contractor shall turn over to the Architect a set of Record Drawings and Record Specifications. The set of Record Drawings shall be on 24" x 36" (color copy), printed hard copy drawing reflecting any changes made during the job and marked Record Drawings. The Record Specifications shall be a paper copy of the project specifications reflecting any changes made during the job and marked Record Specifications. **Scanned digital copies of the Record Drawings and Record Specifications shall be made on CDs or Flash Drives in PDF format, then delivered to the Architect (as stated above).** The Contractor shall pay for all costs involving Record Documentation. All Record Documentation shall be done neatly and legibly to read clearly from paper document, and digital copy.
- D. All Addenda, Supplemental Instructions and Change Order Drawings shall be stapled neatly into the Record Specifications set.
- E. **Prior to final payment**, the Contractor shall turn over to the Architect all CDs or Flash Drives with the paper set of Record Drawings, paper set of Record Specifications, and digital copies reflecting any changes made during the job and marked Record Drawings and Record Specifications.

1.5 Operations and Maintenance Manuals, Bonds and Guarantees

- A. Three (3) physical copies (binders) and three (3) digital copies (CD or Flash Drive) of Operations and Maintenance Manuals, Bonds and Guarantees shall be submitted to the Architect prior to final acceptance of the project by the Owner and **shall begin on the date of Substantial Completion or the date of occupancy by the Owner**, whichever date occurs first. Final payment will be held until the dates of all bonds or guarantees have been modified to reflect either the date of Substantial Completion or the date of occupancy by the Owner, whichever date occurs first.
- B. Refer to plans and specifications (specific sections) for information as to requirements for manuals, bonds and guarantees, including but not necessarily limited to the following:
1. Mechanical equipment and controls (description of controls and sequence of operations)
 2. Electrical equipment and controls (description of controls and sequence of operations)
 3. Architectural specialties
 4. Roofing two (2) year installation and 20 year guarantee
 5. Emergency instructions and procedures
 6. Operating procedures, including start-up, shut down, seasonal operation and weekend operations
 7. Piping diagrams
 8. Manufacturer's information including list of spare parts
 9. Name, address and telephone number of installer or supplier
 10. Maintenance procedures
 11. Maintenance and service schedules for preventive and routine maintenance
 12. Maintenance record forms

13. Sources of spare parts and maintenance materials
14. Copies of maintenance service agreements
15. Copies of warranties and bonds

- C. Organize Operations and Maintenance Manuals, Bonds and Guarantees into suitable sets of manageable size. Bind and index data (including table of contents at interior of binder) in heavy duty, three ring binders, in thickness necessary to accommodate contents with pockets inside the cover to receive folded oversized sheets. Identify each binder on the front and spine with the printed title "Operations and Maintenance Manuals, Bonds and Guarantees" and the project name. **This will result in three (3) binders of Operations and Maintenance Manuals, Bonds and Guarantees to be handed in prior to final acceptance. Also to be included with the above mentioned document shall be a digital copy of the Operations and Maintenance Manuals, Bonds and Guarantees.**

1.6 Final Reviewed Shop Drawings

- A. **Contractor shall be responsible to scan and assemble all final reviewed shop drawings. All digital scans shall be saved to a CD or Flash Drive in PDF format. Three (3) copies of these digital shop drawings on CDs or Flash Drives shall be submitted as part of close-out documents.**

1.7 Fire Marshal Information

- A. All fire code related documentation as required in the plans and specifications shall be submitted with shop drawings and other submittals for approval and / or review and the following:
1. The Contractor shall contact the Fire Marshal at the appropriate time to inspect fire code related construction before concealing any areas that would prevent the Fire Marshal to perform his inspection.
 2. Correct any code related construction that does not meet the Fire Marshal's requirements.
 3. The Contractor shall provide the Fire Marshal with fire related material specification sheets and product data such as fireproofing / firestopping, fire penetration caulking systems, etc.
 4. The Architect shall be contacted in writing, fax, or phone three (3) weeks before the Contractor's request for Substantial Completion review. This will allow the Architect sufficient time to contact the Fire Marshal for scheduling the Fire Marshal's inspection. If the Fire Marshal does not approve the building for occupancy, Substantial Completion shall not be given by the Architect of Record and the Contractor shall immediately remedy items that prevented Fire Marshal approval for occupancy.
 5. All fire related systems and devices shall be operational before the Fire Marshal is called for his inspection. Fire systems and devices that are not operating properly shall not be considered punch list items and shall be in operation before Substantial Completion is given to the Contractor. All of the Contractor's major subcontractors (mechanical, electrical, etc.) along with fire related systems and equipment sub-subcontractors shall be present at the Fire Marshal's inspection.
 6. All stamped Contract Documents and fire related systems and devices documents shall be present at the site for the Fire Marshal's inspection.

1.8 Demonstration and Training of Owner's Personnel

- A. Instruct / train the Owner's Personnel in the operations and maintenance of systems and equipment (mechanical, electrical, etc.) as indicated in each section of the specifications and as follows:
1. Provide instructor's experienced in operations and maintenance procedures.
 2. Provide instruction, coordinated with the Owner for times and dates that are convenient to the Owner's Personnel, for equipment that require seasonal

operation, provide similar instruction on what is required at the start of each season.

3. Training shall be scheduled with the Owner, through the Architect, with at least 14 days advance notice.
4. The Contractor shall coordinate the instructors for training, including notification of dates, times, length of instruction, and instructional content.
5. The training / instruction shall be conducted in a manner that can be videotaped by the Owner for future review. The training / instruction of personnel shall be conducted a minimum of two (2) times (additional training / instruction may be required as determined by the Owner and the Architect) to allow all personnel required to operate or maintain systems or equipment the appropriate training required for operation and maintenance.
6. The training / instruction sessions for mechanical, electrical, fire systems, etc. shall not be scheduled on the same day. Some of the Owner's personnel may be required to operate and maintain systems or equipment in more than one area of operation (mechanical, electrical, fire systems, etc.).
7. **All of the training / instruction sessions shall be completed before Substantial Completion is requested by the Contractor.**

B. Program Procedure: Develop an instruction program that includes individual training sessions for each system and equipment that may not be part of a system, as required by specific specification sections. For each training session, develop a learning objective and training outline. Include instruction for the following:

1. System design and operation philosophy
2. Review of documentation
3. Operations
4. Adjustments
5. Troubleshooting
6. Maintenance
7. Repair

1.9 Additional attic stock

A. In specific sections of the specifications are requirements that the Contractor leave a certain amount or percentage of attic stock material to be left on the project site for the Owner's future use. The attic stock shall be from the same lot numbers / production runs so that all attic stock will match the material installed on the project.

1.10 Final Project Cleaning

- A. Conduct final cleaning and waste removal operations to comply with local laws, ordinances, federal and local environmental and anti-pollution regulations.
- B. Employ experienced workers or professional cleaners for final cleaning. Clean all surfaces to a condition expected in a commercial building cleaning and maintenance program. Comply with all manufacturer's written instructions for chemicals used during final cleaning.
- C. Complete the following cleaning operations before Substantial Completion Review is requested:
 1. Clean and repair the project site in areas disturbed by construction activities, including landscape development areas, of trash, waste materials, litter, and other foreign materials not to remain as part of the project.
 2. Clean concrete or asphalt paved areas. Remove any spills, stains and other foreign deposits from these hard surfaces.
 3. Prepare the grounds that are not planted or covered with a hard surface to a smooth, even-textured surface conducive to plant growth.
 4. Remove all tools, construction equipment, machinery and surplus materials from the project site and repair any areas, such as ruts, swales, indentions, etc., of the site that have been damaged by these devices.

5. Remove debris and surface dust / dirt from limited access spaces such as roof areas, plenums, shafts, trenches, equipment vaults, manholes, attics and similar spaces.
 6. Sweep concrete floors, broom clean, in unoccupied spaces.
 7. Remove debris and dirt from carpet by vacuuming. Remove any visible soil or stains that remain after initial vacuuming with materials recommended by the manufacturer of the carpet.
 8. Clean all mirrors and glass in doors and windows. Remove excess glazing compound and other noticeable materials not part of the glazing system. Replace any chipped or broken glass or other damaged transparent materials. Polish all mirrors and glass without scratching surfaces.
 9. Remove labels that are not permanent along with any glue that remains after label removal.
 10. Repair, restore and touch-up damaged materials / surfaces. Replace any material / surface that cannot be satisfactorily repaired, restored or touched-up.
 11. **Do not paint over any UL and similar fire labeling, including mechanical and electrical name plates.**
 12. Clean all surfaces of mechanical and electrical equipment including elevator equipment. Remove all excess lubrication, paint and mortar droppings and other foreign substances not part of the equipment.
 13. Clean all plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 14. Replace all disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers and grilles.
 15. Clean ducts, blowers and coils at all units that were operated without filters during construction.
 16. Clean light fixtures, lamps, globes and reflectors to allow function at full efficiency. Replace all burned-out bulbs and those noticeably dimmed by hours of use and defective starters in fluorescent and mercury vapor fixtures.
- D. The General Contractor shall, upon job completion, remove all temporary facilities, excess materials, equipment, trash, debris, waste, etc. from the project and project site. Roof areas and parking lots shall be clean and free of all construction and other debris. The building shall be turned over to the Owner in generally a "spotless" condition with all glass, hardware, doors, walls, floors, ceilings, etc. free from all grease, dirt and/or scuff marks.
- E. During final cleaning, volatile waste must be properly disposed of and shall not be dumped on the ground, burnt or allowed into storm or sanitary sewer systems or waterways. Burying or burning of waste is prohibited. Remove waste materials from project site and dispose of lawfully.
- F. At this stage of the work, the completion of the project, when this cleaning-up period shall be accomplished, the Contractor shall maintain a crew of men that is sufficiently large enough to complete the work quickly, so that this important phase does not linger.

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION (not used)

END OF SECTION 01 77 00

SECTION 02 41 00.02 - DEMOLITION (ARCHITECTURAL)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Demolition and removal of **Existing Cooler Freezer building, existing cafeteria interior, Site Fencing, pavement, sidewalks, basketball courts, and gym building exterior and interior walls, interior wood framing.**
 - a. **Refer to drawings for quantity and types of construction being demolished and removed from the project site.**
 - 2. Removing below-grade construction, such as foundations, spread footings, drilled piers, grade beams etc.
 - 3. Disconnecting, capping or sealing, and abandoning in-place site utilities.
- B. Provide all labor, materials, and equipment required for completing demolition work to be done as indicated in the Construction Documents.
- C. Examine and investigate the building site prior to bid to become fully informed of conditions and problems to be encountered during the work.
- D. Remove all materials in the demolition from the site unless salvageable for Owner (Refer to Section 02 42 00 - Removal and Salvage of Construction Materials) and dispose of by the Contractor.
- E. Demolition shall be confined to areas defined in the construction documents only. Any damage to surrounding existing surfaces which will remain, resulting from demolition, shall be corrected at the Contractor's expense.
- F. The Contractor shall be responsible for maintaining safety conditions to protect his forces, as well as all occupants and staff from ALL construction hazards.
 - 1. The Contractor shall be responsible to maintain all means of egress as well as all fire protection features at all times during construction.
 - 2. The Contractor shall be advised that the existing building shall remain occupied during the entire school year. All activity shall be coordinated and scheduled, with the school administration, in such a way as to minimize disruption to the educational environment of the facility.
- G. The Contractor shall immediately report any unsafe structural conditions uncovered during demolition or construction to the Architect for coordination of required corrective measures.
- H. Visit and examine the site. Note all conditions of character and extent of work involved. No extras will be considered for any demolition work that is not specifically described in the Contract Documents but that may be required to properly carry out the work. During the Mandatory Pre-Bid Conference, Contractors will be allowed the opportunity to view the work required for this project. The date of the Mandatory Pre-Bid Conference is indicated on the Advertisement for Bids. The Contractor is encouraged to bring a digital camera to the Mandatory Pre-Bid Conference to document the existing conditions. The bidders are expected to utilize these digital photographs for bidding purposes.

- I. All demolition materials shall be disposed of properly at a dump site officially designated to receive materials of the type being disposed of, in full accordance with all applicable codes and regulations. Burning of demolished material at the site is unacceptable.
- J. Related Sections include the following:
 - 1. Division 1, 31, 32 and 33
 - 2. Division 23 Sections for demolishing or relocating site mechanical items.
 - 3. Division 26 Sections for demolishing or relocating site electrical items.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or recycled.

1.4 SUBMITTALS & PROCEDURES

- A. Schedule of Building Demolition Activities: Indicate the following:
 - 1. Detailed sequence of demolition and removal work, with starting and ending dates for each activity.
 - 2. Interruption of utility services (interruption of active utilities feeding adjacent buildings shall be coordinated with the APSB'S CM and Architect).
 - 3. Coordination for shutoff, capping, removal, and potential relocation of utility services.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Satisfactory Soils: Comply with requirements in Division 31 Section 31 23 12 - Excavation and Fill.

PART 3 - EXECUTION

3.1 DEMOLITION FIRMS

- A. Qualified Demolition Firms:
 - 1. Shall be licensed contractors in this type of demolition as per state law.

3.2 EXAMINATION

- A. Survey existing conditions and correlate with requirements indicated to determine extent of building demolition required.
- B. Owner is to remove any items to be salvaged by the Owner prior to beginning of demolition, if any. **The CM / Owner shall make a preliminary visit to the site during the Procurement Phase (While the project is being advertised for bids) to produce a possible list of salvage items desired by the Owner. CM / Owner shall provide the Owner's List of salvage material, if any, in the form of an addenda item.**

3.3 PREPARATION

- A. Existing Utilities: Locate, identify, disconnect, and seal or cap off all underground utilities serving buildings and structures to be demolished. All utilities shall be removed to a point as indicated in the Contract Documents unless otherwise indicated.
 - 1. Arrange to shut off any active utilities with the local utility companies in Gonzales.
 - 2. Since most utility services are required to be removed from beneath the Lab Building, the Demolition Contractor will have to provide temporary utilities that he may deem necessary for the completion of this project. The Demolition Contractor shall verify if a utility service is active or inactive. If the utility service is active and not serving adjacent buildings being used by APSB, the appropriate utility company shall be contacted to shut off the active utility. If an active utility

service is serving adjacent buildings, the Demolition Contractor shall relocate active utility as indicated in Contract Documents.

3. Cut off pipe or conduit a minimum of 36" below grade and as indicated on Contract Documents. Cap valve or plug and seal remaining portion of pipe or conduit as deemed necessary and meets all local codes and regulations.

- B. Existing Utilities: Refer to Division 23, 26, 31, 32 and 33 for shutting off, disconnecting, removing, and sealing or capping utilities. Do not start demolition work until utility disconnecting and sealing **have been completed and verified in writing to the CM and Architect.**

3.4 PROTECTION

- A. The Demolition Contractor shall provide and maintain all safety precautions during demolition work. Demolition Contractor shall install new 8'-0" high temporary security fence where indicated in the contract documents. All gates in the security fence shall be secured. The security fencing shall remain in place after the demolition is completed. See Section 01 50 00 - Temporary Facilities and Controls.
- B. Enclosures, barricades, signs, etc. shall be used at the Demolition Contractor's discretion in order to direct pedestrians and vehicular traffic away from the demolition site. The Demolition Contractor shall be responsible for the safety and structural stability of all enclosures, barricades, signs, etc. that have been implemented by him.
- C. The Demolition Contractor shall provide fire extinguishers located adjacent to any hazardous materials that could cause fire. All personnel performing demolition work must be trained in the use of such fire extinguishing equipment. Whenever a cutting torch or other equipment that might cause a fire is used, provide and maintain fire extinguishers nearby for immediate use.
- D. The Demolition Contractor shall prevent the spread of flying debris, particles, and dust. Sprinkle rubbish and debris with water to keep dust to a minimum. Clean the work area daily.
- E. The Demolition Contractor shall remove existing utilities as indicated or uncovered by demolition work and terminate in a manner conforming to nationally recognized codes covering the specific utility. When utility lines are encountered, that are not indicated on the drawings and are active, verify if the active utility is servicing an adjacent building in use by APSB and notify the Owner's CM and Architect of this condition.
- F. Existing Facilities: Existing walkways, existing Lab Building, existing canopies, and other items noted to be demolished in the Contract Documents.
- G. No existing items to remain unless otherwise called for in these specifications or drawings.
- H. **Existing Utilities: No abandoned utility services are to remain; active services are to be taken care of as indicated in the Contract Documents.**
- I. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Division 1.
 1. Protect existing site improvements, appurtenances, and landscaping (trees) to remain.
 2. Add new Temporary fencing around work area as described in the Contract Documents and indicated in Section 01 50 00 - Temporary Facilities and Controls.
 3. Provide temporary barricades and other protection required to prevent injury to people.

4. Provide protection to ensure safe passage of people around building demolition area.
- J. Particular caution shall be exercised in the demolishing of building components to prevent injuries to persons and property. Do not leave pipes, stubs, brackets and other building components loose without adequate support and anchorage. Safety of persons during and after demolition shall be the Contractor's primary concern. The Contractor shall be responsible to determine and assure that execution of the work under this contract in no way endangers any workman/persons.

3.5 DEMOLITION, GENERAL

- A. General: Demolish indicated existing buildings and structures and site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:
 1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
 2. Maintain adequate ventilation when using cutting torches.
 3. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads and streets.
 1. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.

3.6 ACTUAL DEMOLITION

- A. Remove building and structures and site improvements intact when permitted by authorities having jurisdiction.
- B. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.
- C. Concrete Walks-on-Grade: Saw-cut perimeter of area to be demolished at junctures with construction indicated to remain, then break up and remove.
- D. Existing Utilities: Abandon existing inactive utilities and below-grade inactive utility structures. Cut inactive utilities flush below grade as indicated on Contract Documents.

3.7 EXPLOSIVE DEMOLITION

- A. Explosives: Use of explosives is not permitted.

3.8 SITE RESTORATION

- A. Site Grading: Uniformly rough grade area where demolition work has occurred to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades. Provide for positive drainage.

3.9 DISPOSAL OF DEMOLISHED MATERIALS

- A. **THE CRUSHING OF DEMOLITION MATERIALS SHALL NOT BE ALLOWED ON THE PROJECT SITE. ALL DEMOLITION MATERIALS SHALL BE DISPOSED OF PROPERLY AT A DUMP SITE OFFICIALLY DESIGNATED TO RECEIVE MATERIALS OF THAT BEING DISPOSED OF, IN FULL ACCORDANCE WITH ALL APPLICABLE CODES AND REGULATIONS.**

- B. General: Remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
 - 1. Do not allow demolished materials to over accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- C. Burning: Do not burn demolished materials.
- D. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

END OF SECTION 02 41 00

SECTION 024100 - SITE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Demolition of structures, paving, and utilities.
 - 2. Filling voids created as a result of removals or demolition.
- B. Related Requirements:
 - 1. Louisiana Department of Transportation and Development (DOTD) Standards and Specifications (LSSRB), latest edition.
 - 2. Section 311000 - Site Clearing: Clearing of trees and other plant vegetation
 - 3. Section 312000 - Earthwork: Placement of fill material
 - 4. Section 313500 - Erosion and Sedimentation Control (Including SWPPP): Erosion protection during demolition operations.

1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

1.3 REGULATORY REQUIREMENTS

- A. Conform to applicable State and local codes for demolition of structures, safety of adjacent structures, dust control, runoff control, and pollution prevention.
- B. Obtain required permits and licenses from appropriate authorities. Pay associated fees including disposal charges.
- C. Notify affected utility companies before starting work and comply with their requirements.
- D. Do not close or obstruct public or private roadways, sidewalks, or fire hydrants without appropriate permits or written authorization.
- E. If hazardous, contaminated materials or other environmental related conditions are discovered, stop work immediately and notify the Owner's Construction Representative (OCR) for action to be taken. Do not resume work until specifically authorized by the OCR.

1.4 SUBMITTALS

- A. Project Record Documents: Accurately record actual locations of capped utilities and subsurface obstructions that will remain after demolition. Submit record as part of closeout submittals.

1.5 PROJECT CONDITIONS

- A. Structures to be demolished will be discontinued in use and vacated prior to start of work.
- B. Owner assumes no responsibility for condition of structures to be demolished.
- C. Conditions existing at time of inspection for bidding purposes will be maintained by Owner as reasonably practical. Variations within structures may occur by Owner's removal and salvage operations prior to start of demolition work.

- D. Unless otherwise indicated in Contract Documents or specified by the Owner, items of salvageable value to Contractor shall be removed from site and structures. Storage or sale of removed items on site will not be permitted and shall not interfere with other work specified.
- E. Explosives shall not be brought to site or used without written consent of authorities having jurisdiction. Such written consent will not relieve Contractor of total responsibility for injury to persons or for damage to property due to blasting operations. Performance of required blasting shall comply with governing regulations.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

- A. Fill material shall be aggregate fill materials as specified in Section 02300.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Provide, erect, and maintain erosion control devices, temporary barriers, and security devices at locations indicated on Construction Drawings.
- B. Protect existing landscaping materials, appurtenances, and structures, which are not to be demolished. Repair damage to existing items to remain caused by demolition operations.
- C. Prevent movement or settlement of adjacent structures. Provide bracing and shoring as necessary.
- D. Mark location of utilities. Protect and maintain in safe and operable condition utilities that are to remain. Prevent interruption of existing utility service to occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities as acceptable to governing authorities and Owner.
- E. Notify adjacent property owners of work that may affect their property, potential noise, utility outages, or other disruptions. Obtain written permission from adjacent property owners when demolition equipment will traverse, infringe upon, or limit access to their property. Coordinate notice with Owner.

3.2 GENERAL DEMOLITION REQUIREMENTS

- A. Conduct demolition to minimize interference with adjacent structures or pavements to remain.
- B. Cease operations immediately if adjacent structures appear to be in danger. Notify authority having jurisdiction. Do not resume operations until directed by authority.
- C. Conduct operations with minimum of interference to public or private access. Maintain ingress and egress at all times.
- D. Sprinkle work with water to minimize dust. Provide hoses and water connections for this purpose.
- E. Comply with governing regulations pertaining to environmental protection.
- F. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing prior to start of work.

3.3 DEMOLITION

- A. Demolish site improvements designated to be removed as shown on the drawings. Site improvements shall include but not be limited to structures, retaining walls, foundations, pavements, curbs and gutters, drainage structures, utilities, signage or landscaping.

- B. Disconnect and cap or remove utilities to be abandoned as shown on the drawings.
- C. Fill or remove underground tanks, piping, and appurtenances as shown.
- D. Demolish buildings completely and remove from site using methods as required to complete work within limitations of governing regulations. Small structures may be removed intact when acceptable to Owner and authorities having jurisdiction.
- E. Locate demolition equipment and remove materials to prevent excessive loading to supporting walls, floors, or framing.
- F. Demolish concrete and masonry in small sections. Break up concrete slabs-on-grade that are 2-feet or more below proposed subgrade to permit moisture drainage. Remove slabs-on-grade and below grade construction within 2-feet of proposed subgrade. Use proper dust control methods to maintain dust emissions below the permissible level.

3.4 FILLING BASEMENTS AND VOIDS

- A. Completely fill below grade areas and voids resulting from demolition or removal of structures, underground fuel storage tanks, wells, cisterns, etc., using aggregate fill materials consisting of stone, gravel, or sand free from debris, trash, frozen materials, roots, and other organic matter.
- B. Areas to be filled shall be free of standing water, frost, frozen or unsuitable material, trash, and debris prior to fill placement.
- C. Place fill materials in accordance with Section 02300 unless subsequent excavation for new work is required.
- D. Grade surface to match adjacent grades and to provide flow of surface drainage after fill placement and compaction.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove from site debris, rubbish, and other materials resulting from demolition operations. Leave areas of work in clean condition.
- B. No burning of any material, debris, or trash on-site or off-site will be allowed except when allowed by appropriate governing authority and Owner. If allowed as stated above, burning shall be performed in manner prescribed by governing authority. Attend burning materials until fires have burned out and have been completely extinguished.
- C. Transport materials removed from demolished structures with appropriate vehicles and dispose off-site to areas that are approved for disposal by governing authorities and appropriate property owners.

END OF SECTION

SECTION 02 42 00 - REMOVAL AND SALVAGE OF CONSTRUCTION MATERIALS

PART 1 - GENERAL

1.1 SCOPE

- A. In the demolition and removal of materials and equipment from the Existing Structures Located on the Ascension Parish School Board Property, the Contractor shall address salvaged material as follows:
 - 1. If the Contractor desires to retain, after Owner has indicated that they do not want a material being removed, what is indicated in plans as salvage material and pointed out as salvage by the Owner during a walk through the project, the value of the salvaged item shall be provided to the Architect and shall be taken care of by Change Order. If no value is presented to the Architect for salvaged material, which the Owner has indicated can be removed from site, the Contractor shall not salvage this material from this demolition project and shall be disposed of in a legal manner at an appropriate dump site. Salvaging material from this project without indicating its value to the Architect, may be in violation of state laws.
- B. If the Contractor does not follow the procedure indicated above, concerning salvaged material, the Contractor will be responsible for reimbursing the Owner for the value of the material as indicated above.

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION (not used)

END OF SECTION 02 42 00

SECTION 04 01 20.31 - MASONRY SEALER

PART 1 - GENERAL

1.1 SCOPE

- A. This section covers furnishing of all labor, tools, equipment, material, and performing all work and services necessary or incidental to furnish and apply, complete, all masonry sealers as shown on drawings and as specified herein, in accordance with provisions of the Contract Documents, and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.
- C. For additional information refer to sections:
04 21 13 - Brick Masonry

1.2 SUBMITTALS

- A. Product Specification Data: Submit manufacturer's technical literature, specifications, and application instructions for the specified clear water repellent material.
- B. Samples: Obtain samples of water repellent for sample application. Sample application is covered in Section C. Quality Assurance.
- C. Applicator Qualifications: Submit certification stating applicator has a minimum of three (3) years' experience using the specified product. Provide a list of several most recently completed projects where the specified material was used. Include the project name, location, Architect and method of application.

1.3 QUALITY ASSURANCE

- A. Manufacturer: A firm with no less than ten (10) years' experience in manufacturing the products specified in this section.
- B. Applicator Qualification: A firm with no less than three (3) years' experience in the application of the products specified in this section. In addition, applicator must state the intended use of the proper application equipment and that it has been well maintained.
- C. Mock-Up:
 - 1. Apply water repellent per manufacturer's application instructions as directed by the Architect to substrate material which matches actual job conditions. Determine the acceptability of appearance and optimum coverage rate required for application. (The test wall indicated in Section 04 21 13 - Brick Masonry can be used.)
 - 2. After sample treatment has cured in accordance with manufacturer's recommendations, water test to verify that substrate is coated with sufficient water repellent to effectively repel liquid water from the surface.
 - 3. Obtain Architect approval prior to full scale application of water repellents.
- D. Pre-Application Meeting: Convene a pre-application meeting prior to the start of application of the specified material. Attendance by a representative of each of the following organizations is requested; the application firm, the Architectural firm, and the

water repellent manufacturer. Notify each of the attendees at least three (3) days prior to the meeting time.

- E. Post-Application Meeting: After the application and curing of the masonry sealer, a manufacturer's representative shall visit the site and test the sealed wall to assure that sealer has been applied in accordance with manufacturer's recommendations and all warranties can be submitted as indicated in specifications.

1.4 PRODUCT DELIVERY

- A. Material Delivery: Deliver materials to the job site in original sealed containers, clearly marked with manufacturer's name, brand name, and type of material. Verify the product matches that of the original sample applied on the mock-up wall.
- B. Storage and Protection: Store materials inside if possible, away from sparks and open flame. Store in a secure area to avoid tampering and contamination. Water based materials must be kept from freezing. Store and handle in accordance with manufacturer's written instructions.

1.5 PROJECT CONDITIONS

- A. Surface Preparation: Surface must be free of cracks, dirt, oils, paint or other contaminants which may affect the appearance or performance of the water repellent material.
- B. Environmental Requirements:
 - 1. Air and substrate temperature must be above 40°F (5°C) or below 95°F (35°C) unless otherwise specified by manufacturer.
 - 2. Do not proceed with application if the substrate is wet or contains frozen water.
 - 3. Do not apply material when rain is predicted within 48 hours; or earlier than five (5) days after the substrate became wet.
 - 4. Do not apply materials in high or gusty winds.
- C. Preparation:
 - 1. Special precautions should be taken to avoid vapor transmission (fumes) from entering the building being treated. Ventilation systems and fresh air intakes should be turned off and closed.
 - 2. Protect shrubs, metal, wood trim, glass, asphalt and all building hardware during application for overspray.
 - 3. Do not permit spray mist or liquid to drift onto surrounding properties.

1.6 SCHEDULING

- A. Architect shall be notified not less than 48 hours before each application of water repellent is scheduled.
- B. After completion of all applications, the manufacturer's representative shall inspect the final product and provide the Architect written assurance that these products meet the manufacturer's standards and guarantee.

1.7 WARRANTY

- A. The Contractor and applicator shall jointly and severally warrant water repellent material against failure in material for a period of ten (10) years from the date of substantial completion.
- B. Submit completed manufacturer's written "Request for Warranty Form" to manufacturer ten (10) days prior to application.
- C. After substantial completion of the project, submit manufacturer's written "10 Year Warranty Application" to manufacturer for processing. Upon receiving validated warranty, submit copies to Architect and building Owner.

PART 2 - PRODUCTS

2.1 Manufacturer

Sherwin Williams – "Loxon" 40% silane Water Repellent (LX31T0040 Clear) (Coverage Rate: 100 - 150 sq.ft/ gal)

2.2 Or Prior approved equal.

PART 3 - EXECUTION

3.1 Examination

- A. Verify the following:
 - 1. The required joint sealants have been installed.
 - 2. New masonry and mortar have cured a minimum of twenty-one (21) days.
 - 3. Surface to be treated is clean, dry and contains no frozen water.
 - 4. Environmental conditions are appropriate for application.
- B. Preparation
 - 1. Protection:
 - a. Special precautions should be taken to avoid vapor transmission (fumes) from entering the building being treated. Ventilation systems and fresh air intakes should be turned off and closed.
 - b. Protect shrubs, metal, wood trim, glass, asphalt and other building hardware during application from overspray.
 - c. Do not permit spray mist or liquid to drift onto surrounding properties or parking lots.
- C. Application
 - 1. See paragraph 1.5 B. of this section for environmental requirements.
 - 2. Apply water repellents in accordance with manufacturer's written application instructions.
 - 3. Material must be applied using low pressure application equipment designed for water repellent application.
 - 4. Apply material as shipped by the manufacturer. Do not dilute.
 - 5. Apply treatment evenly until surface is totally saturated. Coverage rates are dependent on substrate material. Only one saturation coat is required.
- D. Field Quality Control
 - 1. The Architect shall be contacted 48 hours prior to application so as to provide supervision as required. The Architect or the Architect's representative shall

inspect the progress as the work proceeds. Do not apply any water repellent that is not specified by the Architect.

2. After water repellent has cured for 72 hours all surfaces shall be tested with a water spray. Recoat any area that indicates water absorption.

E. Cleaning

1. At completion, remove from the job site, all excess material, debris, and waste resulting from this work. Dispose of water repellent containers according to state and local environmental regulations.

END OF SECTION 04 01 20.31

SECTION 04 05 13 – MASONRY MORTARING

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of mortar as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. List of Materials:
 - 1. Masonry Cement - (ASTM Designation C91, Type N).
 - 2. Sand - Shall conform to current ASTM Specifications for aggregate for Masonry Mortar ASTM Designation C144. Use natural sand, free of contaminants.
 - 3. Water - Shall be clean and free of deleterious amounts of solids, alkalis, salts, or organic materials.
 - 4. Admixtures - All mortar used for laying exterior masonry units shall be waterproofed with an admixture of **Master Builders Solutions Dry-Block**, or prior approved equal. Mixed and used in strict accordance with manufacturer's written instructions. Color must be approved by the Owner and Architect.
No air-entraining admixtures or cementitious materials containing air-entraining admixtures shall be used in the mortar.
No antifreeze compounds or other substances shall be used in the mortar to lower the freezing point.
Calcium chloride or admixtures containing calcium chloride shall not be used in mortar in which reinforcement, metal ties or anchors are embedded.
 - 5. Brands - Brands of cementitious materials and the source of supply of sand shall remain the same throughout the entire job and shall not be changed without written permission of the Architect.
 - 6. Grout for filling "U" blocks and vertical cells shown on the drawings to be filled with concrete in concrete masonry at standard concrete block walls shall be 2,000 psi concrete meeting the requirements set forth in Section 03 30 00 - Cast-In-Place Concrete. Grout shall comply with ASTM C476 and IBC requirements for masonry grout.
 - 7. Coloring of mortar:
 - a. All exterior mortar associated with smooth-faced masonry, veneer brick, accent brick (if any), and split-faced concrete unit masonry shall be selected by the architects.
 - b. Samples of mortar mix colors shall be submitted to the Architect and mixed in strict accordance with manufacturer's printed instructions. Mortar samples shall be used in conjunction with the sample masonry test panel indicated in Section 04 21 13 - Brick Masonry. **(MORTAR SHALL BE PREMIXED)**

- B. Prepared Masonry Cement - "Type - N Mix" manufactured by Cemex USA, Holcim USA, Argos USA or prior approved equal. (NOTE: MORTAR SHALL BE PREMIXED.)
- C. Storage - Cementitious materials and aggregates shall be stored in such a manner as to prevent deterioration, or intrusion of foreign matter.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. Preparation
 - 1. Proportions: One volume masonry cement and between 2-1/4 and 3 volume of damp, loose mortar sand (or as recommended by manufacturer and ASTM C270). Water shall be used in quantity necessary to give proper workability.
 - 2. Mixing Mortars: All cementitious materials and aggregate shall be mixed for at least 3 minutes and not more than 5 minutes in a mechanical batch mixer, with the maximum amount of water to produce a workable consistency. Mixing shall comply with ASTM C270
 - 3. Time Limits: Mortar shall be used and placed in final position within 2 hours after mixing when the air temperature is 80 degrees F. Mortar not used within these time limits shall be discarded.
 - 4. Retempering: Mortars that have stiffened within the time intervals stated above because of evaporation of moisture, may be retempered to restore workability by adding water. (This procedure can be done only once.)
- B. Unit masonry shall be kept clean of all excess mortar, dirt, grease, etc. Acids may be used only by qualified cleaning service people skilled in this work. Any damaged unit masonry shall be replaced by the Contractors expense and shall be made to match surrounding work.
- C. Exterior masonry shall be kept clean of all excess mortar, dirt, grease, etc. All cleaning of brick shall be performed by a qualified cleaning service skilled in this work.

END OF SECTION 04 05 13

SECTION 04 21 13 - BRICK MASONRY

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, with Brick Masonry as shown on drawings and as specified in accordance with provisions of the contract documents and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, and complete installation of brick masonry shall be furnished and installed as part of this work.
- C. For additional information refer to section:
04 05 13 - Masonry Mortaring
04 22 00 - Concrete Unit Masonry
07 11 00 - Dampcoursing
- D. All brick masonry shall comply with ASTM standard specifications for brick and applicable testing methods, specifically ASTM C216, Grade SW, Type FBS, and shall be installed by qualified masons.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Facebrick - Facebrick shown on drawings shall be nominal 8" long brick that lay up 3 courses in 8" with a nominal 4" bed depth. Brick shall be for use in exposed external and masonry walls and portions where a high degree of mechanical perfection, and minimum permissible variation in size are required. The Architect will review bricks submitted for color match and place any such matches in addendum form during the bidding process. The Architect shall have final opinion on match before any brick is installed. There will be two (2) colors of facebrick provided by one of the Acceptable Manufacturers, which shall be selected for use on this project. (The two colors of brick shall be the field brick and the accent brick as shown in the drawings and specified herein.)
 - 1. Acceptable Manufacturers:
 - Acme Brick - Velour modular,
Field Brick Color #1= To be chosen by owner
Accent Brick Color #2= To be chosen by owner
 - Cherokee Brick and Tile Co.- Velour modular
Field Brick Color #1= To be chosen by owner
Accent Brick Color #2= To be chosen by owner
 - or Prior Approved Equal
- B. The Contractor shall set up test masonry walls in conjunction with Section 04 22 00 - Concrete Unit Masonry for sampling coordination of brick/block and mortar color. The test masonry wall shall be of a size and shape to allow a full repeat of range, color variation, texture and color as required to render a complete wall system that reflects the masonry to be installed on the building and to render an approval by the Owner/Architect (minimum size 8'H x 8'W). Test walls may be required for several samples and/or several manufacturers. Refer to Section 01 33 23 - Shop Drawings, Product Data and Samples for additional information. The mortar to be used shall be as specified in Section 04 05 13

- Masonry Mortaring. The mortar color shall be selected by the Architect. The wall shall not be destroyed or moved until the project is complete.

C. Wall Reinforcement

1. Brick masonry shall be attached thru rigid wall insulation and into stud back-up wall with anchor system as supplied in accordance with the recommendations of the manufacturer and indicated in Contract Documents. (One tie, minimum, for every 1.77 sq. ft. and no more than 16" o.c. horizontally and vertically. Ties shall also be staggered.) Approximate spacing is at every 6th course vertically and every 16" o.c. horizontally. NOTE: All masonry anchors in cavity wall shall be hot dipped galvanized and installed in accordance with TMS 402/602.

a. Acceptable Manufacturers:

Heckmann Building Products: Pos-I-Tie; or

Hohmann & Barnard: 359-FH Veneer Anchor with VBT Series Triangular Ties); or

Prior Approved Equal.

(Note: corrugated ties shall not be accepted.)

D. Weep Hole Cover - New construction weep hole cover shall be:

1. 3-3/4" deep x 2-1/2" high x 3/8" wide, Model No. WHC-40 Series (Gray), as manufactured by Tamlyn; or
2. 3-3/8" deep x 2-1/2" high x 3/8" wide, Model No. QV - Quadro-Vent, as manufactured by Hohmann & Barnard, Inc.

or prior approved equal

E. Certification - Manufacturer shall furnish Architect with certification of products used as to their meeting all specified quality, grade, etc.

F. Storage of Materials - All mortar materials shall be stored under cover in a dry place. During freezing weather, all masonry units shall be protected with tarpaulins or other suitable material.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Wetting Brick - All brick having absorption rates (determined in accordance with ASTM Specification C67) in excess of 0.025 oz. per square inch per minute shall be wetted so that the rate of absorption when laid does not exceed this amount.
- B. Protection of Work - During erection, all walls shall be kept dry by covering at the end of each day or shutdown period with strong, waterproof membrane. Partially completed walls not being worked on shall be similarly protected at all times. All covering shall overhang at least 2' on each side of the wall and shall be securely anchored.
- C. Freezing Weather - Comply with TMS 602 cold weather masonry construction requirements. Do not lay masonry on frozen surfaces or when temperature is below 40°F without required protection.
- D. Joining of Work - Where fresh masonry joins masonry that is partially set or totally set, the exposed surface of the set masonry shall be cleaned and lightly wetted so as to obtain the best possible bond with new work. All loose brick and mortar shall be removed.

If it becomes necessary for construction purposes to "stop off" a horizontal run of masonry, this shall be done only by racking back in each course. Toothing will not be permitted.

- E. Tooling Joints - When brick mortar joints, which are exposed and have become "thumbprint" hard, they shall be tooled with a round or other approved jointer. The jointer shall be slightly larger than the width of the mortar joint so that a complete contact is made along the edges of the units, compressing and sealing the surface of the joint. All joints shall be 3/8" tooled concave joints.
- F. Do not use chipped or broken units. If such units are in the finished wall, they shall be rejected by the Architect and their removal and replacement made by the contractor at the contractor's cost.
- G. Use brick from standard lots, with all face brick coming from the same lot as much as possible. Brick laid up with obvious banding, mismatching of color, tone and/or consistency of mix, shall be rejected by the Architect and their removal and replacement made by the contractor at the Contractor's cost.
- H. Temporary Shoring for Arches and Lintels - Mason shall be responsible for assembly, installation, maintenance and removal of all formwork and shoring necessary for complete installation of Masonry Lintels and Arches. The mason shall provide safe, stable, secure and complete forms capable of supporting all material dead loads and construction live loads. Forms shall be removed and shall leave no visible signs on surrounding masonry. Forms shall be constructed in a manner which is dimensionally accurate to maintain level and plumb lines, and consistent arch radius. Shoring shall remain in place until the masonry has developed sufficient strength to carry its weight. (Re: Brick Institute of America - Technical Notes on Brick Construction - Entry 31, 31A and 31B)

3.2 WORKMANSHIP

- A. All masonry shall be laid plumb, level, and true to line. Maintain uniform joint thickness and lay in a running bond pattern. Brick shall be laid with completely filled mortar joints. The ends of brick shall be buttered with sufficient mortar to fill the end joints. Closures shall be rocked into place with the head joints thrown against the two adjacent brick in place. **Full Head & Bed Joints are mandatory. If any work does not have Full Head & Bed Joints the work shall be rejected by the Architect.**
- B. Where cutting of brick is necessary, a masonry power saw shall be used.
- C. When flashing is to be laid on or against masonry, the surface of the masonry shall be smooth and free from projections which might puncture the flashing material. Weep holes spaced 24" o.c. shall be provided in the head joints in the first course immediately above all flashing or as indicated on drawings. Weep holes shall be kept free of mortar droppings.
- D. Cavity shall be kept free and clean of mortar and mortar droppings.
- E. Expansion Joints
 - 1. Shall be located at offsets and at junctions of walls in "L", "T", or "U" shapes along with a maximum of 30'-0" on straight walls. Expansion joint shall be 3/8" wide and shall consist of one-part polysulfide or polyurethane sealant over backer rod.
- F. Backer-rod shall be closed cell polyethylene foam, with the diameter at least 25 percent greater than the joint width.

3.3 CLEANING

- A. All holes in exposed masonry shall be pointed, and defective joints shall be cut out and repointed with mortar.
- B. Exposed masonry shall be protected against staining by wall coverings, and excess mortar shall be wiped off the surface as the work progresses.
- C. All exposed masonry shall be thoroughly cleaned. This final cleaning of brick shall be done in coordination with the General Contractor and the subcontractor applying sealer to the brick. The time of final cleaning and sealing shall be decided with the General Contractor making the final decision on the time. It is realized that cleaning will be required within seven (7) to ten (10) days after laying of masonry to allow ease of mortar removal, masonry dust, etc. This is the usual maintenance cleaning of the masonry and shall not be confused with the final cleaning before sealing of masonry which shall be coordinated and scheduled with the General Contractor. Before applying any cleaning agent to the entire wall, it shall be applied to a sample wall area of approximately 20 sq. ft., in a location approved by the Architect. No further cleaning work may proceed until the sample area has been approved by the Architect, after which time the same cleaning materials and method shall be used on the remaining wall area. If stiff brushes and water do not suffice, the surface shall be thoroughly wetted with clear water and then scrubbed with solutions approved by the Architect. Muriatic acid-based masonry cleaners shall not be used. All sash, metal lintels and other corrodible parts shall be thoroughly protected during cleaning.
- D. Any burning or discoloration of masonry, mortar or adjacent materials, due to unapproved cleaning methods shall be reason for rejection of the work by the Architect with the respective work removed and replaced by the Contractor at his cost.

END OF SECTION 04 21 13

SECTION 04 22 23.29 - SPLIT-FACE CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete of Split-face Concrete Unit Masonry as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, and complete installation shall be furnished and installed as part of this work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Obtain Veneer Masonry Units from a single source to ensure color, finish and texture continuity. Manufacturer shall have no less than 5 years production experience. All masonry units shall be manufactured by one of the following:
 - 1. E Dillon and Company
2522 Swords Creek Road
Swords Creek, VA 24649
(P)800-234-8970 Or
 - 2. Block USA, Gulf Coast Division
10043 South Park Drive
Gulfport, MS. 39503
(P) (228) 897-1828
Split-Faced Color: Wellhouse Rope Or
 - 3. Headwaters Construction Materials
Eagle - Cordell Concrete Products (Oldcastle)
10538 Beaumont Hwy.
Houston, TX 77078
(P) (713) 691-5526
Split-Faced Color: Antique Brass Or
 - 4. DecraStone
120 Industrial Road North
Tupelo, MS 38801
(P) (662) 842-7811
Split-Faced Color: Driftwood Or
 - 5. Acceptability for use on the project shall be based upon the color of the split-faced block and smooth faced (velour) block. The approval of a manufacturer is contingent upon the Architect approving the color. The Architect shall have final opinion on the acceptability of block color in coordination with all other veneer masonry.
- B. Masonry units shall comply with ASTM C-90.
 - 1. Minimum Net Area Average Compressive Strength: Average of three units 1900 PSI, individual unit 1700 PSI. (See concrete masonry Note 2 on Drawing Sheet SDC-1.0.)

2. Maximum Absorption: The absorption rate shall not exceed 13 lbs/CF.
 3. Weight Classification: Normal Weight (not less than 125 lbs/CF).
 4. Dry-Block certification.- admixtures shall comply with NCMA TEK Notes or manufacturer's requirements for integral water repellents
- C. The Contractor shall set up test masonry walls of split face block in conjunction with brick masonry for sampling of both block types and mortar color. The test masonry wall shall be of a size (minimum size 8'H x 8'W) and shape to allow a full repeat of range, color variation and texture as required to render an approval by the Owner/Architect. Test walls may be required for several samples and/or several manufacturers. Refer to Section 01 33 23 - Shop Drawings, Product Data and Samples for additional information. The mortar color shall be as specified in Section 04 05 13 - Masonry Mortaring. This wall shall not be destroyed or moved until the project is complete.
1. One (1) color of Split-Faced Block shall be selected for use on this project.
 2. The Architect / Owner shall determine acceptable colors. Acceptance / Rejection of Color shall be critical for all Split-Faced Block and shall determine Prior Approval or Rejection of material for use on the project.
- D. The standard size unit to be used on the job is 8" x 8" x 16" solid units. L-Shaped Corner blocks shall be used at all corners.
- E. Mortar - Refer to Section 04 05 13 - Masonry Mortaring. All mortar in exterior walls shall contain recommended amount of DRY-BLOCK mortar admixture for water repellancy. Color shall be as specified in Section 04 05 13 - Masonry Mortaring.
1. There will be a maximum of one (1) colors of mortar selected for use on this project.
- F. At single wythe split-faced concrete unit masonry walls use ty-wall #9 gauge hot dipped galvanized "Z-type" assembly sized to wall thicknesses as indicated on drawings, or prior approved equal and shall comply with ASTM A951.
- G. Certification - Manufacturer shall furnish Architect with certification of products used as to their meeting all specified quality, grade, etc.
- H. Storage of Materials - All mortar materials shall be stored under cover in a dry place. During freezing weather, all masonry units shall be protected with tarpaulins or other suitable material.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. All concrete masonry units shall be laid in running bond, and horizontal and vertical joints shall be concave or otherwise noted.
- B. Protect masonry by brushing clean during layout and against spattering or defacing during other operations. Cover top of walls at end of work each workday.
- C. Unit masonry laid true to dimensions, plumb and level.
- D. SPLIT-FACED MASONRY UNITS - Exposed areas must be free of chips or cracks after erection. It is of paramount importance that concrete masonry units be uniform in size so that an acceptable exposed wall can be built. Do not use split-faced masonry units showing sufficient variations in dimensions which in the Architect's opinion, produce a wall with too wide a range of joint width. Use masonry saw for any cuts.

- E. LINTELS - Provided as detailed. Minimum bearing eight inches (8"). Modulate blocks with adjacent split-faced masonry units for a uniform pattern.
- F. DAMPCOURSING - See Section 0715 - Dampcoursing.
- G. FREEZING WEATHER - No masonry shall be laid when the temperature of the outside air is below 40F, unless means approved by the Architect are provided to heat and maintain the temperature of the masonry materials and protect the completed work from freezing. Protection shall consist of heating and maintaining the temperature of the masonry materials at least 40F, and maintaining an air temperature above 40F. Comply with requirements of ACI 530 / TMS 602.
- H. NOTE: Great time and effort were used to course out with block work horizontally and vertically especially at all openings. These efforts are to be carried out according to plans during construction.
- I. NOTE: All split-faced masonry units shall be laid in stack bond pattern. The mortar joints shall have a concave tool joint to seal the joint.
- J. Expansion Joints
 - 1. Shall be located at offsets and at junctions of walls in "L", "T", or "U" shapes along with a maximum of 30'-0" on straight walls. Expansion joint shall be 3/8" wide and shall consist of one-part polysulfide or polyurethane sealant over backer rod. Joints shall comply with TMS 402/602 Building Code Requirements for Masonry Structures for spacing and detailing.
- K. NOTE: All masonry shall be laid with **FULL HEAD AND BED JOINTS**.

3.2 CLEANING

- A. All exposed split-face masonry shall be thoroughly cleaned. This final cleaning of split-face masonry shall be done in coordination with the General Contractor and the subcontractor applying sealer to the split-face masonry. The time of final cleaning and sealing shall be decided with the General Contractor making the final decision on the time. It is realized that cleaning will be required within seven (7) to ten (10) days after laying of split-face masonry to allow ease of mortar removal, masonry dust, etc. This is the usual maintenance cleaning of the split-face masonry and shall not be confused with the final cleaning before sealing of split-face masonry which shall be coordinated and scheduled with the General Contractor. Before applying any cleaning agent to the entire wall, it shall be applied to a sample wall area of approximately 20 sq. ft., in a location approved by the Architect. No further cleaning work may proceed until the sample area has been approved by the Architect, after which time the same cleaning materials and method shall be used on the remaining wall area. If stiff brushes and water do not suffice, the surface shall be thoroughly wetted with clear water and then scrubbed with solutions approved by the Architect. Muriatic acid-based masonry cleaners shall not be used. All sash, metal lintels and other corrodible parts shall be thoroughly protected during cleaning.

END OF SECTION 04 22 23.29

SECTION 04 72 00 - CAST STONE MASONRY (BUILDERS CAST STONE)

PART 1 - GENERAL

- 1.1 The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete of builder's cast stone as shown on drawings and specified in accordance with provisions of the contract documents and completely coordinated with that of all other trades.
- 1.2 Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.
- 1.3 Section Includes - Architectural Cast Stone
 - A. Scope - All labor, materials and equipment to provide the Cast Stone shown on architectural drawings and as described in this specification.
 - 1. Manufacturer shall furnish Cast Stone covered by this specification.
 - 2. Installing contractor shall unload, store, furnish all anchors, set, patch, clean and seal the Cast Stone as required.
- 1.4 Related Sections
 - A. Section 01 33 23 - Samples, Shop Drawings and Submittals
 - B. Section 04 05 13 - Masonry Mortaring
 - C. Section 07 92 00 - Joint Sealants
- 1.5 References
 - A. ACI 318 - Building Code Requirements for Reinforced Concrete
 - B. ASTM A1064 - Standard Specification for Steel Wire and Welded Wire Reinforcement for Concrete
 - C. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel bars for Reinforced Concrete
 - D. ASTM C 33 - Standard Specification for Concrete Aggregates
 - E. ASTM C 150 - Standard Specification for Portland Cement
 - F. ASTM C 173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volume Method
 - G. ASTM C 231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
 - H. ASTM C 260 - Standard Specification for Air-Entrained Admixtures for Concrete
 - I. ASTM C 270 - Standard Specification for Mortar for Unit Masonry
 - J. ASTM C 426 - Standard Test Method for Linear Shrinkage of Concrete Masonry Units
 - K. ASTM C 494/C 494M - Standard Specifications for Chemical Admixtures for Concrete
 - L. ASTM C 618 - Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
 - M. ASTM C 666 - Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
 - N. ASTM C 979 - Standard Specification for Coloring Pigments for integrally Pigmented Concrete
 - O. ASTM C 989 - Standard Specification for Ground Granulated Blast-Furnace slag for Use in Concrete
 - P. ASTM C 1194 - Standard Test Method for Compressive Strength of Architectural Cast Stone
 - Q. ASTM C 1195 - Standard Test Method for Absorption of Architectural Cast Stone
 - R. ASTM C 1364 - Standard Specification for Architectural Cast Stone
 - S. ASTM C 2244 - Standard Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates
 - T. Cast Stone Institute ® Technical Manual (Current Edition)
- 1.6 Definitions

- A. Cast Stone - shall be a refined architectural concrete building unit manufactured to simulate natural cut stone, used in unit masonry applications as described below:
 - 1. Dry Cast Concrete Products - manufactured from zero slump concrete.
 - a. Vibrant Dry Tamp (VDT) casting method: Vibratory ramming of earth moist, zero-slump concrete against a rigid mold until it is densely compacted.
 - b. Machine casting method: manufactured from earth moist, zero-slump concrete compacted by machinery using vibration and pressure against a mold until it becomes densely consolidated.
 - 2. Wet Cast Concrete Products - manufactured from measurable slump concrete.
 - a. Wet casting method: manufactured from measurable slump concrete and vibrated into a mold until it becomes densely consolidated.

1.7 Submittal Procedures

- A. Comply with Section 01 33 23 - Samples, Shop Drawings and Submittals.
- B. Samples: Submit pieces of the Cast Stone that are representative of the general range of finish and color proposed to be furnished for the project.
- C. Test Results: Submit manufacturer's test results of Cast Stone previously made by the manufacturer.
- D. Shop Drawings: Submit manufacturer's shop drawings including profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors annotation of stone types and their location.

1.8 Quality Assurance

- A. Manufacturer Qualifications:
 - 1. Manufacturer shall have sufficient plant facilities to produce the shapes quantities and size of cast stone required in accordance with the project schedule.
 - 2. Manufacturer shall submit a written list of projects similar in scope and at least three (3) years of age, along with Owner, Architect and Contractor references.
- B. Standards: Comply with the requirements of the Cast Stone Institute Technical Manual and the project Specifications. Where a conflict may occur, the Contract Documents shall prevail.

PART 2 - PRODUCTS

2.1 Architectural Cast Stone

- A. Comply with ASTM C 1364
- B. Physical properties: Provide the following:
 - 1. Compressive Strength - ASTM C 1194: 6,500 psi (45 Mpa) minimum for products at 28 days.
 - 2. Absorption - ASTM C 1195: 6% maximum by the cold water method, or 10% maximum by the boiling method for products at 28 days.
 - 3. Air Content - ASTM C173 or C 231, for wet cast product shall be 4-8% for units exposed to freeze-thaw environments. Air entrainment is not required for VDT products.

4. Freeze-thaw - ASTM C 1364: The CPWL shall be less than 5% after 300 cycles of freezing and thawing.
 5. Linear Shrinkage - ASTM C 426: Shrinkage shall not exceed 0.065%.
- C. Job Site Testing - One (1) samples from production units may be selected at random from the field for each 500 cubic feet (14 m³) delivered to the job site.
1. Three (3) field cut cube specimens from each of these samples shall have an average minimum compressive strength of not less than 85% with no single specimen testing less than 75% of design strength as allowed by ACI 318.
 2. Three (3) field cut cube specimens from each of these samples shall have an average maximum cold-water absorption of 6%.
 3. Field specimens shall be tested in accordance with ASTM C 1194 and C 1195.
- D. Provide all cast stone indicated in the drawings. Manufacturers shall be members of the Cast Stone Institute® or approved equal.
1. EXTERIOR CANOPY COLUMN SURROUND CAP

2.2 Raw Materials

- A. Portland Cement - Type I or Type III, white and/or grey, ASTM C 150.
- B. Coarse Aggregates - Granite, quarts or limestone, ASTM C 33, except for gradations, and are optional for the VDT casting method.
- C. Fine Aggregates - Manufactured or natural sands, ASTM C33, except for gradation.
- D. Colors - Inorganic iron oxide pigments, ASTM C 979 except that carbon black pigments shall not be used.
- E. Admixtures - Comply with the following:
1. ASTM C 260 for air-entraining admixtures.
 2. ASTM C 494/C 495M Types A-G for water reducing, retarding, accelerating and high range admixtures.
 3. Other admixtures: integral water repellents and other chemicals, for which no ASTM Standard exists, shall be previously established as suitable for use in concrete by proven field performance or through laboratory testing.
 4. ASTM C 618 mineral admixtures of dark and variable colors shall not be used in surfaces intended to be exposed to view.
 5. ASTM C 989 granulated blast furnace slag may be used to improve physical properties. Tests are required to verify these features.
- F. Water - Potable
- G. Reinforcing Bars:
1. ASTM A 615/A 615M. Grade 40 or 60 steel galvanized or epoxy coated when cover is less than 1.5 in. (37mm).
 2. Welded Wire Fabric: ASTM A1064 where applicable for wet cast units.

- H. All anchors, dowels and other anchoring devices and shims shall be standard building stone anchors commercially available in a non-corrosive material such as zinc plated, galvanized steel, brass, or stainless steel Type 302 or 304.

2.3 Color and Finish

- A. Architect shall select color and finish from Builder's Cast Stone samples submitted through the shop drawings / samples process.
- B. All surfaces intended to be exposed to view shall have a fine grained texture similar to natural stone, with no air voids in excess of 1/32 in. (0.8 mm) and the density of such voids shall be less than 3 occurrences per any 1 in. (25mm²) and not obvious under direct daylight illumination at a 5 ft (1.5m) distance.
- C. Units shall exhibit a texture approximately equal to the approved sample when viewed under direct daylight illumination at a 10 ft (3m) distance.
 - 1. ASTM D 2244 permissible variation in color between units of comparable age subjected to similar weathering exposure.
 - a. Total color difference - not greater than 6 units
 - b. Total hue difference - not greater than 2 units.
- D. Remove cement film, if required, from exposed surfaces prior to packaging for shipment.

2.4 Reinforcing

- A. Reinforce the units as required by the drawings and for safe handling and structural stress.
- B. Minimum reinforcing shall be 0.25 percent of the cross section area.
- C. Reinforcement shall be non-corrosive where faces exposed to weather are covered with less than 1.5 in. (38mm) of concrete material. All reinforcement shall have minimum coverage of twice the diameter of the bars.
- D. Panels, soffits and similar stones greater than 24 in. (600mm) in one direction shall be reinforced in that direction. Units less than 24 in. (600mm) in both length and width dimension shall be non-reinforced unless otherwise specified.
- E. Welded wire fabric reinforcing shall not be used in dry cast products.

2.5 Curing

- A. Cure units in a warm curing chamber approximately 100°F (37.8°C) at 95 percent relative humidity for approximately 12 hours, or cure in a 95 percent moist environment at a minimum 70°F (21.1°C) for 16 hours after casting. Additional yard curing at 95 percent relative humidity shall be 350 degree days (i.e. 7 days @ 50°F (10°C) or 5 days @ 70°F (21°C)) prior to shipping. Form cured units shall be protected from moisture evaporation with curing blankets or curing compounds after casting.

2.6 Manufacturing Tolerances

- A. Cross section dimensions shall not deviate by more than $\pm 1/8$ in. (3mm) from approved dimensions.
- B. Length of units shall not deviate by more than length/360 or $\pm 1/8$ in. (3mm), whichever is greater, not to exceed $\pm 1/4$ in. (6mm).
 - 1. Maximum length of any unit shall not exceed 15 times the average thickness of such unit unless otherwise agreed by the manufacturer.

- C. Warp, bow or twist of units shall not exceed length/360 or $\pm 1/8$ in. (3mm), whichever is greater.
- D. Location of dowel holes, anchor slots, flashing grooves, false joints and similar features - on formed sides of unit $1/8$ in. (3mm), on unformed sides of unit, $3/8$ in (9mm) maximum deviation.

2.7 Production Quality Control

A. Testing

1. Test compressive strength and absorption from specimens selected at random from plant production.
2. Samples shall be taken and tested from every 500 (14 m³) cubic feet of product produced.
3. Perform tests in accordance ASTM C 1194 and C 1195.
4. New and existing mix designs shall be tested for strength and absorption compliance prior to producing units.

2.8 Delivery, Storage and Handling

- A. Mark production units with the identification marks as shown on the shop drawings.
- B. Package units and protect them from staining or damage during shipping and storage.
- C. Provide an itemized list of product to support the bill of lading.

2.9 MANUFACTURERS

- A. Texas Building Products, Inc., 320 E. Broadway, Fort Worth, Texas 76104 (Phone: 817-332-2373)
- B. or prior approved equals

PART 3 - EXECUTION

3.1 Examination

- A. Installing Contractor shall check Cast Stone materials for sit and finish prior to installation. Do not set unacceptable units.

3.2 Setting Tolerances

- A. Comply with Cast Stone Institute ® Technical Manual.
- B. Set stones $1/8$ in. (3mm) or less, within the plane of adjacent units,
- C. Joints, plus - $1/16$ in. (1.5mm), minus - $1/8$. (3mm).

3.3 Jointing

A. Joint Size:

1. At stone/brick joints $3/8$ in. (9.5mm).
2. At stone/stone joints in vertical position $1/4$ in. (6mm) ($3/8$ in. (9.5 mm) optional).

3. Stone/stone joints exposed on top 3/8 in. (9.5mm).
 - B. Joint Materials:
 1. Mortar, Type N, ASTM C 270.
 2. Use a full bed of mortar at all bed joints.
 3. Flush vertical joints full with mortar.
 4. Leave all joints with exposed tops or under relieving angles open for sealant.
 5. Leave head joints in copings and projecting components open for sealant.
 - C. Locations of Joints:
 1. As shown on shop drawings.
 2. At control and expansion joints unless otherwise shown.
- 3.4 Setting
- A. Drench units with clean water prior to setting.
 - B. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.
 - C. Set units in full bed of mortar, unless otherwise detailed.
 - D. Rake mortar joints 3/4 in. (18mm) for pointing.
 - E. Remove excess mortar from unit faces immediately after setting
 - F. Tuck point unit joints to a slight concave profile.
- 3.5 Joint Protection
- A. Comply with requirements of Section 07 92 00 - Joint Sealants..
 - B. Prime ends of units, insert properly sized backing rod and install required sealant.
- 3.6 Repair and Cleaning
- A. Repair chips with touch up materials furnished by manufacturer.
 - B. Saturate units to be cleaned prior to applying an approved masonry cleaner.
 - C. Consult with manufacturer for appropriate cleaners.
- 3.7 Inspection and Acceptance
- A. Inspect finished installation according to Bulletin #36.
 - B. Do not field apply water repellant until repair, cleaning, inspection and acceptance is completed.

END OF SECTION 04 72 00

SECTION 05 40 00 - COLD FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SCOPE

- A. Provide all labor, materials, tools, equipment and perform all work and incidental services necessary for the furnishing and installation, complete, of all light gauge framing included on the drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades and manufactured by the following manufacturers:

Marino / Ware
400 Metuchen Rd.
South Plainfield, NJ 07080
Phone: (908) 757-9000

ClarkDietrich Building Systems
9100 Center Point Dr., Suite 210
West Chester, OH. 45069
Phone: (513) 870-1100

(or prior approved equal)

- B. For additional information, refer to sections:
09 21 16 - Gypsum Drywall Assemblies
- C. Standards
1. ASTM A 780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
 2. ASTM A 1003 - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
 3. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
 4. ASTM C 955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.
 5. ASTM C 1513 - Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.
 6. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.
 7. AISI - Standard for Cold-Formed Steel Framing General Provisions.
 8. AISI - North American Specification (NASPEC) for the Design of Cold-Formed Steel Structural Members - 2001.
 9. American Welding Society (AWS).
 - a. AWS D1.1 "Structural Welding Code - Steel."
 - b. AWS D1.3 "Structural Welding Code - Sheet Steel."

1.2 SUBMITTALS

- A. Submit under provisions of Section 01 33 23 - Shop Drawings.
- B. Submit manufacturer's product literature and data sheets for specified products.
- C. Manufacturer's certification of product compliance with codes and standards.
- D. Shop Drawings: Submit shop drawings prepared by the successful manufacturer showing:
1. Locations of framing members, wall framing sections and opening elevations.
 2. Sizes and spacing of framing members.
 3. Methods of fastening framing members to each other and to supporting systems.

4. Details of vertical deflection connections to structures.
 5. Locations and spacing of lateral bracing and structural bracing systems.
 6. Accessory products required for complete installation.
 7. Shop Drawings shall be signed and sealed by a registered PE (Professional cold-formed specialty Engineer).
- E. Structural Calculations: Submit structural calculations prepared by the successful manufacturer to meet all codes in the State of Louisiana for approval.
1. Submittal shall be signed and sealed by a registered PE (Professional cold-formed specialty Engineer).
 2. Description of design criteria.
 3. Engineering analysis depicting stress and deflection (stiffness) requirements for each framing application.
 4. Selection of framing components, accessories, fasteners, and welded connection requirements. **(All light gauge framing component sizes indicated in the drawings and specifications are considered minimum even if a smaller size or gauge would pass the current IBC.)**
 5. Engineer shall have a minimum of 5 years' experience with projects of similar scope.

1.3 QUALITY ASSURANCE

- A. Contractor shall provide effective, full-time quality control over all fabrication and erection complying with all codes and regulations in the State of Louisiana, specifically wind loads.
- B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code-Steel" and AWS D1.3 "Structural Welding Code-Sheet Steel."
- C. Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Notify manufacturer of damaged materials received prior to installing.
- B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Store materials protected from exposure to rain, snow or other harmful weather conditions, at temperature and humidity conditions per the recommendations of ASTM C955.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. All interior wall studs and framing members shall meet all codes and regulations and be of the type, size, spacing and gauge as shown on the plans and manufactured by Marino/Ware or, ClarkDietrich or prior approved equal.
 1. All interior lightgauge framing is 20 ga. minimum 3-5/8" depth studs with a 1-5/8" minimum flange, 6" depth stud with a 1-5/8" minimum flange, 8" depth stud with a 1-5/8" minimum flange, 10" depth stud with a 1-5/8" minimum flange, and 12"

- depth stud with a 1-5/8" minimum flange unless specifically indicated otherwise on drawings.
 - 2. All studs and framing members, galvanized track, bridging, end closures, etc., and accessories shall be formed from steel that corresponds to the requirements of ASTM A653, Grade A with a minimum yield of 33,000 psi. Framing members shall be of type, size, spacing and gauge shown on drawings.
- B. All exterior wall studs and framing members shall meet all codes and regulations and be of the type, size, spacing and gauge as shown on the plans and manufactured by Marino / Ware, ClarkDeitrich or prior approved equal.
 - 1. All exterior lightgage framing is 16 gauge minimum 3-5/8" depth studs with a 2" minimum flange, 6" depth stud with a 2" minimum flange, 8" depth stud with a 2" minimum flange, 10" depth stud with a 2" minimum flange, and 12" depth stud with a 2" minimum flange unless specifically indicated otherwise on drawings.
 - 2. All studs and framing members, galvanized track, bridging, end closures, etc., and accessories shall be formed from steel that corresponds to the requirements of ASTM A653, Grade A with a minimum yield of 33,000 psi. Framing members shall be of type, size, spacing and gauge shown on drawings.
- C. All studs, joists, framing members and accessories shall be formed from steel having a G-60 galvanized coating for interior studs and a G-90 for exterior wall studs, meeting ASTM C 955 and ASTM A 653.
- D. Where furring channels are shown on drawings use 7/8" deep 16 ga. furring channel spaced as indicated on drawings.
- E. Where furring channels are shown on drawings to use 1-1/2" deep 16 ga. furring channel space furring channel as indicated on drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Inspect supporting substrates and structures for compliance of proper conditions for installation and performance of the cold-formed structural framing.
- B. Prepare attachment surfaces so that they are plumb, level, and in proper alignment for accepting the cold-formed structural framing.
- C. Unless otherwise indicated or specified, as a minimum, for installing all lightgage metal framing, follow the details and recommendations of the manufacturer and the Standards specified herein, complying with all details to meet minimum design loads as required by the 2021 IBC.
- D. Unless otherwise indicated or specified, provide all metal studs and framing plumb, level, and spaced at 16" o.c. maximum spacing and fastened and screwed in accordance with manufacturer's details and recommendations.
- E. Unless otherwise indicated or specified, provide all metal joists level and spaced at 16" o.c. maximum spacing and fastened and screwed in accordance with manufacturer's details and recommendations.
- F. Provide continuous, metal horizontal bridging and bracing between all metal studs which are over 48" long and spaced at a maximum spacing of 48" apart for studs over 8'-0" long.

- G. Provide continuous, metal horizontal bridging and bracing between all metal joists which are over 8'-0" long and spaced at maximum spacing of 8'-0" apart for joists over 16'-0" long.
- H. Secure all lightgauge metal framing and accessories with screws and fasteners in sizes as recommended by the lightgauge metal framing manufacturer.
- I. Securely brace all lightgauge metal framing.
- J. Securely attach all lightgauge metal framing.
- K. **Splices in lightgauge metal materials, other than metal running tracks, metal joist end channels, furring channels, and bridging shall not be permitted.**
- L. Unless otherwise indicated or specified, provide suspension wire spaced at minimum 4' centers both ways to support lightgauge framing used at ceilings and soffits.
- M. Unless otherwise indicated or specified, provide minimum twenty (20) gauge, minimum 3-5/8" deep studs, heavier if required, to brace the tops of all interior top tracks and tops of all metal stud walls from tops of interior walls and partitions to structural steel beams and steel purlins above at 72" centers.
- N. Where tops of interior walls and partitions cannot be braced to overhead structural steel beams and steel purlins above, provide minimum 6' long horizontal 45 degree angle stud braces, placed flat, and securely fastened to top tracks of the interior walls and partitions, at all 90 degree partition corners, and all similar angled corners.
- O. Provide additional interior wall bracing above latch side of interior doors to prevent wall movement when door slams shut.
- P. At in-sides of metal stud chase walls, provide a pair of horizontal, continuous 3-5/8" 20 gauge channel tracks facing each other, (at heights of 48" and 96" above the finished floor), and provide 3-5/8" 20 gauge stud "X" braces securely fastened to continuous tracks at 24" maximum from ends of chase, and at 48" o.c. maximum spacing.
- Q. Where opposite chase wall metal studs align with one another at 16" centers, the horizontal tracks may be omitted; hence, provide the 3-5/8" 20 gauge "X" braces securely fastened directly to both studs, (at heights of 48" and 96" above finished floor), at 24" maximum from ends of chase, and at 48" o.c. maximum spacing.
- R. Where lightgauge steel stud walls are secured to the bottom of structural steel beams, deep leg tracks (also known as slip tracks) shall be utilized to allow for structural deflection during the periods of high loading. Do not secure wall studs or sheathing to the deep leg track. Brace top of stud assembly with 8" wide continuous 16 ga. flat strapping secured to each stud within 6" of the top of studs or as shown on Contract Documents.

3.2 WORKMANSHIP

- A. Handling and lifting of prefabricated panels shall be done in a manner as to not cause distortion in any member.
- B. Tracks shall be securely anchored to the supporting structure as shown on the plans.
- C. At track butt joints, abutting pieces of track shall be securely anchored to a common structural element, or they shall be butt-welded or spliced together.
- D. Studs shall be plumbed, aligned, and securely attached to the flanges or webs of both upper and lower tracks.

- E. Jack studs or cripples shall be installed below windowsills, above window and door heads, at free standing stair rails, and elsewhere to furnish support, and shall be securely attached to supporting members.
- F. Fastening of components shall be self-drilling screws or welding. Screws shall be of sufficient size to insure the strength of the connection. All welds shall be touched up with zinc-rich paint.

END OF SECTION 05 40 00

SECTION 05 50 00 – METAL FABRICATIONS

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish all labor, materials, tools, equipment and perform all work and services necessary for or incidental to the furnishing and installation, complete of Miscellaneous Metal as shown on drawings and as specified in accordance with provisions of the contract documents and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.
- C. **MISCELLANEOUS STEEL SHAPES, PLATES AND ASSEMBLIES NOT SHOWN ON THE STRUCTURAL DRAWINGS AS ELEMENTS OF THE PRIMARY STRUCTURAL SYSTEM SHALL BE REQUIRED BY OTHER DRAWINGS AND SPECIFICATIONS INCLUDED IN THE CONTRACT DOCUMENTS. CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL SUCH ITEMS WHICH WILL BE CONSIDERED MISCELLANEOUS ARCHITECTURAL STEEL. MISCELLANEOUS ARCHITECTURAL STEEL DETAILS DESCRIBED IN THE CONTRACT DOCUMENTS SHALL BE CONSIDERED TYPICAL AND SHALL APPLY TO ALL IDENTICAL AND / OR SIMILAR CONDITIONS THROUGHOUT THE PROJECT. ALL MISCELLANEOUS ARCHITECTURAL STEEL TUBE SHAPES SHALL HAVE OPEN ENDS CAPPED WITH 1/4" THICK CAP PLATE UNLESS NOTED OTHERWISE. IF THE SIZE OF THE MISCELLANEOUS ARCHITECTURAL STEEL IS NOT INDICATED, THE CONTRACTOR SHALL SUBMIT TO THE ARCHITECT STEEL SIZE FOR APPROVAL. ALL CONTRACTORS AND SUBCONTRACTORS SHALL UTILIZE A COMPLETE SET OF CONTRACT DOCUMENTS FOR THE BIDDING OF THIS PROJECT. (REFER TO ARTICLE 3 OF INSTRUCTIONS TO BIDDERS.)**
- D. This includes but is not limited to:
 - 1. Misc. Structural Steel
 - 2. Misc. Architectural Steel
 - 3. Steel Lintels
 - 4. Steel Bollard
 - 5. Extruded Aluminum Downspout Boots

1.2 SHOP DRAWINGS

- A. Submit shop drawings for Architect's approval prior to fabrication of items specified. Shop drawings shall indicate thickness and dimensions of all parts, fastening and anchoring methods, provisions for thermal movement.

1.3 COMPLIANCE WITH STANDARD AND INDUSTRY SPECIFICATIONS

- A. The current rules and practices set forth in the "Code of Standard Practice for Steel Buildings and Bridges"; and the "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings", of the American Institute of Steel Construction shall govern the structural work, except as otherwise noted on the drawings or as otherwise specified. Welding shall be in accordance with the current "Code of Arc and Gas Welding in Building Construction", of the American Welding Society.
- B. Miscellaneous steel and ironwork shall be in accordance with "Architectural Metal Handbook" of the National Association of Architectural Metal Manufacturers.
- C. It is distinctly understood that in the case of any conflict between the abovementioned documents and the drawings and specifications of the Architect, the latter shall have precedence.

- D. Comply with the following standards as pertinent:
1. Steel plates, shapes, and bars: ASTM A36
 2. Steel plates to be bent or cold-formed: ASTM A283, Grade C
 3. Steel tubing (hot-formed, welded, or seamless): ASTM A501
 4. Steel bars and bar-size shapes: ASTM A306, Grade 65, or ASTM A36
 5. Cold-finished steel bars: ASTM A108
 6. Cold-rolled carbon steel sheets: ASTM A336
 7. Galvanized carbon steel sheets: ASTM A526, with G90 zinc coating in accordance with ASTM A525
 8. Stainless steel sheets: AISI Type 302 or 304, 24 gauge, with number 4 finish
 9. Gray iron castings: ASTM A48, Class 10
 10. Malleable iron castings: ASTM A47
 11. Steel pipe: ASTM A53, Grade A, Schedule 40, Black finish unless otherwise noted.
 12. Concrete inserts:
 - a. Threaded or wedge type galvanized ferrous castings of malleable iron complying with ASTM A27.
 - b. Provide required bolts, shims, and washers, hot dip galvanized in accordance with ASTM A153.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Structural steel members shall be standard shapes conforming to ASTM Specification A36. Cast iron shall be soft, gray, straight, true to pattern and free from imperfections, malleable cast iron, high grade white castings, annealed. Where feasible, all members shall be welded; otherwise they shall be riveted, bolted, or screwed. Fastening shall be concealed wherever possible. All exposed welds shall be ground smooth.

2.2 FASTENERS

1. For exterior use and where built into exterior walls, provide zinc-coated fasteners. Provide fasteners of type, grade, and class required for the particular use.
2. Comply with following standards as pertinent.
 - a. Bolts and nuts: Provide hexagon-head regular type complying with ASTM A307, Grade A
 - b. Lag Bolts: Provide square-head type complying with Fed. Spec. FF-B-561
 - c. Machine Screws: Provide cadmium plated steel type complying with Fed. Spec. FF-S-111.
 - d. Plain Washers: Comply with Fed. Spec. FF-W-92, round, carbon steel
 - e. Lock Washers: Comply with Fed. Spec. FF-W-84, helical spring type carbon steel
 - f. Toggle bolts: Provide type, class, and style needed but complying with Fed. Spec. FF-B-588
 - g. Anchorage devices: Provide expansion shield complying with Fed. Spec. FF-S-325.

- 2.3 All masonry lintels shall be hot dipped galvanized, all ends shall be treated (See Section 2.10 Painting and Protective Coatings), all lintels painted. All masonry lintels shall be recessed a minimum of 1/4" from face of masonry. **(Backer rod shall be placed at each end of steel masonry lintels to allow for steel expansion.)**

- 2.4 Extruded Aluminum Downspout Boots - These boots shall be fabricated from 1/8" extruded aluminum with all joints fully welded. Boots shall be secured to masonry wall using 1/8" X 1-1/2" mounting straps and stainless steel fasteners (verify exact mounting conditions on site prior to fabrication). Entire assembly shall be powder coated

to match downspouts (color shall be selected by Architect for Roof and Downspouts, powder coating shall match)

2.5 PROTECTION OF ALUMINUM FROM DISSIMILAR MATERIALS

- A. General – In addition to the coating specified, aluminum surfaces shall be prevented from direct contact with dissimilar materials as follows.
 - 1. Dissimilar metals except stainless steel, white bronze, and solid zinc, shall be painted with a heavy brush or spray coat of zinc-chromate primer and one coat of aluminum paint: or shall be separate from the aluminum by a heavy coat of mastic caulking compound, or by a non-absorptive tape gasket.
 - 2. Dissimilar metals used in locations where drainage from them passes over aluminum shall be painted to prevent staining of aluminum.
 - 3. Aluminum surfaces in contact with mortar, concrete, plaster, or other masonry materials shall be given one heavy brush coat of bituminous paint.
 - 4. Aluminum surfaces in contact with wood, or other similar absorptive materials which may become repeatedly wet, shall be given two coats of aluminum metal and masonry paint, or one heavy brush coat of bituminous paint. In place of painting the aluminum. The contractor shall have the option of painting the wood and other absorptive surfaces with two coats of aluminum house paint and sealing joints with caulking compound. Handrails and guard rails are to be painted in accordance with Section 09 91 00 – Painting.

2.6 PAINTING AND PROTECTIVE COATING

- A. All ferrous metal, except galvanized surfaces, shall be properly cleaned and given one shop coat of Tnemec No. 99, or approved equal primer. Anchors that are built into masonry shall be coated with asphalt paint unless specified to be galvanized. Metal work to be encased in concrete shall be left unpainted unless specified or noted otherwise.
- B. Hot dip galvanizing or zinc coatings applied on products fabricated from rolled, pressed and forged steel shapes, plates, bars and strips shall comply with ASTM Specification A123. Hot dip galvanizing or zinc coatings on assembled steel products shall comply with ASTM Specification A386. The weight of the coating shall be designed in Table1 for the class and thickness of material to be coated. Except for bolts and nuts, all galvanizing shall be done after fabrication.
- C. All field cuts or welds on galvanized surfaces shall be treated with Galv-O-Weld.
- D. See Section 09 91 00 - Painting of the specifications for additional field coats of paint.

PART 3 - EXECUTION (Not Used)

END OF SECTION 05 50 00

SECTION 05 52 00 - METAL RAILINGS

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish all labor, materials, tools, equipment and perform all work and services necessary for or incidental to the furnishing and installation, complete of railings and handrails as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.
- C. For additional information, refer to sections:
 - 1. 03 30 00 - Cast-In-Place Concrete: Requirements for placement of anchors or sleeves in concrete.
 - 2. 05 50 00 - Miscellaneous Fabrications
 - 3. 05 55 00 - Metal Stair Tread & Nosings
 - 4. 06 10 00 - Rough Carpentry
 - 5. 06 20 00 - Finish Carpentry
- D. REFERENCES
 - 1. ASTM A 36/A 36M: Specification for Carbon Structural Steel
 - 2. ASTM A 53: Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
 - 3. ASTM A 153/A 153M: Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - 4. ASTM A 500: Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
 - 5. ASTM A 563: Specification for Carbon and Alloy Steel Nuts
 - 6. ASTM A 1011-A: Specification for Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip, Commercial Quality
 - 7. ASTM A 653/A 653M: Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated Galvannealed by the Hot-Dip Process
 - 8. ASTM E 488: Test Method for Strength of Anchors in Concrete and Masonry Elements
 - 9. ASTM E 894: Test Method for Anchorage of Permanent Metal Railing Systems and Rails for Buildings
 - 10. ASTM E 935: Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings
 - 11. ASTM E 985: Specification for Permanent Metal Railing Systems and Rails for Buildings
 - 12. AWS D1.1/ D1.1M: Structural Welding Code--Steel
 - 13. AWS D1.3: Structural Welding Code--Sheet Steel
 - 14. ASTM A307: Bolts
- E. PERFORMANCE REQUIREMENTS

1. Performance requirements: Railing manufacturer shall engineer and fabricate stairs and railings to comply with requirements of the following, when installed:
 - a. Current State Approved International Building Code
 - b. Current NFPA 101 - Life Safety Code
 - c. Americans with Disabilities Act Accessibility Guidelines -2010
2. Structural Performance: Provide metal railings capable of withstanding the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections.
 - a. Handrails & Guardrails:
 1. Concentrated load of 250 lbf applied at any point and in any direction.
 2. Uniform load of 50 lbf/ft. applied horizontally and concurrently with uniform load of 100 lbf/ft. applied vertically downward.
 3. Guardrail Infill Panels shall withstand concentrated horizontal loads of 200 lbs applied to 1 sq. ft. at any point in the system.
 4. Uniform and concentrated loads need not be assumed to act concurrently.
 - b. Structural calculations shall be prepared by a registered engineer licensed in the State of Louisiana.
 - c. In engineering railings to withstand structural loads indicated, determine allowable working stresses of steel railings not to exceed 72 percent of the minimum yield strength.
3. Quality Assurance:
 - a. Shop drawings: Submit shop drawings including plans, elevations, sections, and details, indicating materials, components, sizes, dimensions, tolerances, hardware fasteners, finishes, options, accessories, and installation. Show details of attaching railing system to supports. Show embedment detail in structural concrete slab.
 - b. Provide assembled sample of each railing section, fabricated from full sized components, including top rail, posts, infill panels, and showing method of fastening and finishing intersections.
 - c. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.
 - d. Manufacturer Qualifications: A firm experienced in manufacturing metal railing systems similar to those indicated for this project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
 - e. Installer Qualifications: Minimum five (5) years' experience in the successful installation of railing systems of the type indicated for this project.
 - f. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delay. Coordinate work with other operations and installation of adjacent materials to avoid damage.
 - g. Do not modify intended aesthetic effects, as judged solely by the Architect, except with Architect's approval. If modifications are

proposed, submit comprehensive explanatory data to the Architect for review.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Handrails at Cafetorium (Stage Ramp and Stair):

1. Railings and handrails shall be manufactured from 1-1/2" O.D. Schedule 40 metal pipe. The horizontal members shall be spaced as indicated on drawings. (A 4" sphere shall in no case be able to pass through the openings of handrails at or below 34".) and welded and ground smooth at vertical supports.
2. Refer to Section 09 91 00 - Painting for preparation and final finish of railing supports.
3. Wall brackets for handrails at walls shall be #626 stamped steel as manufactured by Julius Blum and Co., Inc. Carlstadt, N.J. (Phone (201) 438-4600 or (212) 695-2236), or prior approved equal. Wall brackets shall not be spaced more than 3'-0" o.c.

2.2 WORKMANSHIP

- #### A.
- The current rules and practices set forth in the "Code of Standard Practice for Steel Buildings and Bridges"; and the "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings", of the American Institute of Steel Construction shall govern the structural work, except as otherwise noted on the drawings or as otherwise specified. Welding shall be in accordance with the current "Code of Arc and Gas Welding in Building Construction", of the American Welding Society.
1. All welds shall be ground smooth.
 2. All railing shall return smoothly to the wall surface as per NFPA Life Safety Code Requirements.
 3. All railings shall be capable of supporting 500 lb loading applied in any direction.
 4. Contractor shall coordinate solid blocking in all stud walls to allow spacing of support brackets indicated in Contract Documents.
- #### B.
- See Section 09 91 00 - Painting for additional information on priming and painting of railing and handrail surfaces.
- #### C.
- Galvanizing Repair: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

PART 3 - EXECUTION

3.1 EXAMINATION

- #### A.
- Verify field measurements are acceptable to suit assembly tolerances prior to fabrication.

- B. Do not begin installation until substrates have been properly prepared.
- C. Verify supports and anchors are correctly positioned.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Supply items required to be cast into concrete or embedded in masonry with setting templates, to appropriate trades. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to the General Contractor in a timely manner, for coordination with all required trades and incorporation into the work.
- B. Take field measurements after permanent end terminations are in place and prior to preparation of shop drawings and fabrication, to ensure fitting of work.
- C. Prepare surfaces using the methods for achieving the best result for the substrate under the project conditions.

3.3 FABRICATION

- A. General: Fabricate railings in compliance with requirements indicated for design, dimensions, member sizes and spacing, details and anchorage, but not less than that required to support structural loads.
- B. Assemble railings in the 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. Use connections that maintain structural value of joined pieces.
- C. Cut, drill and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32" unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Connections: Fabricate railings with welded connections unless otherwise indicated.
- E. Form changes in direction by bending. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking or otherwise deforming exposed surfaces of components.
- F. Close exposed ends of hollow railing members with prefabricated end fittings.

3.4 INSTALLATION

- A. Install railing system in accordance with the Contractor Documents.
- B. Fit all nonwelded connections together to form tight, hairline joints.
- C. Install railing system plumb, level, square, true to line, rigid and free of rack.

1. Set posts plumb within a tolerance of 1/16" in 3 feet.
 2. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4" in 12 feet.
- D. Attach railing system securely in place. Where necessary to connect to in- place construction, use anchorage devices and fasteners capable of properly transferring loads to in-place construction.
 - E. Coat concealed surfaces of aluminum and copper alloys that will be in contact with grout, concrete, masonry, wood or dissimilar metals, with a heavy coat of bituminous paint.
 - F. Attach railing system to supports using solid stainless steel pins (1/2" diameter).
 - G. Provide all required hardware.
 - H. Repair minor damages to finish to match as approved by Architect.
 - I. Remove and replace defective or damaged components that cannot be successfully repaired as determined by Architect.

3.5 CLEANING

- A. Remove temporary coverings and protection of adjacent work areas.
- B. Clean railing system promptly after installation.
- C. Do not use harsh cleaning materials or methods that would damage finish.
- D. Do not use abrasive cleaners.

3.6 PROTECTION

- A. Protect installed products until completion of project.
- B. Replace defective or damaged components as directed by Architect.
- C. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 05 52 00

SECTION 06 10 00 – ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of Rough Carpentry as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.
- C. For additional related information refer to sections:
 - 1. 03 11 00 - Concrete Formwork
 - 2. 06 20 00 - Finish Carpentry
 - 3. 05 40 00 - Cold Formed Metal Framing
 - 4. 07 11 00 - Dampcoursing
 - 5. Mechanical and Electrical Sections
- D. References
 - 1. APA – The Engineered Wood Association
 - 2. American Wood Council (AWC), National Design Specification (NDS) for Wood Construction
 - 3. Southern Forest Products Association (SFPA)
 - 4. International Building Code (latest edition adopted by Authority Having Jurisdiction)
 - 5. American Wood Protection Association (AWPA U1, Use Category System)

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Framing Lumber - generally all lumber not indicated otherwise as trim, hardwood, treated wood, plywood, millwork, etc., shall be #2 structural grade southern yellow pine, S4S. The rough carpentry shall be used for structural framing, nonexposed or hidden wood framing, and for furring stripping, blocking or bracing where wood is shown to be used on the plans.
 - 1. Interior framing shall be #2 Southern Yellow Pine, or better.
 - 2. Dimensional lumber shall have a maximum moisture content of 19%.
- B. Treated wood - **Treated wood shall meet the requirements of American-Wood Preservers' Association AWPA U1. Acceptable Borate compounds and formulations shall be sodium octaborate, sodium tetraborate, sodium pentaborate, boric acid, and FR-1.**
 - 1. All wood plates, blocking, framing, stripping, blocking or backing that touch concrete, masonry and/or that may be subject to humid conditions shall be Borate Pressure treated Southern Yellow Pine, in size as indicated; S4S.
 - 2. Wood specifically shown on the plans as treated wood. Borate Pressure treated wood of grade and species indicated on plans or as specified above shall be used. Minimum treatment as recommended by the American-Wood Preservers' Association (AWPA).
 - 3. Interior treated wood framing and blocking, etc., shall be Borate Pressure Treated #2 Southern Yellow Pine in areas kept free from rainwater, standing water, and ground contact.
 - 4. Exterior framing and blocking, etc., shall be Alkaline Copper Quaternary (ACQ) Treated #2 Southern Yellow Pine in areas exposed to rainwater, standing water, and ground contact. **In no case shall this type of treated wood be in direct**

contact with metals other than Type 304 or Type 316 stainless steel, or hot-dipped galvanized fasteners complying with ASTM A153 and connectors complying with ASTM A653, Class G185. Verify with Architect on the job.

- C. Plywood - generally all plywood not indicated as trim, hardwood, millwork or paneling shall be APA PS 1, Structural I Rated Sheathing, Exterior Exposure Class CD plywood of thickness indicated on plans, southern yellow pine
1. All plywood, regardless of location, shall be exterior grade, with exterior type glue, in thickness and grade as indicated on the Drawings.
 2. Specialty items such as sheathing, floor subsheathing, roof sheathing, structural and marine plywood shall be furnished and installed where specifically shown on the plans and/or specified elsewhere.
 3. All sheathing shall be installed to withstand wind loading forces indicated for the area in which sheathing is applied. (Current International Building Code [IBC], chapter 16 & 23)
 4. Treated plywood shall be Borate Pressure treated.
- D. Fire Retardant Exterior Plywood Sheathing (if any) - shall be Exterior Fire X by Hoover Treated Wood Products, Inc. Or prior approved equal meeting IBC Section 2303.2.
1. Fire Retardant Plywood shall have a flame spread of 25 or less (Class A) in accordance with ASTM-E 84.
 2. Fire Retardant Plywood shall be kiln dried after testing (KDAT) to 19% max moisture content.
 3. Fire Retardant Plywood shall be exposure grade 1, building code compliance - PS 1, panels in thickness as indicated in construction drawings. 19/32" with 48/24 minimum span rating.
 4. All sheathing shall be installed to withstand wind loading forces indicated for the area in which sheathing is applied. (Current IBC, chapter 16 & 23)
- E. Miscellaneous items - as required provide and install items materials obviously necessary to complete the work (such as pegboard, fiberboard, blackboard, felt, building paper, fasteners, hangers and hardware) whether or not shown in the Contract Documents.
1. Nails - Bright common wire nails, galvanized for exterior work. Subdrill where necessary to avoid splitting. Split members shall be rejected. **All fasteners in treated wood shall be stainless steel (Type 304 or 316) or hot-dip galvanized per ASTM A153, Class D minimum.**
 - a. Power nailing will be permitted where nails are specified and installation does not mar or damage the wood members. Nails shall have full head. Do not overdrive nails.
 1. For power-driven nails to be substituted for specified common nail sizes, contractor shall submit proposed manufacturer, collation type, nominal diameter, length, and head style for each substitute.
 2. Each proposed substitute shall be listed in ICC ESp1539 as meeting head area ratio requirements for use in LFRAs for the specified common nail size. Alternatively, substitute may be listed in ES-1768 as having the same diameter and length as the specified common nail size.
 - b. Drive nail heads for plywood diaphragms flush with plywood surface. Where nails have been overdriven in plywood panels, remove and replace plywood, nails and supporting members.
 1. Bolts - Drill bolt holes 1/32" larger than bolt diameter. Use square plate or malleable iron washers under heads and nut where they bear against wood. Retighten exposed bolts immediately prior to final inspection. Perform final bolting after structural members have been properly aligned.
 2. Lag Screws and Screws - Subdrill, use square plate or malleable iron washer under lag screw head when they bear on wood.
 3. Fabricated Connections

- a. Sheet metal galvanized of size and type shown on drawings
 - b. Sheet metal galvanized hurricane straps. (Re: Structural Drawings)
 - c. Structural Steel connections: (Re: Structural Drawings)
- F. Provide wood blocking for all shelving, curtains, grab bars, handrails, accessories as required. Consult Architect during framing.
- G. Fire Blocking - Install as per I.B.C. 718 and Chapter 23.
 - 1. Where required by codes, install continuous row of fire stop blocking in stud walls and partitions at ceilings and floor levels and at maximum 10 feet spacing. Form complete and effective separation for entire width of wall or partition.
 - 2. Use fire stop blocking with minimum 2 inches minimum nominal thickness and same width as studs.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. Produce joints which are true, tight, and well nailed with all members assembled in accordance with the drawings. Notch, cope and miter meeting members so members have full bearing. Accurately cut, fit, and frame lumber.
- B. Jointing: Make joints to conceal shrinkage; miter exterior joints; cope interior joints; miter or scarf end-to-end joints. Install trim in pieces as long as possible, jointing only where solid support is obtained.
- C. Fastening: Install items straight, true, level, plumb, and firmly anchored in place. Where blocking or backing is required, coordinate as necessary with other trades to insure placement of required backing and blocking in a timely manner. On exposed work, set nails for putty. Screw, do not drive, wood screws; except that screws may be started by driving and then screwed home.
- D. Framing Construction and Tolerances
 - 1. Erect walls plumb and true to line. Variation from plane shall not exceed 1/4 inch in 10 feet maximum.
 - 2. Frame walls and partitions with studs and spacing indicated on the Drawings, and at not greater than 16 inches on center.
 - 3. Unless noted otherwise on drawings, provide double studs at openings and triple studs at corners.
 - 4. Provide double plates at top of wall studs, arranging to form continuous horizontal ties. Splice individual plates and stagger ends of double plates.
 - 5. Frame openings for large pipes and ducts and for receiving recessed Work in partitions without cutting structural members.
- E. Warped and twisted structural framing members shall be discarded. Pieces with serious defects shall be discarded regardless of grading. Set horizontal and sloped members with the crowns up.
- F. Clean up of debris, dust and scraps in rough framing shall be completed prior to covering up of work.
- G. **IMPORTANT!** Any and all redwood and cedar throughout project shall be secured in place with bolts, nails, screws, clips, etc., that are STAINLESS STEEL or HOT DIPPED GALVANIZED. Uncoated steel or electroplated steel fasteners shall be rejected and all woods where used shall likewise be rejected. Architect may after job is accepted as complete, and before one (1) year warranty period has elapsed, discover that inappropriate fasteners were used may order Contractor to remove redwood and reinstall new redwood this time as specified.

- H. **In treated wood, stainless steel Type 304 and Type 316 shall be the only fastener finish allowed. (Hot dipped galvanized fasteners or other finishes besides stainless steel mentioned above shall not be used in treated wood on this project.)**

3.2 MEASUREMENTS

- A. Before commencing work, check all lines and levels indicated and such other work as has been completed. Should there be any discrepancies, immediately report in writing to Architect. In event of failure to do so, the Contractor shall be responsible for correction of any errors.

3.3 COORDINATION

- A. Coordinate work with other trades, (electrical, mechanical, plumbing, etc.) and do all cutting and patching required to accommodate their work. Protect adjacent work.
 - 1. Cutting is limited at structural walls. See structural drawings for hole location requirements and maximum hole sizes.

3.4 DELIVERY, STORAGE & SELECTION OF PIECES

- A. Deliver and store lumber on sills and cover for protection. Carefully select members so that knots and obvious defects will not interfere with the placing of bolts or proper nailing, and will allow making of proper connections.
- B. A member may be rejected by the Architect, whether or not it has been installed, for excessive warp, twist, bow, crook, mildew, fungus or mold, as well as for improper size, grade, species, treatment, cutting and fitting.
- C. All material shall be stored on the site in a waterproof manner, and after, installation shall be protected against inclement weather conditions. Stack lumber to allow good air drying. Position separators at each layer and at grade to keep material elevated.

END OF SECTION 06 10 00

SECTION 06 16 43 - GYPSUM SHEATHING (EXTERIOR)

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Fiberglass-mat faced, moisture and mold resistant gypsum sheathing.
- B. Related Sections:
 - 1. Section 05 40 00 Structural Metal Stud Framing.
 - 2. Section 06 10 00 Rough Carpentry.
 - 3. Section 09 21 16 Gypsum Board Assemblies.

1.2 REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM C473 Standard Test Methods for Physical Testing of Gypsum Panel Products.
 - 2. ASTM C518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - 3. ASTM C1002 Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - 4. ASTM C1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 - 5. ASTM C1280 Standard Specification for Application of Gypsum Sheathing.
 - 6. ASTM D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
 - 7. ASTM D6329 Standard Guide for Developing Methodology for Evaluating the Ability of Indoor Materials to Support Microbial Growth Using Static Environmental Chambers.
 - 8. ASTM E72 Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
 - 9. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.
 - 10. ASTM C1396 Standard Specification for Gypsum Board
 - 11. ASTM E 136 Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C
 - 12. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials
- B. Gypsum Association (GA): GA-253 Application of Gypsum Sheathing.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's specifications and installation instructions for each product specified.
- B. Submit fastener information, including corrosion resistance details.
- C. Submit manufacturer's installation instructions.

1.4 WARRANTY

- A. Provide products that offer twelve months of coverage against in-place exposure damage (delamination, deterioration and decay)
- B. Manufacturer's Warranty:
 - 1. Five years against manufacturing defects from the date of substantial completion of the project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Georgia-Pacific Gypsum LLC:
 - 1. Fiberglass-Mat Faced Gypsum Sheathing: DensGlass Sheathing.
- B. National Gypsum
 - 1. Fiberglass-Mat Faced Gypsum Sheathing: Gold Bond eXP Sheathing.
- C. Other manufacturers may be submitted for review in accordance with Division 01 Substitution Procedures.

2.2 MATERIALS

- A. Fiberglass-Mat Faced Gypsum Sheathing: ASTM C1177:
 - 1. Thickness: 5/8 inch.
 - 2. Width: 4 feet.
 - 3. Length: 8 feet
 - 4. Weight: 1.9 lb/sq. ft.
 - 5. Edges: Square.
 - 6. Surfacing: Fiberglass mat on face, back, and long edges.
 - 7. Racking Strength (Ultimate, not design value) (ASTM E72): Not less than 540 pounds per square foot, dry.
 - 8. Flexural Strength, Parallel (ASTM C473): 80 lbf, parallel.
 - 9. Humidified Deflection (ASTM C1177): Not more than 2/8 inch.
 - 10. Permeance (ASTM E96): Not less than 23 perms.
 - 11. R-Value (ASTM C518): 0.56.
 - 12. Mold Resistance (ASTM D3273): 10, in a test as manufactured.
 - 13. Microbial Resistance (ASTM D6329, UL Environmental GREENGUARD 3-week protocol): Will not support microbial growth.
 - 14. Acceptable Products:
 - a. 5/8 inch DensGlass Sheathing, Georgia-Pacific Gypsum LLC.
 - b. Or Prior Approved Equals.

2.3 ACCESSORIES

- A. Screws: ASTM C1002, corrosion-resistant coating suitable for use with exterior gypsum sheathing.
- B. Joint treatment (if required): Manufacturer's recommended exterior joint tape or sealant system.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
 - 1. Inspection: Verify that project conditions and substrates are acceptable, to the installer, to begin installation of work of this section.
 - 2. Do not begin installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Install sheathing in accordance with ASTM C1280, GA-253, and manufacturer's written instructions.
- B. Install panels with long dimension perpendicular to supports unless otherwise indicated.
- C. Stagger end joints and locate over framing members.

3.3 PROTECTION

- A. Protect installed sheathing from damage and deterioration. Remove and replace damaged panels.

END OF SECTION 06 16 43

SECTION 06 20 00 – FINISH CARPENTRY

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish all labor, materials, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of finish carpentry as shown on drawings and as specified in accordance with provisions of the contract documents and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.
- C. For additional information refer to sections:
05 40 00 - Cold Formed Metal Framing
06 10 00 - Rough Carpentry
- D. Submittals:
 - 1. Product data for each type of finish carpentry material.
 - 2. Shop drawings where custom millwork is required.
 - 3. Samples of finish materials (minimum 12" length of trim, 8" x 10" veneer panels).
 - 4. Certificates of compliance with AWS and sustainability requirements (if applicable).
- E. Quality Standards:
 - 1. Comply with current Architectural Woodwork Standards (AWS) for premium grade architectural woodwork.
- F. Delivery and Storage:
 - 1. Deliver finish carpentry materials dry, bundled, and protected. Store inside, off ground, and in conditioned spaces. Protect from humidity extremes.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Exterior trim lumber - clear all heart vertical grain redwood.
- B. Exterior finish plywood - APA PS 1 exterior grade if one side exposed - APA A-A exterior grade if both sides exposed - fir species unless shown otherwise.
- C. Interior hardwood trim - #1 clear premium white maple, stain grade.
- D. Interior finish plywood - APA N-B interior grade if one side exposed - APA N-N interior grade if both sides exposed, fir plywood, stain grade birch.
- E. Interior hardwood plywood - APA N-B interior grade (premium) if one side exposed, APA N-N interior grade (premium) if both sides exposed, as veneer, stain grade, rotary cut, no repairs, book matched if opposing or multiple panels, otherwise use matching panels adjacent.
- F. Stain grade clear white maple windowsill / stool and apron trim with jamb trims (Re: 3, 9 and 9A-3.1).
- G. Stain grade clear white maple edge and apron trim at front of Platform (Re: 3A-7.0)

- H. Provide stainless steel fasteners where exposed to moisture, otherwise provide finish nails to match adjacent wood color when possible.

2.2 QUALITY STANDARDS

- A. All finish lumber shall be kiln dried or otherwise seasoned to moisture content of approximately that which it will attain in service.
- B. Dimensions - Nominal sizes are given in these standards unless otherwise noted. Minimum dressed dimensions shall comply with the applicable product standard.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. Install finish carpentry in accordance with AWS Premium Grade requirements. Set work plumb, level, and true to line. Install trim with tight-fitting joints; miter corners accurately. Countersink nails and fill with wood putty compatible with finish
- B. Maximum variation from plumb or level: 1/8" in 8'-0". Maximum offset at matching veneer joints: 1/32".
- C. All finish carpentry shall be supplied, stored and placed using industry standards, good building practice and according to the recommendations of the manufacturer and supplier. All joints, cuts and installation shall be in strict accordance with the A.W.I. (American Woodwork Institute) Standards. Spliced or saw-toothed jointed lumber shall not be used. All stained finish lumber shall be of generally matching patterns, colors, hues and tones when finished.
- D. All finish lumber shall be dressed free of tool marks and other objectional defects. Wood shall be trimmed, sanded and generally finished to size by the carpenter. The painter shall fine sand and rub to prepare the surface for finishes as required.
- E. Note on stainless steel nails in Section 06 10 00 - Rough Carpentry (3.1 H.), applies here also.

END OF SECTION 06 20 00

SECTION 07 11 00 - DAMPPROOFING (DAMPCOURSING)

PART 1 - GENERAL

1.1 SCOPE

- A. Furnish and install dampcoursing and flashing materials as indicated on drawings and used in conjunction with Section 04 21 13 - Brick Masonry and Section 04 22 00 - Concrete Unit Masonry. Contractor may submit equals to items specified herein for prior approval.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Dampcoursing and flashing shall be Mighty-Flash™ SA Self-Adhering Stainless Steel Fabric Flashing, as manufactured by Hohmann & Barnard, Inc., (T: 800-645-0616 | www.h-b.com) or prior approved equal.
 - 1. Composition: Self-adhering stainless steel composite flashing with removable release liner.
 - 2. Stainless steel type: Type 304
 - 3. Thickness: Stainless steel sheet 0.003 in. bonded to polymeric fabric.
 - 4. Width: 36" rolls (60 ft. length).
 - 5. Performance:
 - a. Puncture Resistance: 2,500+ PSI (ASTM E154).
 - b. Tensile Strength: 100,000+ PSF (ASTM D412).
 - c. Fire Resistance: Pass (ASTM E84).
 - d. Mold Resistance: Pass (ASTM D3273).
 - e. UV Resistance: 180 days exposure.
 - 6. Features: Clear non-asphaltic adhesive, heat resistant, recyclable (60% recycled content), lifetime warranty.
- B. Accessories (as recommended by manufacturer):
 - 1. Stainless Steel Drip Plate (DP)
 - 2. HB Sealant
 - 3. Primer SA
 - 4. Termination Bar (T1 or T2)
 - 5. Stainless Steel Corners and End Dams
 - 6. X-SEAL Tape

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install all wall flashings in one continuous piece along masonry ledge, brick sills, lintel openings, etc., with white woven printed material facing out, per manufacturer's instructions.
- B. Overlap flashing minimum 6 inches at all joints. Seal with manufacturer's approved accessories (Primer SA, HB Sealant, or X-SEAL Tape) to ensure continuous waterproof barrier.
- C. At surface mount applications, secure flashing with stainless steel or aluminum termination bar and sealant at top edge.
- D. Install stainless steel drip plate where indicated to divert moisture to outside of wall assembly.

- E. Coordinate installation with masonry work. Provide weep holes at base of walls, above window and door lintels, and other locations indicated on drawings.

END OF SECTION 07 11 00

SECTION 07 20 00 - THERMAL PROTECTION (BUILDING INSULATION)

PART 1 - GENERAL

1.1 SCOPE

- A. Furnish building insulation where indicated on drawings and/or specified herein. Contractor may submit equals to items specified herein for prior approval.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. In walls where indicated on drawings, mostly at exterior walls, install 6-1/4" R-19 unfaced friction at fiberglass batt insulation as manufactured by Owens Corning or prior approved equal. Shall meet ASTM C665 (for thermal insulation, mineral-fiber blankets).
- B. At interior walls where indicated on drawings, install 3-1/2" Eco Touch sound attenuation batts. (meeting **ASTM C423** for sound absorption) .Typical locations are between classrooms and at the mechanical room walls that are constructed with metal studs. Sound attenuation batts shall be unfaced, lightweight, flexible fiberglass insulation batts. (Manufactured by Owens Corning or prior approved equal.)
- C. Rigid insulation to be installed above the metal roof deck: Refer to Specification Section 07 52 00 for insulation included as part of roof system assembly and covered under roofing 20 year system warranty.
- D. Where a concrete block wall falls in an exterior wall location, foam insulation shall be placed in each cavity of the concrete block. **CoreFoam Masonry Foam Insulation or approved equal** shall be installed in the block cavities or prior approved equal. The flame spread index shall be 25 or less and the smoke density less than 450 (ASTM E-84). The thermal resistance per inch shall be 4.6 at 75 degrees F.
 - 1. All open cells and voids within each wall block shall be filled with foam insulation.
 - 2. Prior to installation of masonry foam insulation, the wall must be essentially dry with no standing water in the CMU cores and no visible wetness on the exterior surface.
 - 3. Masonry foam insulation shall be mixed by the installer prior to each job to insure product freshness and consistency.
 - 4. Walls can be filled with foam using either top-fill or, more commonly, pressure-injection techniques. Follow manufacturer's recommendations.
 - 5. Product should be protected from excess moisture during initial 24 hour curing period after installation. A 72-hour curing period is normally required prior to painting, however in each case the coatings contractor should test the walls to confirm the surface is suitable prior to paint application.
- E. Insulating Concrete - See Section 03 52 16 for Insulation Concrete Roof Decks.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All materials specified above shall be installed as indicated on drawings and manufacturer's instructions.
- B. All insulation used in project shall have a flame spread of less than 25, as well as meeting all other standards required by the Louisiana State Fire Marshal's Office.

3.2 WORKMANSHIP

- A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until satisfactory conditions are corrected.
- B. Remove or protect against projections in construction framing which may damage or prevent proper insulation.
- C. Install the work of this section in strict accordance with the original design, and the manufacturer's recommended installation and storage procedures as approved by the Architect, anchoring all components firmly into position.
- D. Extend insulation full thickness as shown over entire surface to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation and mastic.
- E. Comply with manufacturer's instructions for the particular conditions of installation in each case. If printed instructions are not available or do not apply to the project conditions, consult the manufacturer's technical representative for specific recommendations before proceeding with work.
- F. Apply a single layer of insulation of the required thickness, unless otherwise shown or required to make up the total thickness.
- G. Set vapor barrier faced units with vapor barrier to outside of construction; do not obstruct ventilation spaces. Set units to allow 3/4 in. Air space in front of vapor barrier. Secure units using mechanical fasteners driven through flanges of vapor barrier. Fill all voids.
- H. Tape joints and ruptures in vapor barriers, using adhesive tape of type recommended by insulation manufacturers, and seal each continuous area of insulation to surrounding construction to ensure vapor tight insulation.

END OF SECTION 07 20 00

SECTION 07 27 37 – AIR INFILTRATION / WEATHERIZATION BARRIER

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of Air Infiltration / Weatherization Barrier as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.
- C. Senergy products are listed in this specification to establish a standard of quality. Any substitutions to this specification shall be submitted to and receive approval from the Architect at least 10 days before bidding. Proof of equality shall be borne by the submitter.

NOTE: The Air Infiltration/Weatherization Barrier for this project shall be the same manufacturer for the Air Infiltration/Weatherization Barrier of Section 09 24 00 – Cement Plastering. There shall only be one manufacturer of Air Infiltration/Weatherization Barrier on this project.

1.2 RELATED SECTIONS

- A. Section 05 40 00 Cold-formed metal framing
- B. Section 06 16 43 Gypsum Sheathing (Exterior)
- C. Section 07 92 00 Joint Sealants
- D. Section 0d9 21 16 Gypsum Board Assemblies

1.3 DEFINITIONS

- A. Air Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.
- B. Water-Resistive Barrier Assembly: The collection of water-resistive materials and accessories that direct incidental water that may pass the primary rainscreen, or condense within the drain plane, out of the wall cladding while providing protection for underlying sheathing materials.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 33 23 – Shop Drawings, Product Data and Samples.
- B. Product Data: Provide data on Senergy SENERSHIELD-R/RS Air/Water resistive Barrier, product characteristics, performance criteria and limitations.
- C. Code Compliance: Provide manufacturer's applicable code compliance report.
- D. Certificate: System manufacturer's approval of applicator.
- E. Sealant: Sealant manufacturer's certificate of compliance with ASTM C1382.
- F. System manufacturer's current specifications, typical details and related product literature which indicate preparation required storage, installation techniques and jointing requirements.

1.5 PERFORMANCE REQUIREMENTS

- A. General: Air barrier shall be capable of performing as a continuous vapor-permeable air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. At wall cladding transitions, the air/water-resistive barrier shall form a continuous air barrier and shall make provision for water drainage, either by creation of an unobstructed drainage plane that extends across the cladding transition or by flashing to discharge to the exterior at the transition. Air barrier assemblies shall be capable of accommodating substrate movement and sealing substrate expansion and control joints, construction material changes and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits or interruption of the drainage plane.
- B. Commonwealth of Massachusetts Building Code Requirements: The intent of this specification is to require compliance with 780 CMR 13, Section 1304.3 Air Leakage.
1. 1304.3.1 Air Barriers: The building envelope shall be designed and constructed with a continuous air barrier to control air leakage into, or out of the conditioned space. An air barrier shall also be provided for interior partitions between conditioned space and space designed to maintain temperature or humidity levels which differ from those in the conditioned space by more than 50% of the difference between the conditioned space and design ambient conditions. The air barrier shall have the following characteristics:
 - a. It must be continuous, with all joints made airtight.
 - b. It shall have an air permeability not to exceed 0.004 cfm/sq. ft. under a pressure differential of 0.3 in. water. (1.57 psf.) (equal to 0.02L/sq. m @ 75 Pa.).
 - c. It shall be capable of withstanding positive and negative combined design wind, fan and stack pressures on the envelope without damage or displacement and shall transfer the load to the structure. It shall not displace adjacent materials under full load.
 - d. It shall be durable or maintainable.
 - e. The air barrier shall be joined in an airtight and flexible manner to the air barrier material of adjacent systems, allowing for the relative movement of systems due to thermal and moisture variations and creep.
Connection shall be made between:
 - i. Foundation and walls.
 - ii. Walls and windows or doors.
 - iii. Different wall systems.
 - iv. Wall and roof.
 - v. Wall and roof over unconditioned space.
 - vi. Walls, floor and roof across construction, control and expansion joints.
 - vii. Walls, floors and roof to utility, pipe and duct penetrations.
 - f. All penetrations of the air/water resistive barrier and paths of air infiltration/exfiltration shall be made airtight.
- C. Testing:

1. General Air/Water-Resistive Barrier Minimum Performance:

TEST	METHOD	CRITERIA	RESULTS
Water-resistive barrier coatings used under EIFS	ASTM E2570		Meets all performance requirements
Air Leakage of Air Barrier Assemblies	ASTM E2357	0.2 l/(s.m ²) @75 Pa (0.04 cfm/ft ² @ 1.57 psf)	Senersshield-R: 0.0007 l/s.m ² (0.0001 cfm/ft ²) @ 75 Pa (1.57 psf) positive / post conditioning Senersshield-RS:0.0001 cfm/ft ² @ 1.57 psf (0.0007 l/s.m ²) @ 75 Pa) positive / post conditioning Senersshield-R: 0.0014 l/s.m ² (0.0003 cfm/ft ²) @ 75 Pa (1.57 psf) negative / post conditioning

			SENERSHIELD-RS: 0.0003 cfm/ft ² @ 1.57 psf (0.0014 l/s.m ² @ 75 Pa) negative / post conditioning
Air Permeance of Building Materials	ASTM E2178	0.02 l/(s.m ²) @75 Pa (0.004 cfm/ft ² @ 1.57 psf)	0.0049 l/s.m ² @ 75 Pa (0.00098 cfm/ft ² @ 1.57 psf)
Rate of Air Leakage	ASTM E283		0.0185 l/s.m ² @ 75 Pa (0.0037 cfm/ft ² @ 1.57 psf)
Water Vapor Transmission	ASTM E96	Report value	SENERSHIELD-R - 18 Perms (grains/Hr. in Hg. ft ²) @ 10 mils wet film thickness SENERSHIELD-RS 18 Perms (grains/Hr. in Hg. ft ²) @ 12 mils wet film thickness SENERSHIELD-R/RS - 14 Perms (grains/Hr. in Hg. ft ²) @ 20 mils wet film thickness
Pull-Off Strength of Coatings	ASTM D4541	Min. 110 kPa (15.9 psi) or substrate failure	Pass - Tested over exterior gypsum sheathing, ASTM C1177 glass-mat sheathing, cement board, OSB, plywood; pvc and galvanized flashing
Nail Sealability (without Sheathing Fabric)	ASTM D1970	No water penetration at galvanized roofing nail penetration under 127 mm (5") head of water after 3 days at 4° C (40° F)	Pass
Surface Burning	ASTM E84	Flame Spread < 25 Smoke Development < 450	Meets Class A: Flame spread =15 Smoke developed = 95
Radiant Heat Multi-Story Tests	NFPA 268 & NFPA 285		Pass using many wall designs; including Senergy EIFS cladding with 12" EPS insulation
Water Resistive Barrier under EIFS	ASTM E2570	Meets all criteria in the standard	Pass
Compound Stability (Elevated Temperature)	ASTM D5147 Section 15	No flowing, dripping, or drop formation up to 177° C (350° F)	Pass
Fire Resistance	ASTM E119/UL 263		Will not add or detract from the rating of a fire resistive wall assembly
Drainage Efficiency	ASTM E 2273		99%

2. SENERSHIELD R/RS Air/Water-Resistive Barrier ICC-ES AC-212:

TEST	METHOD	CRITERIA	RESULTS
Sequential Testing: 1. Structural 2. Racking 3. Restrained Environmental Conditioning 4. Water Penetration	1. ASTM E 1233 Procedure A 2. ASTM E 72 3. ICC-ES AC-212 4. ASTM E 331	No cracking at joints or interface of flashing No water penetration after 15 min @ 137 Pa (2.86 psf)	Pass - Tested over OSB and gypsum sheathing No water penetration after 90 min @ 299 Pa (6.24 psf)
Sequential Testing: 1. UV Light Exposure 2. Accelerated Aging 3. Hydrostatic Pressure Test	1. ICC-ES AC-212 2. ICC-ES AC-212 3. AATCC 127-1985	No cracking or bond failure to substrate No water penetration after 21.7 in (550 mm) water for 5 hours	Pass
Freeze-Thaw	ASTM E 2485 (Method B)	No sign of deleterious effects after 10 cycles	Pass - Tested over exterior gypsum sheathing, ASTM C1177 glass-mat sheathing, cement board, OSB, plywood
Water Resistance	ASTM D2247	No deleterious effects after 14-day exposure	Pass - Tested over exterior gypsum sheathing, ASTM C1177 glass-mat sheathing, cement board, OSB, plywood
Tensile Bond	ASTM C 297	Minimum 103 kPa (15 psi)	Pass - Tested over exterior gypsum sheathing, ASTM C1177 glass-mat sheathing, cement board, OSB, plywood, CMU; pvc and galvanized flashing
Tensile Bond (after freeze-thaw)	ASTM C 297	Minimum 103 kPa (15 psi) avg; no failure after 10 cycles freeze-thaw	Pass

3. SENERSHIELD-R/RS Air/Water-Resistance Barrier ICC-ES AC 148:

TEST	METHOD	CRITERIA	RESULTS
Sequential Testing: 1. UV Light Exposure 2. Accelerated Aging 3. Hydrostatic Pressure Test	1. ICC-ES AC 148 2. ICC-ES AC 148 3. AATCC 127-1985	No cracking or bond failure to substrate No water penetration after 21.7 in (550 mm) water for 5 hours	Pass
Peel Adhesion	ASTM D 3330	After UV Exposure	Pass - tested over ASTM C1177 glass-mat

	Method F	After Accelerated Aging After Elevated Temperature Exposure After Water Immersion	sheathing, OSB, plywood, PVC and uncoated aluminum
Nail Sealability after Thermal Cycling	ASTM D 1970 (Modified), AAMA 711	No water penetration at galvanized roofing nail penetration under 31 mm (1.2") head of water after 24 hours at 4° C (40° F)	Pass
Tensile Strength after UV Exposure	ASTM D 5034, AAMA 711	Minimum 0.5 N/mm (2.9 lbs./in)	Pass
Cold Temperature Pliability	ASTM D 1970, AAMA 711	No cracking after bending around a 25 mm (1") mandrel after 2-hour exposure to -18° C (0° F)	Pass
Resistance to Peeling	AAMA 711	No signs of distress or failure after 24 hours of exposure at room temperature, 50° C (122° F), 65° C (149° F), 80° C (176° F)	Pass

4. MAXFLASH AAMA 714-15:

TEST	METHOD	CRITERIA	RESULTS
Peel Adhesion	ASTM C794 Control AAMA 714 Sec 5.1 UV exposure Sec 5.3, ASTM G154 Elevated temperature AAMA 714 Sec 5.4 Thermal cycling AAMA 714 Sec 5.5 7 day water immersion AAMA 714 Sec 5.7	Tested over ASTM C1177 sheathing, plywood, OSB, concrete (mortar), CMU, galvanized steel, aluminum	Pass control and after conditioning, min. 5 pli
Crack Bridging	AAMA 714 Sec 5.6, ASTM C1305	No failure after 10 cycles with 1/8" gap and water holdout of 550 mm (21.7") for 24 hours, tested at 60 mils per ASTM C1305	Pass
Nail Sealability	AAMA 714 Sec 5.2 (AAMA 711 Sec 5.2), modified ASTM D1970 sec 7.9	No failure before and after thermal cycling, 24 hours at 40°F with 31.75 mm (1 1/4") head of water	Pass
Accelerated Aging	AAMA 714 Sec 5.3, ASTM G154, Cycle 1	No deleterious effects such as wrinkling, distortion, blistering, expansion, shrinkage or warpage after 14 days (336 hours) to Cycle 1 of G154	Pass
Elevated Temperature	AAMA 714 Sec 5.4	No deleterious effects such as wrinkling, distortion, blistering, expansion, shrinkage or warpage at 50°C (122°F), 65°C (149°F) and 80°C (176°F)	Pass
Thermal Cycling	AAMA 714 Sec 5.5	No deleterious effects such as wrinkling, distortion, blistering, expansion, shrinkage or warpage after 10 cycles	Pass
Water Immersion	AAMA 714 Sec 5.7	No deleterious effects such as wrinkling, distortion, blistering, expansion, shrinkage or warpage after 7 days	Pass
Adhesion to Damp Substrates	AAMA 714 Sec 6.1 and 6.2	Minimum 5 pli, over OSB and mortar (absorptive substrates)	Pass
Water Vapor Permeability	AAMA 714 Sec 6.3, ASTM E96 Method B	0.2 l/(s.m2) @75 Pa (0.04 cfm/ft2 @ 1.57 psf)	19.9 perms @ 12 mils 7.2 perms @ 30 mils

Note: all testing with MaxFlash at 12 mils unless otherwise noted

5. MAXFLASH AAMA 711-13 - Voluntary Specification for Self-Adhering Flashing
Used for Installation of Exterior Wall Fenestration Products

TEST	METHOD	CRITERIA	RESULTS

Peel Adhesion	ASTM D3330 Method F Control AAMA 711 Sec 5.3 UV exposure Sec 5.4, ASTM G154 Elevated temperature AAMA 711 Sec 5.5 Thermal cycling AAMA 711 Sec 5.6 7 day water immersion AAMA 711 Sec 5.8	Tested over ASTM C1177 sheathing, plywood, OSB, PVC, galvanized steel, aluminum	Pass control and after conditioning, minimum 1.5 pli
Tensile Strength	AAMA 711 Sec 5.1 ASTM D 1970 Sec. 7.9	Minimum 2.9 pli	Pass at 42 and 30 mils
Nail Sealability	AAMA 711 Sec 5.2 (AAMA 711 Sec 5.2), modified ASTM D1970 sec 7.9	No failure before and after thermal cycling, 24 hours at 40°F with 31.75 mm (1 ¼") head of water	Pass
Accelerated Aging	AAMA 711 Sec 5.4, ASTM G154, Cycle 1	No deleterious effects such as wrinkling, distortion, blistering, expansion, shrinkage or warpage after 14 days (336 hours) to Cycle 1 of G154	Pass
Elevated Temperature	AAMA 711 Sec 5.5	No deleterious effects such as wrinkling, distortion, blistering, expansion, shrinkage or warpage at 50°C (122°F), 65°C (149°F) and 80°C (176°F)	Pass
Thermal Cycling	AAMA 711 Sec 5.6	No deleterious effects such as wrinkling, distortion, blistering, expansion, shrinkage or warpage after 10 cycles	Pass
Cold Temperature Pliability	AAMA 711 Sec. 5.7 ASTM D1970 Sec 7.6	No cracking of samples bent around 25 mm (1") mandrel at - 18°C (0°F) and -29°C (-20°F)	Pass at 12 and 30 mil
Water Immersion	AAMA 711 Sec 5.8	No deleterious effects such as wrinkling, distortion, blistering, expansion, shrinkage or warpage after 7 days	Pass
Peeling Resistance	AAMA 711 Sec 5.9, Annex 2	No signs of peeling after 7 days exposure to elevated temperatures - 50°C (122°F), 65°C (149°F) and 80°C (176°F)	Pass

6. MAXFLASH ICC-ES AC-212

TEST	METHOD	CRITERIA	RESULTS
Sequential Testing: 1. Structural 2. Racking 3. Restrained Environmental Conditioning 4. Water Penetration	AC-212 Sec 4.2 1. ASTM E 1233 2. ASTM E 72 3. AC-212 Sec. 4.7.3 4. ASTM E 331	No cracking at joints or interface of flashing No water penetration after 15 min @ 137 Pa (2.86 psf)	Pass - Tested over OSB and gypsum sheathing No water penetration after 90 min @ 299 Pa (6.24 psf) or 575 Pa (12psf)
Weather Testing Sequential: 1. UV Light Exposure 2. Accelerated Aging 3. Hydrostatic Pressure Test	AC-212 Sec 4.8 1. AC-212 Sec. 4.8.1 2. AC-212 Sec 4.8.2.2 3. AATCC 127	No cracking or bond failure after 210 hrs. No cracking or bond failure after 25 cycles No water penetration under 550 mm (21.7") head of water	Pass
Freeze-Thaw	AC-212 Sec. 4.2	10 cycles, no deleterious effects such as cracking, checking, crazing or erosion, viewed at 5x magnification	Pass
Water Resistance	AC-112 Sec 4.3 ASTM D2247	No deleterious effects after 14-day exposure	Pass - Tested over exterior gypsum sheathing, ASTM C1177 glass-mat sheathing, cement board, OSB, plywood

Tensile Bond	ASTM C 297	Minimum 103 kPa (15 psi)	Pass - Tested over exterior gypsum sheathing, ASTM C1177 glass-mat sheathing, cement board, OSB, plywood, CMU; pvc and galvanized flashing
Tensile Bond	AC-212 Sec. 4.1 ASTM C 297	Minimum 103 kPa (15 psi) avg; no failure after 10 cycles freeze-thaw	Pass 105 kPa (15 psi) - Tested over ASTM C1177 sheathing, plywood, OSB, cement board, PVC, aluminum, galvanized steel and stainless steel
Water Vapor Permeability	AC-212 Sec. 4.4 ASTM E96 Method B	Report Value	19.9 perms @ 12 mils 7.2 perms @ 30 mils
Water Penetration	AC-212 Sec. 4.5 ASTM E331	No water penetration at: 137 Pa (2.86 psf) 299 Pa (6.24 psf) 575 Pa (12 psf)	Pass, testing performed with MaxFlash exposed over sheathing joints.
Air Permiance of Building Materials	ASTM E2178	0.02 l/(s.m2) @75 Pa (0.004 cfm/ft2 @ 1.57 psf)	0.00410 L/s-m2 @ 75 Pa (0.00082 cfm/ft2 @ 1.57 psf) Performed on 12 mil thick free film sample

Note: all testing with MaxFlash at 20 mils unless otherwise noted

7. General Liquid Flashing Minimum Performance:

TEST	METHOD	CRITERIA	RESULTS
Air Permiance of Building Materials	ASTM E2178	0.02 l/ (s.m2) @75 Pa (0.004 cfm/ft2 @ 1.57 psf)	0.00410 L/s-m ² @ 75 Pa (0.00082 cfm/ft ² @ 1.57 psf), performed on free film sample
Air Leakage of Air Barrier Materials	ASTM E2357	0.2 l/ (s.m2) @75 Pa (0.04 cfm/ft2 @ 1.57 psf)	TBD
Nail Sealability	ASTM D1970 Sec. 7.9	No water penetration at galvanized roofing nail penetration under 127 mm (5") head of water after 3 days at 4° C (40° F)	Pass, before and after thermal cycling, 3 days at 40°F with 127 mm (5") head of water
Surface Burning	ASTM E84	Flame Spread < 25 Smoke Development < 450	Pass, tested at 30 mils

1.6 QUALITY ASSURANCE

- A. Manufacturer: More than 10 years in the EIFS industry, with more than 1000 completed EIFS projects.
- B. Applicator: Approved by Master Builders Solutions in performing work of this section.
- C. Regulatory Requirements: Conform to applicable code requirements for air/water resistive barriers.
- D. Source Limitations: Obtain primary air-barrier material and through wall flashing through one source from or approved by a single manufacturer.
- E. Mockups: Before beginning installation of air barrier, provide air barrier work for exterior wall assembly mockups, incorporating backup wall construction, external cladding, window, door frame and sill, insulation, and flashing to demonstrate surface preparation, crack and joint treatment, and sealing of gaps, terminations, and penetrations of air barrier membrane.
 1. Coordinate construction of mockup to permit inspection by Owner's testing agency of air barrier before external insulation and cladding is installed.
 2. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
- F. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Pre-installation conference shall include the Contractor, installer, Architect, and system manufacturer's field representative. Agenda for meeting shall include but not be limited to the following:
 1. Review of submittals.
 2. Review of surface preparation, minimum curing period and installation procedures.
 3. Review of special details and flashings.

4. Sequence of construction, responsibilities and schedule for subsequent operations.
5. Review of mock-up requirements.
6. Review of inspection, testing, protection and repair procedures.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products per manufacturer's instructions.
- B. Deliver Senergy SENERSHIELD-R/RS and associated materials in original unopened packages with manufacturer's labels intact.
- C. Protect Senergy SENERSHIELD-R/RS and associated materials during transportation and installation to avoid physical damage.
- D. Store Senergy SENERSHIELD-R/RS in cool, dry place protected from freezing. Store at no less than 4°C/40°F.
- E. Store Senergy SENERSHIELD-R/RS and associated materials protected from direct sunlight and extreme heat.
- F. Store Senergy SHEATHING FABRIC and MASTERSEAL AWB 970 NP flexible flashing in cool, dry place protected from exposure to moisture.
- G. Store MAXFLASH at a minimum of 40°F. In cold weather, keep containers at room temperature for at least 24 hours before using.

1.8 PROJECT/SITE CONDITIONS

- A. Do not apply Senergy SENERSHIELD-R/RS in ambient temperatures below 25°F(-4°C). Provide properly vented, supplementary heat during installation and drying period when temperatures less than 25°F(-4°C) prevail.
- B. Cold temperature application less than 40°F (4°C) down to 25°F (-4°C): expect extended dry time. Final air/water-resistive properties and film durability rely on temperatures rising above freezing (32°F/0°C)
- C. Do not apply Senergy SENERSHIELD-R/RS and associated materials to frozen surfaces.
- D. 40°F (4°C) and rising allow to dry completely, typically 2-10 hours before proceeding with cladding installation. 40°F (4°C) down to 25°F (-4°C): when applied at a 12-mil wet film thickness, typically dry in approximately 12 hours at 32°F (0°C) and 50% relative humidity (RH).
- E. Limit exposure of Senergy SENERSHIELD-R/RS and associated products to a maximum of 180 days.

1.9 SEQUENCING AND SCHEDULING

- A. Coordinate and schedule installation of Senergy SENERSHIELD-R/RS and associated materials with related work of other sections.
- B. Coordinate and schedule installation of flashing and joint sealers to prevent water infiltration behind the exterior cladding system.

1.10 WARRANTY

- A. Material Warranty: Provide Master Builders Solutions materials warranty for Senergy SENERSHIELD-R/RS installations under provisions of Section 01 70 00 – Closeout Procedures.
 - 1. Comply with Master Builders Solutions applicator approval requirements and notification procedures to assure qualification for warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Senergy SENERSHIELD-R/RS Air/Water-Resistive Barrier manufactured by Master Builders Solutions.

2.2 MATERIALS

- A. Air/Water Resistive Barrier Components:
 - 1. Air/Water-Resistive Barrier:
 - a. SENERSHIELD-R: A one-component fluid-applied vapor permeable air/water-resistive barrier.
 - 2. Rough Opening and Joint Treatment:
 - a. SHEATHING FABRIC: A spun-bonded non-woven reinforced polyester web for use with Senergy fluid applied air/weather-resistive barriers.
 - b. MAXFLASH: A one-component elastomeric material for use as a flexible flashing membrane.
 - 3. MASTERSEAL AWB 970 NP Transitional Membrane / Expansion Joint Flashing 20-mil thick, self-sealing, self-healing composite membrane of polyester fabric and butyl adhesive. Compatible with Senergy liquid air/weather resistive barriers.

2.3 ACCESSORIES

- A. Sprayed Polyurethane Foam Sealant: 1- or 2-component, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0 lb/cu. ft (24 to 32 kg/cu. m) density; flame spread index of 25 or less according to ASTM E162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.
- B. Joint Sealant: reference Acceptable Sealant for use with Senergy Air/Water-Resistive Barriers Technical Bulletin.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site Conditions:
 - 1. Verify project site conditions.
- B. Walls:
 - 1. Substrates:
 - a. Roller applied air/water-resistive barrier acceptable substrates: Acceptable substrates are: PermaBase® Cement Board and other cement-boards conforming with ASTM C1325 (Type A-exterior); poured concrete/unit masonry; ASTM C1177 type sheathings, including, Weather Defense™ Platinum sheathing, GreenGlass® sheathing, eXP™ sheathing, GlasRoc® sheathing, Securock™ glass-mat sheathing, and DensGlass® exterior sheathing. DensElement (sheathing only); gypsum sheathing (ASTM C79/C1396); Huber Zip (sheathing only); Exposure I or exterior plywood (Grade C/D or better); or Exposure I OSB. Consult the Master Builders Solutions Technical Services Department for all other applications.
 - b. Wall sheathing must be securely fastened per applicable building code and sheathing manufacturer's requirements.

- c. Examine surfaces to receive SENERSHIELD-R/RS air/water resistive barrier and verify that substrate and adjacent materials are dry, clean, sound, and free of releasing agents, paint, or other residue or coatings. Verify substrate is flat, free of fins or planar irregularities greater than 6.4 mm in 3 m (1/4" in 10').
 - d. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263.
 - e. Verify that masonry joints are struck flush and completely filled with mortar.
- 2. Flashings:
 - a. All flashings are by others and must be installed in accordance with specific manufacturer's requirements. Where appropriate, end-dams must be provided.
 - b. Openings must be flashed prior to window/door, HVAC, etc. installation. Refer to MASTERSEAL AWB 970 NP product bulletin and the Senergy Air/Water-Resistive/Vapor Barrier Application Guidelines bulletin for further information.
 - c. Windows and openings shall be flashed according to design and Building Code Requirements.
 - d. Individual windows that are ganged to make multiple units require continuous head flashing and the joints between the units must be fully sealed.
- 3. Roof:
 - a. Verify that all roof flashings have been installed in accordance with the guidelines set by the Asphalt Roofing Manufacturers Association (ARMA).
- 4. Kick-out flashing:
 - a. Kick-out flashing must be installed leak-proof and angled (min 100°) to allow for proper drainage and water diversion.

C. Do not proceed until all unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect all surrounding areas and surfaces from damage and staining during application of Senergy SENERSHIELD-R/RS Air/Water-Resistive Barrier.
- B. Protect finished work at end of each day to prevent water penetration.
- C. Substrate preparation: Prepare substrates in accordance with Senergy instructions.

3.3 MIXING

General: No additives are permitted unless specified in product mixing instructions. Close containers when not in use. Prepare in a container that is clean and free of foreign substances. Do not use a container which has contained or been cleaned with a petroleum-based product. Clean tools and equipment with water immediately after use. Dried material can only be removed mechanically.

- A. Air/Water-Resistive Barriers:
 - 1. SENERSHIELD-R/RS & MASTERSEAL AWB 600 FL: Mix with a clean, rust-free paddle and drill until thoroughly blended. Do not add water.

3.4 APPLICATION

- A. Air/Water Resistive Barrier:
 - 1. Substrate shall be installed per substrate manufacturer's instructions. Substrate shall be dry, clean, sound and free of release agents, paint or other residue or coatings. Verify substrate is flat, free of fins or planar irregularities greater than 6.4 mm in 3 m (1/4" in 10'). Unsatisfactory conditions shall be reported to the

general contractor and corrected before application of the air/water-resistive barrier materials.

2. Rough Openings:

- a. Apply a bead of MAXFLASH in each corner of the rough opening, ensuring that corners are fully sealed. Where wood bucks are used, apply a bead of MAXFLASH into gaps between bucks and between the buck and building structure. Apply additional MAXFLASH in a zigzag pattern onto head, sill, jambs and exterior substrate. Spread MAXFLASH evenly across the rough opening to form a uniform, continuous, void and pinhole-free membrane with a 12-20 mil thickness. Extend MAXFLASH membrane minimum 4 inches onto the exterior wall, maintaining 12-20 mil thickness. Extend MAXFLASH at a minimum 4 inches onto the exterior wall, maintaining 12-20 mil thickness. Allow MAXFLASH to skin before applying fluid-applied air/water-resistive barrier to sheathing. Lap the air/water-resistive barrier a minimum of 2 inches onto MAXFLASH, creating a continuous, monolithic air/water-resistive barrier membrane. Allow MAXFLASH to cure prior to the installation of windows, doors and other wall assemblies.

3. Sheathing Joints:

- a. SHEATHING FABRIC: Spot all fasteners and precoat sheathing joints, terminations, inside and outside corners with mixed SENERSHIELD-R/RS using a 101 mm (4") wide by 20 mm (3/4") nap roller, brush or spray. Immediately place and center SHEATHING FABRIC over wet SENERSHIELD-R/RS at all sheathing joints, terminations, inside and outside corners, as well as knot holes and check cracks that may exist in plywood or OSB. Ensure SHEATHING FABRIC extends evenly on both sides of the sheathing joint. Completely saturate SHEATHING FABRIC with SENERSHIELD-R/RS. Lap SHEATHING FABRIC 63.5 mm (2 1/2") minimum at intersections. If using roller, brush, or trowel application, allow to dry to the touch before applying SENERSHIELD-R/RS to entire wall surface. If spraying, "wet on wet" application is acceptable.

4. Field of Substrate:

- a. Apply SENERSHIELD-R/RS to DensGlass™ exterior sheathing, eXP™ sheathing, GlasRoc® sheathing, Securock™ glass-mat sheathing, Weather Defense™ Platinum sheathing, GreenGlass® sheathing, PermaBase™ cement-board by National Gypsum and other cement-boards (ASTM C1325 Type A Exterior) and gypsum sheathing (ASTM C79/ASTM C1396):
 - SENERSHIELD-R with a 20 mm (3/4") nap roller, stainless steel trowel, brush or spray gun to a consistent, minimum 10 wet mil thickness that is free of voids and pin holes. A fully loaded roller pad is required to obtain a consistent, minimum 10 wet mil thickness. Back rolling may be needed to produce a pinhole-free film. Note: Refer to Spray Application technical bulletin for spray application equipment and application instructions.

- 5. Limit the weather exposure of SENERSHIELD-R to a maximum of 180 days and SENERSHIELD-RS maximum 180 days for mechanically attached systems and 30 days if used as part of an adhesively attached Senergy wall system. Verify surfaces are free of dirt, contaminants, or other deleterious conditions before application of cladding. Report and correct any such conditions prior to cladding application. Dry/cure times of adhesively applied EPS insulation board installed over SENERSHIELD-R/RS may be prolonged, particularly in cool and/or damp weather. Non-cementitious adhesives are not recommended for EPS insulation board attachment to SENERSHIELD-R/RS.

B. Transition Membrane Installation

- 1. Install SENERSHIELD-R/RS / SHEATHING FABRIC and/or MASTERSEAL AWB 970 NP and sealant in accordance with project details & specifications to form a seal with adjacent construction and maintain a continuous air/water-resistive barrier.

- a. General Contractor shall make provision to coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
 - b. General Contractor shall make provision to install strip on roofing membrane or base flashing so that a minimum of 75 mm (3") of coverage is achieved over both substrates.
2. Remove usable size of the release film immediately before application and center the MasterSeal® AWB 970 NP over the area to be sealed. Using a wallpaper roller, extension-handled countertop roller or weighted hand roller, firmly roll the MasterSeal® AWB 970 NP to the area being sealed. As the MasterSeal® AWB 970 NP is applied, pull more of the release film, exposing the adhesive surface, pressing down with a roller and keeping the MasterSeal® AWB 970 NP smooth.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspections and prepare test reports.
- B. Inspections: Air barrier materials and installation are subject to inspection for compliance with requirements. Inspections may include the following:
 1. Continuity of air barrier system has been achieved throughout the building envelope with no gaps or holes.
 2. Continuous structural support of air barrier system has been provided.
 3. Masonry and concrete surfaces are smooth, clean and free of cavities, protrusions, and mortar droppings.
 4. Site conditions for application temperature and dryness of substrates have been maintained.
 5. Maximum exposure time of materials to UV deterioration has not been exceeded.
 6. Surfaces have been primed, if applicable.
 7. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fish mouths.
 8. Termination sealant has been applied on cut edges.
 9. Strips and transition strips have been firmly adhered to substrate.
 10. Compatible materials have been used.
 11. Transitions at changes in direction and structural support at gaps have been provided.
 12. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, preparation and priming of surfaces, structural support, integrity, and continuity of seal.
 13. All penetrations have been sealed.
- C. Tests: Testing to be performed will be determined by Owner's testing agency from among the following tests:
 1. Qualitative Testing: Air barrier assemblies will be tested for evidence of air leakage according to ASTM E1186, smoke pencil with pressurization or depressurization.
- D. Remove and replace deficient air barrier components and retest as specified above.

3.6 CLEANING AND PROTECTION

- A. Protect air barrier system from damage during application and remainder of construction period.
- B. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace air barrier exposed for more than 90 days.

- C. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.
- D. Remove masking materials after installation.

END OF SECTION 07 27 37

SECTION 07 42 43 - COMPOSITE WALL PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES:

- A. Exterior, panelized fiber cement cladding system and accessories to complete a drained and back-ventilated rainscreen.

1.2 RELATED SECTIONS

- A. 05 40 00 - Cold Formed Metal Framing
- B. 06 10 00 - Rough Carpentry
- C. 06 16 43 - Gypsum Sheathing
- D. 07 20 00 - Thermal Protection (Building Insulation)
- E. 07 27 37 - Air Infiltration/Weather Barrier
- F. 07 60 00 - Flashing and Sheet Metal
- G. 07 92 00 - Joint Sealants

1.3 REFERENCES

- A. American Architectural Manufacturers Association (AAMA):
 - 1. AAMA 509-09 – Voluntary Test and Classification Method of Drained and Back Ventilated Rain Screen Wall Cladding Systems
- B. ASTM International (ASTM):
 - 1. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - 2. ASTM C 1185 - Standard Test Methods for Sampling and Testing Non-Asbestos Fiber Cement.
 - 3. ASTM C 1186 – Standard Specification for Flat Fiber-Cement Sheets.
 - 4. ASTM E-84 - Standard Test for Surface Burning Characteristics of Building Materials.
 - 5. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
 - 6. ASTM E 228 - Standard Test Method for Linear Thermal Expansion of Solid Materials with a Vitreous Silica Dilatometer.
 - 7. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
 - 8. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
 - 9. ASTM G 23 - Standard Practice for Operating Light-Exposure Apparatus (Carbon-Arc Type) with and without Water for Exposure of Nonmetallic Materials, Replaced by G152 and G153.
- C. Florida Building Code - Test Protocol HVHZ
 - 1. Testing Application Standard (TAS) 201, 202, 203 – Impact Test Procedures
- D. National Fire Protection Association (NFPA):
 - 1. NFPA 285 - Fire Test Method for Exterior Wall Assemblies Containing Combustible Material.

- 2. NFPA 268 – Ignition Resistance of Exterior Wall Assemblies.
- E. Standards Council of Canada & Underwriters Laboratories Canada (ULC):
 - 1. CAN/ULC S-102 – Standard Method of Test for Surface Burning Characteristics.
 - 2. CAN/ULC S-134 – Standard Method of Fire Test of Exterior Wall Assembly.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 33 23.
- B. Product Data: Submit manufacturer's product description, storage and handling requirements, and installation instructions.
- C. Product Test Reports and Code Compliance: Documents demonstrating product compliance with local building code, such as test reports or Evaluation Reports from qualified, independent testing agencies.
- D. Manufacturer's Details: Submit drawings (.dwg, .rvt, and/or .pdf formats), including plans, sections, showing installation details that demonstrate product dimensions, edge/termination conditions/treatments, compression and control joints, corners, openings, and penetrations.
- E. Samples: Submit samples of each product type proposed for use.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. All fiber cement panels specified in this section must be supplied by a manufacturer with a minimum of 10 years of experience in fabricating and supplying fiber cement cladding systems.
 - a. Products covered under this section are to be manufactured in an ISO 9001 certified facility.
 - 2. Provide technical and design support as needed regarding installation requirements and warranty compliance provisions.
- B. Installer Qualifications: All products listed in this section are to be installed by a single installer trained by manufacturer or representative.
- C. Mock-Up Wall: Provide a mock-up wall as an evaluation tool for product and installation workmanship. Wall shall include a window opening with a full panel installed entirely above the window using a starter track to simulate actual project conditions. **All joints, terminations, and flashing details shall be executed in the mock up wall to insure proper installation techniques.**
- D. Pre-Installation Meetings: Prior to beginning installation, conduct conference to verify and discuss substrate conditions, manufacturer's installation instructions, warranty requirements, and project requirements. **A manufacturers representative shall be present at this meeting to review the mock up wall along with all project conditions prior to installation of the composite wall panels.**

1.6 DELIVERY, STORAGE AND HANDLING

- A. Panels must be stored flat and kept dry before installation. A waterproof cover over panels and accessories should be used at all times prior to installation.
- B. If panels are exposed to water or water vapor prior to installation, allow to completely dry before installing. Failure to do so may result in panel shrinkage at ship lap joints, and such action may void warranty.
- C. Panels MUST be carried on edge. Do not carry or lift panels flat. Improper handling may cause cracking or panel damage.
- D. Direct contact between the panels and the ground should be avoided at all times. It is necessary to keep panels clean during installation process.

1.7 WARRANTY

- A. Provide manufacturer's 15-year warranty against manufactured defects in fiber cement panels.
- B. Provide manufacturer's 15-year warranty against manufactured defects in panel finish.
- C. Warranty provides for the original purchaser. See warranty for detailed information on terms, conditions and limitations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Nichiha Corporation or **Prior Approved Equal**.
 - 1. Basis of Design Product: Nichiha Illumination Series and Architectural Block Series
 - a. Profile colors: Designer-specified custom colors (finished in U.S.). A total of Three (3) different colors shall be utilized on this project as shown in the exterior elevation drawing A-5.0. The manufacturer shall match the pattern shown in drawings with colors chosen by the Owner and Architect.
 - b. Profiles:
 - 1. AWP-1818 Panel: Smooth, no score lines.
 - 2. AWP-3030 Panel: No score lines. Wider, soft-U chamfered edge at horizontal joints.
 - c. Accessory/Component Options:
 - 1. Manufactured Corners with 3-1/2" returns for each profile size and color.
 - a. Do not use AWP-1818 Corners with AWP-3030 Panels.
 - 2. Aluminum trim to be painted per finish schedule: Outside corners (Corner Key, Open Outside Corner), vertical joints (H-Mold), terminations (J-Mold)
 - a. Finish: Custom Color as selected by the architect.
 - 3. Essential Flashing System: Starter, Compression Joint, Overhang.
 - a. Finish: Matte black
 - d. Dimensions:

1. AWP-1818: 455mm (17-7/8") (h) x 1,818 mm (71-9/16")
 2. AWP-3030: 455mm (17-7/8") (h) x 3,030 mm (119-5/16")
 - e. Panel Thickness: 16 mm (5/8").
 - f. Finish: Matte, smooth.
 - g. Weight: AWP-1818: 35.27 lbs. per panel, AWP-3030: 57.32 lbs. per panel.
 - h. Coverage: 8.88 sq. ft. per panel (1818), 14.81 sq. ft. per panel (3030).
 - i. Factory sealed on six [6] sides.
- C. Substitutions: Shall be considered **PRIOR TO THE BID** in accordance with spec section 01 33 24 - Substitutions.

2.2 MATERIALS

- A. Fiber cement panels manufactured from a pressed, stamped, and autoclaved mix of Portland cement, fly ash, silica, recycled rejects, and wood fiber bundles.
- B. Panel surface pre-finished and machine applied.
- C. AWP-1818 profiled along all four edges, such that both horizontal and vertical joints between the installed panels are ship-lapped.
- D. Factory-applied sealant gasket added to top and right panel edges; all AWP-1818 joints contain a factory sealant.

2.3 PERFORMANCE REQUIREMENTS

- A. Fiber Cement Cladding – Must comply with ASTM C-1186, Type A, Grade II requirements:
 1. Wet Flexural Strength, lower limit: 1015 psi.
 2. Water Tightness: No water droplets observed on any specimen.
 3. Freeze-thaw: No damage or defects observed.
 4. Warm Water: No evidence of cracking, delamination, swelling, or other defects observed.
 5. Heat-Rain: No crazing, cracking, or other deleterious effects, surface or joint changes observed in any specimen.
- B. Mean Coefficient of Linear Thermal Expansion (ASTM E-228): Max 1.0×10^{-5} in./in. F.
- C. Surface Burning (CAN-ULC S102/ASTM E-84): Flame Spread: 0, Smoke Developed: 5.
- D. Wind Load (ASTM E-330): Contact manufacturer for ultimate test pressure data corresponding to framing type, dimensions, fastener type, and attachment clips. Project engineer(s) must determine Zone 4 and 5 design pressures based on project specifics.
 1. Minimum lateral deflection: L/120.
 2. **Basic Wind Speed: 138 MPH (V_{ult})**
 3. **See Drawing sheet A-9.0, A-9.1 for Component Wind Loads**

- E. Water Penetration (ASTM E-331): No water leakage observed into wall cavity.
- F. Weather Resistant (ASTM G-23): No cracking, checking, crazing, erosion, or other detrimental effects observed.
- G. Steady-State Heat Flux and Thermal Transmission Properties Test (ASTM C-518): 16mm thick panel thermal resistance R Value of 0.47.
- H. Fire Resistant (ASTM E-119): The wall assembly must successfully endure 60-minute fire exposure without developing excessive unexposed surface temperature or allowing flaming on the unexposed side of the assembly.
- I. Ignition Resistance (NFPA 268): No sustained flaming of panels, assembly when subjected to a minimum radiant heat flux of 12.5 kW/m² ± 5% in the presence of a pilot ignition source for a 20-minute period.
- J. Fire Propagation (NFPA 285): Wall assembly of Nichiha AWP, Ultimate Clips and Starter Track, Tyvek Commercial Wrap, ½" Densglass Gold Sheathing, 16" o.c. 18 gauge steel studs, mineral wool in-cavity insulation, and interior 5/8" Type X gypsum met the acceptance criteria of NFPA 285.
- K. Drained and Back Ventilated Rainscreen (AAMA 509-14): System classifications: W1, V1.
- L. Florida Building Code - Test Protocol HVHZ (TAS 202, 203): Horizontal Application Design Pressure: 95 psf, Vertical Application Design Pressure: 85 psf

2.4 INSTALLATION COMPONENTS

- A. Ultimate Clip System:
 - 1. Starter Track:
 - a. Horizontal Panel Installations - FA 700 – 3,030mm (I) galvalume coated steel.
 - 2. Panel Clips: JEL 778 "Ultimate Clip II" (10mm rainscreen for 16mm AWP) – Zinc-Aluminum-Magnesium alloy coated steel.
 - a. Joint Tab Attachments (included) – used at all AWP-1818 panel to panel vertical joints. NOT used with AWP-3030 installations.
 - 3. Corner Clips: JE 777C (10mm rainscreen for 5/8" AWP Manufactured Corners) – Zinc-Aluminum-Magnesium alloy coated steel.
 - 4. Single Flange Sealant Backer – FHK 1015 R (10mm) – 6.5' (I) fluorine coated galvalume.
 - 5. Double Flange Sealant Backer – FH 1015 R (10mm) – 10' (I) fluorine coated galvalume.
 - 6. Corrugated Spacer – FS 1005 (5mm), FS 1010 (10mm) – 4' (I).
- B. Aluminum Trim (see Section 2.1): In custom color as selected by the Architect.
- C. Essential Flashing System (optional, see Section 2.1):
 - 1. Starter – main segments (3,030mm), inside corners, outside corners
 - 2. Overhang – main segments (3,030mm), inside corners, outside corners, joint clips

- D. Fasteners: Corrosion resistant fasteners, such as hot-dipped galvanized screws appropriate to local building codes and practices must be used. Use Stainless Steel fasteners in high humidity and high-moisture regions. Panel manufacturer is not liable for corrosion resistance of fasteners. Do not use aluminum fasteners, staples or fasteners that are not rated or designed for intended use. See manufacturer's instructions for appropriate fasteners for construction method used.
- E. Flashing: Flash all areas specified in manufacturer's instructions. Do not use raw aluminum flashing. Flashing must be galvanized, anodized, or PVC coated.
- F. Sealant: Sealant shall comply with ASTM C920, Class 35.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
 - 1. Fiber cement panels can be installed over braced wood, steel studs and sheathing including plywood, OSB, plastic foam (1" or less) or fiberboard sheathing. Fiber cement panels can also be installed over Structural Insulated Panels (SIP's), Concrete Masonry Units (CMU's) and Concrete Block Structures (CBS's) with furring strips, and Pre-Engineered Metal Construction. Insulated Concrete Forms (ICFs) require added measures. Consult with Nichiha Technical Services.
 - 2. Allowable stud spacing: 16" o.c. maximum.
 - 3. A weather resistive barrier is required when installing fiber cement panels. Use an approved weather resistive barrier (WRB) as defined by the 2015 IBC or IRC. Refer to local building codes.
 - 4. Appropriate metal flashing should be used to prevent moisture penetration around all doors, windows, wall bottoms, material transitions and penetrations. Refer to local building codes for best practices.
- B. Examine site to ensure substrate conditions are within alignment tolerances for proper installation.
- C. Do not begin installation until unacceptable conditions have been corrected.
- D. Do not install panels or components that appear to be damaged or defective. Do not install wet panels.

3.2 TOLERANCE

- A. Wall surface plane must be plumb and level within +/- 1/4 inch in 20 feet in any direction.
 - 1. One layer of Nichiha 5mm (~3/16") Spacer may be used as shim.

3.3 INSTALLATION

- A. General: Install products in accordance with the latest installation guidelines of the manufacturer and all applicable building codes and other laws, rules, regulations and ordinances. Review all manufacturer installation, maintenance instructions, and other applicable documents before installation.
 - 1. Consult with your local dealer or Nichiha Technical Department before installing any Nichiha fiber cement product on a building higher than 45 feet or three stories or for conditions not matching prescribed standard installation guide requirements and methods. A Technical Design Review (TDR) process is available to evaluate project feasibility.
 - 2. *Vertical Control/Expansion Joints* are required with AWP-1818, for walls wider than 30 feet, within 2-12 feet of outside corners finished with metal trim *and* approximately every 30 feet thereafter.
 - a. *Vertical Control/Expansion Joints* are required at each AWP-3030 vertical joint, or H-Mold trim may be used instead.
 - 3. *Horizontal/Compression Joints* are required for multi-story installations of AWP. Locate joints at floor lines. Joints are flashed minimum ½" breaks. Do not caulk. Refer to installation guide(s).
 - a. Wood framed buildings of three or more floors require a compression joint at each floor.
 - b. Steel framed buildings (including reinforced concrete core with LGMF exterior walls) of more than three floors (or 45 feet) require a compression joint every 25 feet at a floor line.
- B. Panel Cutting
 - 1. Always cut fiber cement panels outside or in a well ventilated area. Do not cut the products in an enclosed area.
 - 2. Always wear safety glasses and NIOSH/OSHA approved respirator whenever cutting, drilling, sawing, sanding or abrading the products. Refer to manufacturer SDS for more information.
 - 3. Use a dust-reducing circular saw with a diamond-tipped or carbide-tipped blade.
 - a. Recommended circular saw: Makita 7-1/4" Circular Saw with Dust Collector (#5057KB).
 - b. Recommended blade: Tenryu Board-Pro Plus PCD Blade (#BP-18505).
 - c. Shears (electric or pneumatic) or jig saw can be used for complicated cuttings, such as service openings, curves, radii and scrollwork.
 - 4. Silica Dust Warning: Fiber cement products may contain some amounts of crystalline silica, a naturally occurring, potentially hazardous mineral when airborne in dust form. Consult product SDS or visit <https://www.osha.gov/dsg/topics/silicacrystalline/>.
 - 5. Immediately clean dust from cut panels as it may bind to the finish.

3.4 CLEANING AND MAINTENANCE

- A. Review manufacturer guidelines for details.

END OF SECTION 07 42 43

SECTION 07 46 16 - PREFORMED METAL SIDING / SOFFIT

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of metal soffit system as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, and complete installation shall be furnished and installed as part of this work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Panel
 - 1. Coil and flat sheet metal: 24 gage, pre-coated, commercial quality, ASTM A526-80, Grade A, G90 zinc-coated galvanized steel. Since panels are applied directly over purlins, Grade D (50,000 psi) panels shall be used. (Use all U.S. steel, no foreign steel allowed.)
 - 2. Finish: 70% Kynar 500 or Hylar 5000 resin based fluoropolymer coating of 1.0 mil total dry film finish for exterior and the reverse side a wash coat of 0.3 to 0.4 mil dry film thickness as per warranty.
 - 3. Color: As selected by Owner/Architect from manufacturer's full range of colors. (Minimum of 10 standard colors.)
 - 4. Texture: Smooth at walls, Smooth and unvented at soffits.
 - 5. Panel Height: 1"
 - 6. Panel Style: Flush Panel, concealed fastener. utilizing male and female configuration.
 - 7. Gauge: 24 gauge
 - 8. Substrate: Galvanized steel sheet.
 - 9. Film: Manufacturer's protective, removable film sheet.
 - 10. Profile: Metal soffit system shall receive two (2) "Pencil" groove equally spaced in each panel.
- B. Fasteners.

1. Shall be installed to meet the metal panel manufacturers recommendation and to meet the current International Building Code (IBC). (Refer to structural drawings "Components and Cladding Design Pressures" chart for loading requirements.)
 - a. Metal soffit system shall be attached to 16 ga. hat sections spaced a maximum of 12" O.C. or as required to meet windloading. (Re: section 05 40 00 - Cold Formed Metal Framing)

C. Related Sheet Metal Flashing

1. Provide all components required per the Premanufactured Metal Soffit/Wall System manufacturer's recommendation for a complete Metal Soffit/Wall System to include panels, trim/flashing, closures, sealants, and any other required items.

D. Fabrication

1. Material shall be in-line tension leveled prior to roll forming panel profile.
2. Fabricate trim/flashing from same material as panel.
3. Fabricate trim/flashing and accessories to detailed profiles.
4. Apply specified finishes in conformance with manufacturer's standard, and according to manufacturer's instructions.

E. Vapor Barriers

1. Refer to specification Section 07 27 37 - Air Infiltration / Weatherization Barrier.
2. Air Infiltration / Weatherization Barrier shall be installed over 5/8" Dens Glass Gold sheathing with all joints taped.

F. Accessories

1. General: Provide all necessary accessories required and/or approved by the manufacturer to accommodate the job site conditions for a complete, secure and watertight soffit/wall system for the "Scope of the Work" items stated above.
2. Fasteners: No exposed fasteners will be allowed, unless specifically indicated in the contract documents.
3. Touch-up Paint: Kynar 500 or Hylar 5000 paint. (NO SPRAY CANS!)

2.2 MANUFACTURERS

- A. Metal Soffit Panel System shall be Pac-Clad "Flush Soffit (12" wide x 1" deep) 24 ga. Prefinished Steel panels with Pac-Clad Kynar 500 finish (color to be selected by Architect) or prior approved equal. Maximum thickness shall be 1" thick.

- B. Ultra Seam US-100 FP 24 ga Prefinished Steel Soffit System (color to be selected by Architect) as provided by: Edward J. Laperouse Metal Works, Inc., Houma, LA (Phone) 985-872-4511. Maximum thickness shall be 1" thick.
- C. Architectural Building Components (ABC) Soffit Panels - Flush Metal Panel with smooth finish (1" x 12"), 24 ga. Prefinished Steel as manufactured by Architectural Building Components (phone: 800-432-1105). Maximum thickness shall be 1" thick.
- D. Berridge FW-12 - Flush Metal Panel with smooth finish (1-1/2" x 12"), 24 ga. Prefinished Steel as manufactured by Berridge Manufacturing, (phone: 800-669-0009). Maximum thickness shall be 1" thick.

Or prior approved equal.

2.3 DELIVERY, STORAGE AND HANDLING

- A. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- B. Deliver components, sheets, metal wall panels and other manufactured items so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling.
- C. Unload, store and erect metal wall panels in a manner to prevent bending, warping, twisting and surface damage.
- D. Stack metal wall panels on platforms or pallets, covered with suitable weather tight and ventilated covering. Store metal wall panels to ensure dryness. Do not store metal wall panels in contact with other materials that might cause staining, denting or other surface damage.
- E. Protect strippable protective coating on any metal coated product from exposure to sunlight and high humidity, except to the extent necessary for material installation.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All surfaces on which the work is to be applied shall be examined for flatness as appropriate to application.
- B. Panels shall be installed so that horizontal lines are level and vertical lines are even.
- C. All sheet metal work shall conform to standards set forth in SMACNA architectural sheet metal manual.
- D. Fasteners shall be concealed as provided by manufacturer.
- E. Field Measurements: Verify actual dimensions of construction contiguous with metal roof panels by field measurements before fabrication.

- F. Compliance: Comply with manufacturer's product data, recommendations and installation instructions for substrate verification, preparation requirements and installation.
- G. Install metal panels, fasteners, trim and related sealants in accordance with approved shop drawings and as may be required for a weather-tight installation.
- H. Provide uniform, neat seams.

3.2 TOUCH-UP

- A. Only minor scratches and abrasions shall be allowed to be touched up. Any other damaged materials shall be replaced.

3.3 CLEAN-UP

- A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damage installed products. Clean installed products in accordance with manufacturer's instruction prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.

END OF SECTION 07 46 16

SECTION 07 52 00 - MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SCOPE

- A. The contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of Modified Bitumen Sheet Roofing as shown on drawings and as specified in accordance with provisions of the contract documents and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.
- C. Description
 - 1. Modified Bitumen Roofing Systems: roof insulation and other associated work.
 - 2. Related work specified elsewhere:
 - a. 01 33 23 - Shop Drawings, Product Data and Samples
 - b. 05 50 00 - Metal Fabrications
 - 3. Section 01 33 24 - Substitutions: Section describes requirements on substitutions and product options.
 - 4. Product List: Prior to starting work on the job, submit to Architect four (4) copies of complete list of all products proposed for installation. Tabulate list by section number.
 - 5. Method of specifying product: Products are specified in this document according to one of the methods listed below. The methods are listed in descending order of priority and restriction. The Contractor and Subcontractor cannot use a lower order of method than the order indicated.
- D. Quality Assurance
 - 1. Acceptable Contractor. The Contractor shall have a minimum of five (5) years' experience in successfully installing the same or similar roofing materials and **shall be certified in writing by the roofing materials manufacturer to install the primary roofing products.** A complete list of projects, with the product to be used, shall be provided.
 - 2. Roof Systems: Roof system shall be from a single source manufacturer within the scope of the specific types of products named. Products relating directly to the performance of the selected system which are not manufactured by the system manufacturer, shall be approved in writing by the system manufacturer. Approved manufacturer of the specified products in this section shall have been in business a minimum of five (5) years in the United States.
 - 3. Pre-Roofing Conference: Before the roofing work is scheduled to commence, after shop drawings have been reviewed by the Architect, and before any materials are ordered, **a conference shall be called at the jobsite by the Contractor for the purpose of reviewing the drawings and specifications.** The intent is to resolve questions before the work is started. The conference shall be attended by the roofing contractor, and his foreman, General Contractor's Superintendent roof manufacturer's representative as well as the Architect's representative.

4. Pre-application Conference: Before the roofing work is scheduled and within one week of roofing application is to commence, after shop drawings have been reviewed by the Architect, a conference shall be held at the jobsite for the purpose of a final review of drawings and specifications. The intent is to resolve questions before any work is started. (The manufacturer's representative shall be present.)
5. **At start up, prior to completion and at completion**, the roofing contractor must pay for an independent roofing auditor/inspector to inspect the roof and issue to the Architect a certificate stating that the material and workmanship on the project are in compliance with the requirements and specifications of the manufacturer for an installation complying with a 20 year unlimited guarantee/warranty. At the completion visit, the independent auditor shall make a punch list of items to be completed with a dollar value and shall revisit the project to confirm that all punch list items have been completed. **(The Architect shall be sent a copy of this punch list.) The name of the independent roofing auditor/inspector shall be submitted with shop drawings.**
6. At Owner's option the Contractor shall have the roofing materials for the project delivered to the area of the project (i.e. distribution warehouse, job site, or other location where materials can be stored properly and securely) (within 75 mile radius) and be identified and held specifically for this project. Roofing contractor at owner request and direction shall provide samples from the pallets of roofing materials indicated to be designated for this project as needed for independent lab testing for quality of roofing per ASTM standards as requested by the owner. Cost of testing shall be paid by the owner. If any materials tested are found to not meet ASTM standards indicated by the project specifications and data sheets of the material, the materials will not be accepted for the project and will be replaced by the contractor. Any replacement materials shall be paid by the Contractor. Contractor should allow a minimum of 10-12 weeks for testing of roofing products prior to the need to place roofing on structure. While testing is being done, the owner will not pay for any roofing materials stored on/off site.
7. The representatives of the Architect, Owner, the General Contractor, the Roofing Contractor, and Roofing Manufacturer's representative shall make inspections of the roofing system toward the end of the one (1) year warranty period and toward the end of the Roofing Contractor's two (2) year guarantee period. The Roofing Contractor or Roofing Systems Manufacturer, as applicable, shall make approved repairs and/or replacements covered by the Guarantee. The project will not be accepted until the Roofing Contractor's Guarantee, executed in strict accordance with the Contract Documents, have been submitted and accepted by the Architect and Owner. **(A sample of the total roof systems guarantee shall be submitted in shop drawings.)**
8. The roofing system product supplier shall furnish the Roofing Contractor with Material Safety Data Sheet/Sheets (MSDS), incorporating OSHA approved form, current edition. Said sheets shall be available at the site at all times until project completion.
9. **The Roofing Contractor shall submit to the Architect, in a ring binder, two copies of all roofing data, including manufacturer's catalogs/manuals of materials and accessories used in the Project for distribution to the Owner.**
10. Manufacturer Requirements. The primary roofing materials manufacturer shall provide direct trained company personnel to attend necessary job meetings, perform periodic inspections as necessary, and conduct a final inspection upon successful completion of the project.
11. Recommended Maintenance. In addition to the guarantee, the Contractor shall furnish to the Owner the Manufacturer's printed recommendations for proper

maintenance of the specified roof system including inspection frequencies, penetration addition policies, temporary repairs, and leak call procedures.

12. Roofing Guarantees

- a. Roofing Contractors two (2) year guarantee: Submit two executed copies of the Standard Roofing Contractors Association two (2) year "roofing guarantee" covering work of this section including roofing membrane, membrane flashing, roof insulation systems, vapor barriers, and roofing accessories, signed and countersigned by installer (roofer) and contractor. This roof systems guarantee shall be against leaks from faulty or defective materials and workmanship for an applicable period of two (2) years starting on the date of the Owner's acceptance of the project. The roofing contractor shall inspect the roof toward the end of the 2 yr. warranty period and follow procedures described in paragraph A.2.f. of this specification.
- b. Upon successful completion of the project, and after all post installation procedures have been completed, furnish the Owner with the roof system manufacturer's twenty (20) year labor and materials roof membrane system guarantee. The roof system guarantee shall include the roofing and flashing membranes, the specified rigid insulation, cover panel, insulation fasteners, and the metal edge fascia. All repairs or replacement costs covered under the guarantee shall be borne by the roofing membrane manufacturer. The guarantee shall be a term type, without deductibles or limitations on coverage amount, and be issued at no additional cost to the Owner. Specific items covered under the roof membrane system guarantee include:
- c. Roofing manufacturer's 20 unlimited guarantee: The following statement shall be printed on the back face of the manufacturer's guarantee and signed by the signatories of front side of the guarantee **verbatim** as stated below:
"Said guarantee shall be for the full twenty (20) year period with an unlimited penal sum (no dollar limit). Coverage of this guarantee shall include roof membrane, membrane/base flashing, roof insulation systems, specified. This guarantee shall not be prorated."
- d. NOTE: The executed guarantee shall be delivered to the Architect in three original counterparts prior to acceptance of the work. Final payment shall not be given until the written guarantee is furnished.
- e. Any interior wall and ceiling finishes damaged by failure to correct any problems in a timely fashion shall be paid by the roofing contractor and/or roofing manufacturer.

13. All roofing installation (including fastening of insulation and modified bitumen base sheet) over new 22 gauge galvanized 1-1/2 inch metal deck areas shall meet a minimum uplift design pressure of -45 psf for the field roof zone, -67.5 psf for the perimeter roof zone and -105 psf for the corners and UL Class A rating.

14. Perimeter edge systems shall be fabricated and installed by roofing contractor having a certification, as indicated in Part 2, Section K of the specification. The formed perimeter edge components shall meeting a maximum uplift design resistance of:

- a. Metal Edge Fascia: All perimeter metal fabrication and installation shall meet or exceed a horizontal design pressure for the perimeter 42 psf and for the corner 95 psf.

E. Submittals

1. Manufacturer's Specifications: Submit for approval two (2) copies of the manufacturer's specifications and details which shall be revised to suit the requirements of this section. The material shall not be ordered until the submittals have been approved. One (1) copy shall be kept at the jobsite at all times for use during construction.

2. Manufacturer's standard sample size for each of the following, as required by specifier.

Roof Membrane (Paradiene)
Surfacing Material (No.11 ceramic granule)
Roof Insulation (Paratherm)(Insulperm)
Plastic Cement (PA1021)
Insulation Fasteners (Parafast)
Primer (PA1125)
Base Flashing (Veral)
Surfacing Material
Flashing Cement (PA-828)
Base Flashing
Other Fasteners

F. Product Delivery, Storage and Handling

1. Delivery: Roofing material shall be delivered to the site in the manufacturer's unbroken containers and shall bear the manufacturer's printed labels. Labels for bitumen shall identify the material as specified.
2. Protection of Materials: Store all goods on end. Protect from moisture, vent polyethylene covers. Ventable covers (such as canvas) shall be used to protect all goods, (including insulation and rolled goods) while at jobsite.
3. Equipment: All equipment shall have rubber wheels and padded noses.

G. Job Conditions

1. If applicable do not execute the work of this section unless the owner's representative is present, or unless he directs that the work be performed during his absence.
2. Do not execute the work of this section unless the substrate is dry, free from debris and dust. Bring all conditions that would impair the work and performance of this section to the attention of the owner's representative prior to commencement.
3. All curbs, flashings and counter flashings, etc. shall be a minimum of **8" above the surface.**

PART 2 – PRODUCTS

2.1 Roof Type

A. Insulation Substrates

1. Rigid Roof Insulation: Roof insulation shall be UL and FM approved. Insulation shall be approved in writing by the insulation manufacturer for intended use and for use with the specified roof assembly. A minimum Thermal value of R-38 is required for all insulation. Maintain a maximum panel size of 4 feet by 8 feet.

2. Polyisocyanurate Flat Roof Insulation: Panels composed of a closed cell, rigid polyisocyanurate foam core material, integrally laminated between glass fiber facers, in full compliance with ASTM C 1289, Type II, Class 1, Grade 2. The bottom layer of flat insulation thickness shall be 3.0 inches and the top layer of flat insulation shall be 3.0 inches. Paratherm by Siplast.
 3. Polyisocyanurate Tapered Roof Insulation: **(ONLY FOR USE AS CRICKETS WHERE NECESSARY TO PROVIDE POSITIVE DRAINAGE)** Tapered panels and standard fill panels composed of a closed cell, rigid polyisocyanurate foam core material, integrally laminated between glass fiber facers, in full compliance with ASTM C 1289, Type II, Class 1, Grade 2. The tapered system shall provide for a roof slope to match structural slope of metal deck, with a minimum base layer and starting thickness to provide a minimum Thermal value of R-38. Tapered Paratherm by Siplast.
 4. Gypsum Sheathing Panel: A panel composed of a gypsum based, non-structural water-resistant core material integrally bonded with fiberglass mats on both sides having a nominal thickness of 1/2 inch. The panel surface shall be factory primed with a non-asphaltic primer. DensDeck Prime Gypsum Roof Board as provided by the roofing manufacturer.
- B. Cants and Tapered Edge Strips
1. Performed Fiberboard ASTM C208.
 2. Performed Tapered Fiberglass ASTM C726.
- C. Fasteners
1. Shall be approved by roofing system manufacturer. **All fasteners shall have a minimum of 30 cycles with 15% red rust in the Kesternich Chamber Test and be Factory Mutual Approved.**
 2. INSULATION FASTENERS. Base sheet fasteners shall be approved by FM and the manufacturer of the primary roofing products. Acceptable base sheet fasteners for specific substrate types are listed below.
 - a. PARAFast HEAVY DUTY FASTENERS/METAL PLATES
A fluorocarbon coated screw type fastener having a minimum 0.245 inch diameter thread. Plates used in conjunction with fastener shall be standard type having a minimum 3 inch diameter, as supplied by the fastener manufacturer.
- D. Roof Membrane
1. General
 - a. The roof membrane assembly shall consist of two (2) plies of a prefabricated homogeneous Styrene-Butadiene-Styrene (SBS) block copolymer modified asphalt membrane adhered to a prepared substrate. The assembly shall possess waterproofing capability, such that a phased roof application, with only the modified bitumen base ply in place, can be achieved for prolonged periods of time without detriment to the watertight integrity of the entire roof system. Each sheet of the roof assembly shall meet the following physical requirements as a minimum.
 2. Base and Finish Plies
 - a. Modified Bitumen Base Ply and Stripping Ply at Gravel Stop:
 1. Thickness: - 118 mils - 2.9 mm
 2. Weight (per 100 square feet) – 87.2 lbs – 4.3 kg/sq m
 3. Approvals - UL Class listed, FM Approved (products shall bear seals of approval)
 4. Elongation of base modified bitumen (%) - 1000+

5. Low temperature flexibility @ -18C (-0.4F) – PASS
6. Ultimate Elongation @ 73F MD 15%; XMD 25%
7. Reinforcement - fiberglass mat
Siplast Paratech Glass Base 3.0 TG, torch grade
- b. Modified Bitumen Finish Ply
 1. Thickness - 140 mils - 3.5 mm
 2. Weight (per 100 ft.2) – 107.1 lbs - 5.2 kg/sq. m
 3. Approvals - UL Class listed, FM Approved (products shall bear seals of approval)
 4. Elongation of base modified bitumen (%) - 1000+
 5. Low temperature flexibility @ -18C (0F) – PASS
 6. Ultimate Elongation @ 73F MD 25%; XMD 35%
 7. Reinforcement - fiberglass mat
 8. Surfacing – Bone White granules
Siplast Paratech Glass Cap FR TG, torch grade
- c. Reinforcing Ply - All curbed and cant areas shall consists of a minimum of **five** (5) plies of modified SBS membrane. At roof edges, a minimum of **three** (3) plies of modified SBS membrane shall be use. Same as roof system base ply

E. Flashing Membrane Assembly

1. General
 - a. The flashing membrane assembly shall consist of a prefabricated, fiberglass scrim-mat reinforced, Styrene-Butadiene-Styrene (SBS) block copolymer modified asphalt membrane with a continuous, channel-embossed metal-foil surfacing or prior approved equal.
2. Flashing and Reinforcing Plies
 - a. Metal Clad Flashing Sheet
 1. Thickness - 150 mils (min.) - 3.8 mm
 2. Weight (per 100 ft2) - 96 lbs - 4.6 kg/sq. m
 3. Approvals - UL Approved, FM Approved (products shall bear seals of approval)
 4. Elongation of base modified bitumen (%) - 1000+
 5. Peak Load
@ 73C – 85lbf/inch
@ 0C – 180lbf/inch
 6. Tear Strength 120lbf (0.54kN)
 7. Low temperature flexibility @ -18C (0F) – PASS
 8. Ultimate Elongation @ 73F 45%
 9. Reinforcement - fiberglass scrim/fiberglass mat composite
 10. Surfacing - aluminum metal foil
Siplast Veral Aluminum
 - b. Reinforcing Sheet
 1. Thickness: - 102 mils - 2.6 mm
 2. Weight (per 100 square feet) - 64 lbs - 3.1 kg/sq m
 3. Approvals - UL Class listed, FM Approved (products shall bear seals of approval)
 4. Elongation of base modified bitumen (%) - 1000+
 5. Low temperature flexibility @ -18C (-0.4F) – PASS
 6. Ultimate Elongation @ 73F 50%
 7. Reinforcement - fiberglass mat
Siplast Paratech Glass Base SA 2.5, self-adhered

F. CAULKING/SEALANTS. A single component elastomeric sealant that is moisture curing, non-slump designed for roof application where dynamic joint movement, adhering dissimilar materials, and excellent low temperature durability are required.

1. PS-209 elastomeric sealant by Siplast, Dallas, TX (800) 922-8800.

G. Pre-approved Roof Systems. The following roof systems are pre-approved.

1. Siplast, Inc.:
Base Ply: Paratech Glass Base 3.0 TG
Top Ply: Paratech Glass Cap FR TG
Flashing Top Ply: Veral Aluminum
2. MB Technology
Base Ply: Fastorch SBS FT120 GSA
Top Ply: Fireguard Fastorch FGFT 160 CWH
Flashing Top Ply: Metalflex SBS MF160 WAL
3. or prior approved equals

H. Bituminous Cutbacks

1. Plastic cement used as a base for setting metal flanges, shall be asphalt cutback, reinforced with non-asbestos fibers, conforming to ASTM D-4586 Type II and FED SPEC NO. SS-C-153, TYPE I requirements.
2. Asphalt primer shall consist of a high flash, quick drying, asphalt solvent blend which meets or exceeds ASTM D-41 requirements.

I. Preservative Treated Wood

1. General: Treated lumber and plywood where indicated as herein specified. Comply with applicable American Wood Preserver's Bureau (AWPB) requirements.
2. Provide construction grade lumber of the following species unless otherwise indicated:
 - a. Nailers and blocking: Douglas Fir, Hem-Fir, Idaho White Pine, or Southern Pine.
3. Complete fabrication of items to be treated to the greatest extent possible prior to treatment. Where items must be cut after treatment coat cut surfaces with heavy brush coat of same chemical used for treatment.
4. Inspect wood after treating and drying. Discard warped and twisted items.
5. Wood Treatment: Provide the following items with waterborne preservatives for above ground use, complying with AWPB LP-2 Kiln-dry wood to maximum moisture content of 15% after treatment:
 - a. Wood nailers, blocking, stripping and similar members in connection with roofing, flashing accessories and vapor barriers.

J. Flashing Application - Wood Surfaces.

1. Flashing Application: Cut the cant backing sheet into 12 inch widths and peel the release film from the back of the sheet. Set the sheet into place over the primed substrate extending 6 inches onto the field of the roof area and 6 inches up the vertical surface utilizing minimum 3 inch laps. Set the non-combustible cant into place dry prior to installation of the roof membrane base ply. Flash walls and curbs using the reinforcing sheet and the metal foil flashing membrane. After the base ply has been applied to the top of the cant, prime the base ply surfaces to receive the reinforcing sheet. Fully adhere the reinforcing sheet, utilizing minimum 3 inch side laps onto the primed base ply surface and up the primed wall or curb to the desired flashing height. After the final roofing ply has been applied to the top of the cant, prepare the surface area that is to receive flashing coverage by torch heating granular surfaces or by application of asphalt primer;

allowing primer to dry thoroughly. Torch apply the metal foil-faced flashing into place using three foot widths (cut off the end of roll) always lapping the factory selvage edge. Stagger the laps of the metal foil flashing layer from lap seams in the reinforcing layer. Extend the flashing sheet a minimum of 4 inches beyond the toe of the cant onto the prepared surface of the finished roof and up the wall or curb to the desired flashing height. Exert pressure on the flashing sheet during application to ensure complete contact with the vertical/horizontal surfaces, preventing air pockets; this can be accomplished by using a damp sponge or shop rag. Check and seal all loose laps and edges. Nail the top edge of the flashing on 9 inch centers. (See manufacturer's schematic for visual interpretation).

K. Perimeter Edge Systems

- A. In accordance with LA 2021 IBC, Chapter 15, Section 1504.5.6 and 1504.4.6.1 of the low slope modified bitumen metal edge securement, including gutters, shall be designed and installed for wind loads in accordance with Chapter 16, and be tested for resistance in accordance with Test Methods RE-1, RE-2 and RE-3 of ANSI/SPRI ES-1 and Test Methods G-1 and G2 of ANSI GT-1..
1. The installer of the low-slope modified bitumen perimeter metal system(s) shall provide third-party verification of compliance with ANSI/SPRI/FM 4435/ES-1 by a code-approved testing agency, such as, UL, Intertek or similar 3rd party Auditor.
 2. Color shall be selected by Architect.
 3. Material shall meet a minimum standard of 24 gauge galvanized steel (prefinished).

PART 3 - EXECUTION

- 3.1 Reference: The most current catalog edition published by the manufacturer of the selected roofing system shall be considered part of this specification and shall be referred to for more specific application procedures regarding roofing insulation, membrane and base flashing.
- 3.2 Preparation: (As applicable)
- A. Verify the metal deck surfaces are dry and reasonably smooth.
 - B. Use compatible materials necessary to render an acceptable surface.
 - C. Protect adjacent areas with tarpaulin or other durable materials.
 - D. All decks shall be constructed in accordance with the deck manufacturer's specifications.
 - E. Decking which is unsuitable to receive new roofing shall be replaced.
- 3.3 Nailers and Blocking:
- A. Provide nailers and blocking of nominal sizes indicated or of units built-up to dimensions indicated, on spacings shown.
 - B. Provide required items where indicated and where required for support or attachment of other work. Form to shapes indicated or required. Coordinate locations and cut and shim as required to provide items at true and level planes to receive work to be attached. Provide closure strips for nailers at all edges.
 - C. Attach to substrates as indicated; if not indicated, size and space fasteners as required to support applied loading. Maximum spacing of fasteners shall not exceed 12 inches.
- 3.4 Insulation (Metal Deck Field/Perimeter):

- A. Install insulation panels with end joints offset; edges of the panels shall be in moderate contact without forcing applied in strict accordance with the insulation manufacturer's requirements and the following instructions. Where insulation is installed in two or more layers, stagger joints between layers. Maintain a maximum panel size of 4 feet by 4 feet for insulation applied in insulation adhesive.
- B. Insulation - multiple layer: Mechanically attach the insulation layers simultaneously to the substrate, using the specified fasteners, at a rate of 1 fastener per 3.2 square feet of panel area (10 per 4' x 8' panel) in the field and at a rate of 1 fastener per 1.45 square feet of panel area (22 per 4' x 8' panel) in the perimeter and at a rate of 1 fastener per 1 square feet of panel area (32 per 4' x 8' panel). Stagger the panel joints between insulation layers.
- C. Tapered Edge at Transitions: Field-cut, shape and install tapered edge strip at transitions of 1/4 inch or greater between substrate components to provide a smooth transition and proper support for the subsequent insulation layer or membrane/flashing system components.

3.5 Roof Membrane Installation

- A. General
 - 1. Membrane Application: Application of roofing shall be in accordance with roofing system manufacturer's instructions and the following requirements. Application of roofing shall immediately follow application of insulation system and cover panel as a continuous operation.
- B. Roofing Application. All layers of roofing shall be laid free of wrinkles, creases or fishmouths. Sufficient pressure shall be exerted on the roll during application to ensure prevention of air pockets. Lap seams in the base ply layer should not coincide with the lap seams of the cap sheet layer. The courses should be staggered to ensure this.
 - 1. All layers of roofing shall be laid perpendicular to the slope of the deck.
 - 2. The base ply shall be fully bonded to the prepared substrate and shall have a minimum of three (3) inch side and end laps. Each sheet shall be applied directly behind the torch applicator.
 - 3. The cap sheet shall be bonded to the base ply and have a minimum of three (3) inch side and end laps. Each sheet shall be applied directly behind the torch applicator.
 - 4. Maximum sheet lengths and special fastening of the specified roof membrane system may be required at various slope increments where the roof deck slope exceeds one-half (1/2) inch per foot. The manufacturer shall provide acceptable sheet lengths and the required schedule for all roofing sheet applications to applicable roof slopes.

3.6 Protection of Roofing

- A. Upon completion of roofing work (including associated work) installer shall advise Contractor of recommended procedures for surveillance and protection of roofing during remainder of construction period. At end of construction period, or at a time when remaining construction work will in no way affect or endanger roofing (at Contractor's option), Installer shall make a final inspection of roofing and prepare a written report (to Contractor with copy to Architect) describing nature and extent of deterioration of damage found in the work.
 - 1. Installer shall repair or replace (as required) deteriorated or defective work found at time of final inspection. Installer shall be engaged by Contractor to repair damages to roofing which occurred subsequent to roofing installation and prior to final inspection. Repair or replace the roofing and associated work to a condition free of damage and deterioration at time of substantial completion.

3.7 Workmanship

- A. **In no case shall Contractor bid or install any component that would in any way void or alter the 20-year unlimited roofing membrane system guarantee.**
- B. NOTE: Use roof cavity filler at all areas that might not have a continuous slope for proper drainage or for voids over 1/4" wide.
- C. The Contractor will have to replace any roofing system that he damages during his contract.
- D. **Note: It is the responsibility of the Bidders to certify and verify that the product submitted meets the requirements of the Louisiana State Fire Marshal's Office.**
- E. Membrane system shall be in accordance with the Factory Mutual Approval guide and the manufacturer's approval report.
- F. Contractor shall be on manufacturer's approved list or certified list and shall submit verification of same at preliminary conference **with a letter from the manufacturer.**
- G. All roof penetrations, roof mounted equipment, etc. shall be flashed a minimum of 8" from top of roof surface.
- H. **All mechanical fasteners used under the roof system shall have a minimum of 30 cycles with 15% red rust in the Kesternich Chamber Test and be Factory Mutual Approved.**
- I. **These specifications, herein relative to manufacturers and applicators guarantee, shall be considered prime. The specified guarantee items shall govern over any manufacturers standard guarantee (warranty) items. A sample of the manufacturer's warranty or guarantee shall be submitted for approval and should contain the intent and/or the language above.**
- J. WATER CUT-OFF. At end of day's work, or when precipitation is imminent, construct a water cut-off at all open edges. Cut-offs can be built using asphalt or plastic cement and roofing felts, constructed to withstand protracted periods of service. Cut-offs must be completely removed prior to the resumption of roofing.

3.8 ROOF SYSTEM INTERFACE WITH RELATED COMPONENTS: The following is a list of verbal descriptions for correct installation of components integrated into the roof membrane assembly. In all cases, unless otherwise approved, incorporate flanged components into the system between the application of the base ply and the finish ply. The flange must be primed with a uniform coating of approved ASTM D 41-85 asphalt primer and allowed to dry thoroughly; all flanges must be set in approved mastic.

- A. EDGE METAL. Comply with specified requirement detailed in this Section 075200, Part 2, 2.1, K, A.
- B. Walktread: Cut the walktread into maximum 5 foot lengths and allow to relax until flat. Adhere the sheet using the specified plastic cement. Apply the specified cement in a 3/8 inch thickness to the back of the product in 5 inch by 5 inch spots in accordance with the pattern as supplied by the walktread manufacturer. Walk-in each sheet after application to ensure proper adhesion. Use a minimum spacing of 2 inches between sheets to allow for proper drainage.
- C. LEAD PIPE FLASHINGS. Completely prime the lead flanges and allow to dry prior to installation. After the base ply has been applied, set the flange in mastic and strip-in the flange using the stripping-ply material, extending a minimum of four (4) inches beyond the edge of the flange. Terminate the finish ply at the flange-sleeve juncture of the pipe flashing.
- D. LEAD DRAIN FLASHING. Completely prime the lead drain flashing and allow to dry prior to installation. After base ply been applied, set the lead flashing sheet in mastic and form to turn down inside of the drain bowl. Ply-in the perimeter of the lead flashing using an

additional layer of the base ply material, overlapping the perimeter of the lead a minimum of four (4) inches. Terminate the finish ply to extend beneath the clamping ring seal. Install the clamping ring with all clamps, bolts, etc., in place.

END OF SECTION 07 52 00

SECTION 07 60 00 - FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of sheet metal as shown on drawings and as specified in accordance with provisions of the contract documents and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.
- C. For additional information, refer to Section:
05 50 00 - Miscellaneous Metals
07 41 64 - Custom Sheet Metal Roofing
07 90 00 - Joint Sealants

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Expansion shields shall be lead bronze or equal NON-FERROUS METALLIC Alloy for a minimum screw length of 3/4.
- B. Caulking - (Refer to specification section 07 90 00) The appropriate manufacturer recommended sealant from Sonneborn, Pecora Corporation, GE, or Tremco shall be used on this project. Use the appropriate sealant recommended in use with the various materials applied to in this construction project. Also use the recommended sealant for applications in vertical or horizontal uses and in applications where the width of the joint, the elongation, curing time, etc., requires a specific sealant. Any special materials or application procedures, such as primers, curing materials, etc. that are recommended by the manufacturer for a proper installation shall be adhered to. **Important! At all asphaltic or bituminous materials, such as roofing materials, use the sealant recommended by the manufacturer of the roofing material and provider of roofing guarantee or the manufacturer of the bituminous material.** Colors are to be selected by Architect. Material must comply with Fed. Spec. TT-S-00230C, Type II, Class A; ASTM C-920, Type S, Grade NS, Class 25, Use NT, M, A. Backup material must be used to control the depth of sealant; use Sonofoam Backer-Rod or Sonofoam Soft Backer-Rod as supplied by Sonneborn or prior approved equal. Store material in strict accordance with the manufacturer's instructions.
- C. Screws, bolts, nails and accessories for fastening flashing - Galvanized. Minimum nail size is 12 stubs gauge, and of sufficient length to penetrate 7/8". Nails not in contact with metals may be galvanized or shereadized. All nails shall have large flat heads. All exposed fasteners shall be painted to match metal it is attaching.
- D. All flashing shall be the same material and gauge as indicated on drawings.
- E. All coil flat sheet metal and sheet metal fabrications shall be min. 24 gage, pre-coated, commercial quality, ASTM A653-15, Type SS, Grade 50, Class 1, G90 zinc-coated galvanized steel.
- F. All gutters, downspouts, fascia enclosures, and drip edge metal shall be the same material and gauge as indicated on drawings. (Refer to specification section 05 50 00 - Miscellaneous Metals for Extruded Aluminum Downspout Boots and section 07 61 13 - Standing Seam Sheet Metal Roofing for downspouts, gutters and other accessories)

- G. All steel gutter support brackets shall be **1-1/2" wide x 1/8" thick at 36" O.C. powder coated to match gutters.** Support brackets shall be shaped as required to tightly follow contours of gutters as indicated on the contract documents. Secure using stainless steel fasteners.
- H. If stainless steel is indicated in the Drawings, materials shall be Grade SS302 Polish or SS304 Polish.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. Fabricate metal flashing, trim, expansion joints, and similar items to comply with profiles, and sizes shown, and to comply with standard industry details as shown on SMACNA in the "Architectural Sheet Metal Manual".
- B. Comply with manufacturer's instructions and recommendations for handling and installation of flashing and sheet metal work.
- C. Performance - Coordinate flashing work with other work for the correct sequencing of items which make up the entire membrane or system of weatherproofing or waterproofing and rain drainage. It is required that the flashing and sheet metal work be permanently watertight and deteriorate in excess of manufacturer's published limitations.
- D. For non-moving seams provide soldered flap-lock seams except as otherwise indicated. Comply with metal producer's recommendations for timing, soldering and cleaning the joints.
- E. Provide for thermal expansion of all exposed sheet metal work exceeding 15'-0" running length.
- F. Provide for thermal expansion of 10'-0" maximum spacing, and 2'-0" from corners and intersections. Lap moving joints 2" in and seal with sealant.
- G. Conceal fasteners and expansion provisions wherever possible. Fold back edges on concealed side of exposed edges, to form a hem.
- H. Insert flashing into reglets minimum 1" as read. Anchor by mechanical means, including driven wedges of lead or other compatible metal, spaced 2'-0". Seal the joint with sealant.
- I. Separate aluminum work for dissimilar metals and from cementitious materials. Separate with a course of roofing felt where possible. **Apply 15-mil dry film thickness bituminous coating to either the substrate or aluminum where roofing felt cannot be used for separation.**
- J. Join the sheet metal using a flat locked seam or lapped, and expansion securely soldered joints. Make allowance at all joints for contraction. At exposed edges, sheet metal shall be hemmed and returned upon itself 1/2" for strength. At lap joints, make hems together so that one slides inside the other.
- K. At all flashing, copper joints shall be nailed with copper nails and soldered.
- L. All flashing joints shall have 4" wide joint cover that locks onto the flashing on the fascia drip edge and is nailed into the deck.
- M. All roof penetrations shall be flashed and sealed by this contractor. Refer to architectural for determining the complete scope of the work.
- N. Install sheet metal as detailed on drawings and as recommended by the Sheet Metal and Air Conditioning Contractors National Association, Inc., Architectural Sheet Metal Manual.

O. Protection of Aluminum from Dissimilar Materials

1. General - In addition to the coating specified, aluminum surfaces shall be prevented from direct contact with dissimilar materials as follows:
 - a. Dissimilar metals except stainless steel, white bronze, and solid zinc, shall be painted with a heavy brush or spray coat of zinc-chromate primer and one coat of aluminum paint; or shall be separated from the aluminum by a heavy coat of mastic caulking compound, or by a non-absorptive tape or gasket.
 - b. Dissimilar metals used in locations where drainage from them passes over aluminum shall be painted to prevent staining of aluminum.
 - c. Aluminum surfaces in contact with mortar, concrete, plaster, or other masonry materials shall be given one heavy brush coat of bituminous paint.
 - d. Aluminum surfaces in contact with wood, or other similar absorptive materials which may become repeatedly wet, shall be given two coats of aluminum metal and masonry paint, or one heavy brush coat of bituminous paint. In place of painting the aluminum, the Contractor shall have the option of painting the wood and other absorptive surfaces with two coats of aluminum house paint and sealing joints with caulking compound.

- P. Install all pre-manufactured aluminum components as recommended by the specified manufacturer.

END OF SECTION 07 60 00

SECTION 07 72 33 - ROOF HATCHES

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of roof hatch as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.
- C. For additional information, refer to section:
03 52 16 - Insulating Concrete Roof Decks
07 52 00 - Modified Bitumen Sheet Roofing

PART 2 - PRODUCTS

- 2.1 Roof Hatch: Shall be Type "S"-50 at exterior exposures and Type "S" -50 at interior exposures as manufactured by the Bilco Company or prior approved equal. (RE: Drawings for Locations)

- A. Sales Representative:
Flynn Building Specialties
P.O. Box 2275
Lafayette, LA 70502
Phone: 1-337-234-7594

2.2 Exterior Roof Hatches

- A. Cover and curb shall be 11 ga. aluminum mill finish for exterior roof hatches with 18 ga. curb and cover liner and 3" beaded flange and formed reinforcing members welded to support a minimum live load of 40 lb/ft². Hatch assembly shall be approved for use in high velocity hurricane zones with large and small missile impact resistance.

2.3 Interior Roof Hatches

- A. Cover and curb shall be 11 ga. aluminum for interior roof hatches with 18 ga. cover liner and 3" beaded flange and formed reinforcing members welded to support a minimum live load of 40 lb/ft².
- B. Size: Roof hatch shall be 3'-0" x 2'-6" and have a padlock hasp.

- 2.4 A ladder shall be provided for roof accessibility and shall be firmly anchored to wall and be appropriately sized. (Re: specifications section 05 50 00 - Miscellaneous Metals)

PART 3 - EXECUTION

3.1 Install roof hatch according to manufacturer's recommendations.

END OF SECTION 07 72 33

SECTION 07 72 46 - ROOF WALKWAYS

PART 1 - GENERAL

- 1.1 Furnish and install roof traffic pads as shown on plans and as indicated in the specifications.
- 1.2 Related items: Section 07 52 00

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Roof traffic pad shall be asphaltic panel of 3/4" thick (minimum) having a non-slip, waterproof top surface. Install roof traffic pads a minimum of 3 feet around the entire perimeter of each roof top kitchen hood exhaust unit, roof hatches and a 3 foot wide access route as indicated on plans.
 - 1. Pads shall be "Whitewalk", as manufactured by W.R. Meadows, Inc. (Fort Worth, Texas; Atlanta, Georgia) or
 - 2. Paratread 217 mils as manufactured by Siplast / Icopal Irving, TX (Phone 1-800-922-8800).
 - 3. Pad used must be compatible with roofing system.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in strict accordance with manufacturer's recommendations. All cuts shall be straight and square. Broken or damaged pads shall be replaced at no additional cost to the Owner.
- B. Provide 2" air gap between pads to allow for drainage. Pads shall follow the contour of the roof and shall fit snugly against the roofing material. Do not install over cants, expansion joints, drains or other roofing accessories.

END OF SECTION 07 42 46

SECTION 07 84 00 - FIRESTOPPING

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete of firestopping, smoke seals, and fireproofing as indicated on drawings and as well the following areas whether shown on the drawings or not.
- B. Drawings and General Provisions of this contract, bidding requirements, contract forms, and conditions of contract applicable requirements of Division 1 - General Requirements, govern this section.
- C. The General Contractor shall be required to have all firestopping on the job provided by a single source manufacturer for all trades. There shall be only one manufacturer of firestopping, which is a Fire Marshal requirement. The Contractor shall provide, at the Fire Marshal's walkthrough inspection, a copy of the specs on firestopping material used.

1.2 DESCRIPTION OF WORK

- A. Provide firestopping and smoke seals as indicated on the drawings as well as the following areas; including:
 - 1. Through-penetration firestopping fire-rated construction.
 - 2. Construction-gap firestopping at connections of the same or different materials in fire-rated construction.
 - 3. **Construction-gap firestopping occurring within fire-rated wall, floor or floor-ceiling assemblies.**
 - 4. Construction-gap firestopping occurring at the top of fire-rated walls.
 - 5. Through-penetration smoke-stopping in smoke partitions.
 - 6. Construction-gap smoke-stopping in smoke partitions.
 - 7. Around all ducts, pipes, and conduit openings in fire-rated construction (walls, floors and ceilings).
- B. Related Sections
 - 1. Coordinate all work of this section with the work of the following sections to properly execute the work in order to maintain the hourly ratings of the walls, ceilings, and floors where firestopping and smoke seals are applied:
 - a. 03 30 00 - Cast-In-Place Concrete
 - b. 04 21 13 - Brick Masonry
 - c. 04 22 00 - Concrete Unit Masonry
 - d. 09 21 16 - Gypsum Board Assemblies
 - e. Division 22, 23 and 26 Sections: Mechanical, Plumbing and Electrical Work

1.3 REFERENCES

- A. Underwriter's Laboratories
 - 1. U.L. Fire Resistance Directory
 - a. Through-penetration firestop devices (XHCR)

- b. Fire resistance ratings (BXUV)
 - c. Through-penetration firestop systems (XHEZ)
 - d. Fill, void, or cavity material (XHHW)
- 2. U.L. 1479 Test Method for Fire Tests of Through-Penetration Firestops, including optional air leak test.
- 3. U.L. Component Listing Test Criteria
- 4. Warnock Hersey
- B. American Society for Testing and Materials Standards:
 - 1. ASTM E 814 - 88: Standard Test Method for Fire Tests of Through-Penetration Firestops.
- C. CIE/DIN Age Testing

1.4 DEFINITIONS

- A. Assembly: Particular arrangement of materials specific to given type of construction described or detailed in referenced documents.
- B. Barriers: Time rated fire walls, smoke barrier walls, time rated ceiling/floor assemblies and structural floors.
- C. Firestopping: Methods and materials applied in penetrations and unprotected openings to limit spread of heat, fire, gasses, and smoke.
- D. Penetration: Opening or foreign material passing through or into barrier or structural floor such that full thickness of rated materials is not obtained.
- E. Construction Gaps: Gaps between adjacent sections of walls, exterior walls, at wall tops between top of wall and ceiling, and structural floors or roof decks; and gaps between adjacent sections of structural floors.
- F. System: Specific products and applications, classified and numbered by Underwriters Laboratories, Inc. to close specific barrier penetrations.
- G. Sleeve: Metal fabrication or pipe section extending through thickness of barrier and used to permanently guard penetration. Sleeves are described as part of penetrating system in other sections and may or may not be required.

1.5 SYSTEM DESCRIPTION

- A. Design Requirements
 - 1. Fire-rated construction: Maintain barrier and structural floor fire resistance ratings including resistance to cold smoke at all penetrations, connections with other surfaces or types of construction, at separations required to permit building movement and sound or vibration absorption, and at other construction gaps.
 - 2. Smoke barrier construction: Maintain barrier and structural floor resistance to cold smoke at all penetrations, connections with other surfaces and types of construction and at all separations required to permit building movement and sound or vibration absorption, and at other construction gaps.

1.6 SUBMITTALS

- A. Product data: Manufacturer's specifications and technical data including the following:

1. Detailed specification of construction and fabrication.
 2. Manufacturer's installation instructions.
- B. Shop drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, plus the following specific requirements.
1. Details of each proposed assembly identifying intended products and applicable UL System number, or UL classified devices.
 2. Manufacturer or manufacturer's representative shall provide qualified engineering judgements and drawings relating to non-standard applications as needed.
- C. Quality control submittals:
1. **Statement of qualifications**
- D. Applicator's qualifications statement:
1. **List past projects indicating required experience**

1.7 QUALITY ASSURANCE

- A. Fire stopping materials shall conform to both Flame (F) and Temperature (T) ratings as tested by nationally accepted test agencies per ASTM E-814 or UL 1479 fire tests. The F rating and T rating must be a minimum of one (1) hour but not less than the fire resistance rating of the assembly being penetrated.
- B. Installer's qualifications: Firm experience in installation or application of systems similar in complexity to those required for this project, plus the following:
1. Acceptable to or licensed by manufacturer, State or local authority.
 2. At least 2 years' experience with systems.
 3. Successfully completed at least 5 comparable scale projects using this system.
- C. Local and State regulatory requirements: Submit forms or acceptance for proposed assemblies not conforming to specific UL Firestop System numbers, or UL classified devices.
- D. Materials shall have been tested to provide fire rating at least equal to that of the construction.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Packing and shipping:
1. Deliver products in original, unopened packaging with legible manufacturer's identification. (Manufacturer's name, trade name, and UL label.)
 2. Coordinate delivery with scheduled installation date, allow minimum storage at site.
- B. Storage and protection: Store materials in a clean, dry, ventilated location. Protect from soiling, abuse, moisture, and freezing when required. Follow manufacturer's instructions.

1.9 PROJECT CONDITIONS

- A. Job Conditions:
 - 1. Verifying existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.
 - 2. Proceed with installation only after penetrations of the substrate and supporting brackets have been installed.
 - 3. Conform to manufacturer's printed instructions for installation and when applicable, curing in accordance with temperature and humidity.
- B. Environmental requirements:
 - 1. Furnish adequate ventilation if using solvent.
 - 2. Furnish forced air ventilation during installation if required by manufacturer.
 - 3. Keep flammable materials away from sparks or flame.
 - 4. Provide masking and drop clothes to prevent contamination of adjacent surfaces by firestopping materials.
 - 5. Comply with manufacturing recommendations for temperature and humidity conditions before, during and after installation of firestopping.

1.10 GUARANTEE

- A. Submit copies of written guarantee agreeing to repair or replace joint sealers which fail in joint adhesion, extrusion resistance, migration resistance, or general durability or appear to deteriorate in any other manner not clearly specified by submitted manufacturer's data as an inherent quality of the material for the exposure indicated. **The guarantee period shall be one year from date of substantial completion.**
- B. Firestop contractor shall warrant that firestopping systems used meet firestopping requirements as herein specified. All fire stopping must be in accordance to N.F.P.A. 101, 1997 Edition, United Laboratories Standards, Latest Edition.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Manufacturers
 - 1. 3M are protection products
 - 2. Bio Fireshield, Inc.
 - 3. Dow
 - 4. GE Silicones
 - 5. Hilti
 - 6. International Protective Coatings Corp.
 - 7. Sherwin Williams (Firetex FX5120 waterbased intumescent fireproofing)

NOTE: Prior approvals shall be reviewed as indicated in Article 3.3.2 of Instructions to Bidders.
- B. Through-Penetration Firestopping of Fire-Rated Construction shall meet ASTM E814:
 - 1. Systems or devices listed in the U.L. Fire Resistance Directory under categories XHCR and XHEZ may be used, providing that it conforms to the construction type, penetrant type, annular space requirements and fire rating involved in each separate instance, and that the system be symmetrical for wall applications. Systems or devices must be asbestos-free. Mortar systems must be Warnock Hersey approved.

2. Additional requirements: Withstand the passage of cold smoke either as an inherent property of the system, or by the use of a separate product included as a part of the U.L. system or device and designed to perform this function.
 3. Acceptable manufacturers and products:
 - a. Those listed in the U.L. Fire Resistance Directory for the U.L. System involved or Mortar systems approved by Warnock Hersey.
 4. All firestopping products must be from a single manufacturer. All trades shall use products from the same manufacturer.
- C. Construction-Gap Firestopping of Fire-Rated Construction
1. Firestopping at construction gaps between edges of floor slabs and exterior wall construction.
 2. Firestopping at construction gaps between tops of partitions and underside of structural systems.
 3. Firestopping at construction gaps between tops of partitions and underside of ceiling or ceiling assembly.
 4. Firestopping of control joints in fire-rated masonry partitions.
 5. Firestopping expansion joints.
 6. Acceptable manufacturers and products - those listed in the U.L. Fire Resistance Directory for U.L. System involved.
 7. Fire rated joint treatment systems shall meet ASTM E 1966.
- D. Smoke-Stopping at Smoke Partitions
1. Through-penetration smoke-stopping: Any system complying with the requirements for through-penetration firestopping in fire-rated construction, is acceptable, provided that the system includes the specified smoke seal or will provide a smoke seal.
 2. Construction-gap smoke-stopping: Any system complying with the requirements for construction-gap firestopping in fire-rated construction, is acceptable, provided that the system includes the specified smoke seal or will provide a smoke seal.

2.2 ACCESSORIES

- A. Fill, void or cavity materials: As classified under category XHHW in the U.L. Fire Resistance Directory.
- B. Forming materials: As classified under category XHKU in the U.L. Fire Resistance Directory.

PART 3 - EXECUTION

3.1 EXECUTION

- A. Examination
 1. Verification of conditions: examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

2. Verify barrier penetrations are properly sized and in suitable condition for application of materials.
 3. Do not proceed until unsatisfactory conditions have been corrected.
- B. Preparation
1. Clean surfaces to be in contact with penetration seal materials of dirt, grease, oil, loose materials, rust, or other substances that may affect proper fitting, adhesion, or the required fire resistance.
- C. Installation
1. Install penetration seal materials in accordance with printed instructions of the U.L. Fire Resistance Directory or Mortars per Warnock Hersey approval and in accordance with manufacturer's instruction.
 2. Seal holes or voids made by penetrations to ensure an effective smoke barrier.
 3. Where floor openings without penetrating items are more than four inches in width and subject to traffic or loading, install firestopping materials capable of supporting same loading as floor.
 4. Protect materials from damage on surfaces subject to traffic.
 5. Where large openings are created in walls or floors to permit installation of pipes, ducts, cable tray, bus duct or other items, close unused portions of opening with firestopping material tested for the application. See U.L. Fire Resistance Directory or Warnock Hersey approvals.
 6. Install smoke stopping as specified for firestopping.
 7. Where rated walls are constructed with horizontally continuous air space, double width masonry, or double stud frame construction, provide vertical, 12 inch wide fiber dams for full thickness and height of air cavity at maximum 15 foot intervals.
- D. Field Quality Control
1. Examine penetration sealed areas to ensure proper installation before concealing or enclosing areas.
 2. Keep areas of work accessible until inspection by applicable code authorities.
 3. Perform under this section patching and repairing of firestopping caused by cutting or penetration by other trades.
 4. All areas of work must be accessible until inspection by the applicable Code authorities.
 5. Correct unacceptable firestops and provide additional inspection to verify compliance with this specification at no additional cost.
 6. Submit data sheets on all proposed materials prior to installation. Upon completion, certify in writing all assemblies on job have been fire stopped in accordance to industry standards and submit data sheets and containers of materials installed on job.
- E. Adjusting and Cleaning

1. Clean up spills of liquid components.
2. Neatly cut and trim materials as required.
3. Remove equipment, materials, and debris, leaving area in undamaged, clean condition.

3.2 QUALIFICATIONS

- A. Installers of firestopping shall be manufacturer certified trained with a minimum of three years' experience installing firestop systems. The installers shall submit to the Architect their certification as part of shop drawings.

END OF SECTION 07 84 00

SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SCOPE

- A. The work to be done under this heading consists of furnishing all labor, and materials to caulk all opening frames, expansion joints, joints where masonry joins concrete, joints in architectural changes in materials and any other locations as shown on the drawings or requiring caulking. Installation of all sealant joints as required to provide a watertight exterior envelope.
- B. Joint preparation to receive sealant shall comply with these specifications unless the manufacturer's requirements exceed these specifications.

1.2 SUBMITTALS

- A. **Shop Drawings indicating the product name, number and manufacturer shall be submitted before any material is ordered. All sealants used on this project shall be indicated with the material that it is sealed to. A letter from the sealant manufacturer indicating the appropriateness of sealants and their recommended uses with various materials on this project shall be required. A sample tube of each type of sealant used on this project shall be submitted with shop drawings.**
- B. Submit letters from the sealant manufacturer stating that the contractor is pre-approved by the manufacturer for application of products for this specific project with anticipation of issuing the specified warranty at the completion of the project.
- C. Submit manufacturer's technical data for each joint sealer product required including instructions for joint preparation and joint sealer application. Submit data on cleaning materials, primers, and related products.
- D. Submit manufacturer's standard color samples showing full range of colors for each product exposed to view.
- E. Certificates: Submit certificates for manufacturer of joint sealer products attesting:
 - 1. That the manufacturer has reviewed this specification and that their products comply with these requirements and are suitable for the project purposes.
 - 2. That upon review of the product specifications, the manufacturer agrees with specified provisions for joint preparation and sealant application.
 - 3. That the manufacturer has visited the job site, has performed such tests as they deem necessary, and that the use of their products shall result in the issuance of the specified warranty.
- F. **Submit sample of sealant manufacturer's warranty to be supplied at completion of project.**
- G. Submit sealant manufacturer's guidelines for material storage.

1.3 QUALITY ASSURANCE

- A. Installation qualifications: Work shall be performed by a firm having not less that (5) years successful experience in comparable waterproofing projects, employing personnel skilled in the operations indicated.
- B. During the course of sealant work the contractor shall perform field adhesion tests in addition to testing performed by the manufacturer. Continuous testing shall be performed as scheduled by the manufacturer to allow issuance of the manufacturer's warranty.

- C. Single source responsibility for joint sealer materials: Obtain joint sealer materials from a single manufacturer for each different product required.
- D. Preconstruction field testing of sealants: Prior to installation of joint sealant, the contractor and manufacturer shall perform testing on actual substrates at the project site to determine the proper field preparation required to obtain optimum adhesion and compatibility on each different substrate condition. Manufacturers shall approve installation conditions and procedures in writing to the Contractor and Architect.
- E. Manufacturer's technical representative shall make an inspection of the Contractor's work at intervals required by the manufacturer to assure issuance of the manufacturer's warranty on completion of the project.

1.4 DELIVERY STORAGE AND HANDLING

- A. Deliver materials to the project site in original, unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi component material.
- B. Store and handle materials to prevent their deterioration or damage due to moisture, temperature change, contaminants, or other causes.

1.5 PROJECT CONDITIONS

- A. Environmental conditions: Do not proceed with installation of sealants when ambient and substrate temperature are outside the limits permitted by the joint sealer manufacturer, or when joint substrates are wet due to rain, snow, frost, condensation, or other causes.
- B. Joint width conditions: Do not proceed with installation of joint sealers when joint widths are less than those allowed by joint sealer manufacturer for the application required.

1.6 WARRANTY

- A. Manufacturers shall provide the owner a written warranty against leakage and defects in materials for a period of (10) years from the date of substantial completion. The warranty shall state that the manufacturer shall pay unrestricted costs for labor and materials to replace sealant joints that have failed due to faulty materials.
- B. Failure of materials and workmanship shall include, but are not limited to:
 - 1. Water penetration into the building
 - 2. Adhesive or cohesive failure of sealant
 - 3. Premature or abnormal deterioration of sealant material.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Compatibility: Provide joint sealers, joint fillers, and other related materials that are compatible with one another and with joint substrate under the conditions of service and applications and warranty by manufacturer.
- B. Colors: Provide color of joint sealer as selected by the architect. Available colors shall extend to all standard colors.
- C. EXTERIOR SEALANT: Use premium grade, high performance, two part, low-modulus, high-movement, fast-curing, moisture curing, silyl-terminated polyether or low modulus silicon, non-sag elastomeric sealant with + 100% movement capability and negative 50%

movement capability. Materials shall comply with ASTM-C-920, TYPE S, GRADE NS, CLASS 25, USE NT, M, A, G, AND O.

1. Use the appropriate sealant recommended in use with the various materials applied to in this construction project. Also use the recommended sealant for applications in vertical or horizontal uses and in applications where the width of the joint, the elongation, curing time, etc., requires a specific sealant. Any special materials or application procedures, such as primers, curing materials, etc. that are recommended by the manufacturer for a proper installation shall be adhered to.
 2. **Important! At all asphaltic or bituminous materials, such as roofing materials, use the sealant recommended by the manufacturer of the roofing material and provider of roofing guarantee or the manufacturer of the bituminous material.**
 3. **Important! At EIFS/stucco/plaster use the sealant recommended by the EIFS/stucco/plaster manufacturer or verify compatibility of materials in writing with EIFS/stucco/plaster manufacturer and provide this information to the Architect prior to installation. (This note to be used on projects with EIFS/stucco/plaster.)**
 4. **Acceptable Manufacturers:**
 - a. Subject compliance with single source materials for sealant products and warranty requirements manufacturers are as follows:
 1. Masterseal NP 150 sealant by BASF
 2. Pecora 890 NST by Pecora Corporation
 3. Prior approved equals.
- D. INTERIOR CAULKING MATERIAL: Shall be latex caulking compound as manufactured by Chaberslain, Monarch, Pecora, Sonneborn or approved equal.
- E. HORIZONTAL SEALANTS: At pitch pans and any other area of plans indicating pourable sealer, use Firestone's Rubber Guard Pourable Seal S-10 or self-leveling Sonneborn SL-1.

2.2 PREPARATION:

- A. Joint surfaces must be structurally sound, dry clean, free of dirt, moisture, loose particles, oil, grease, asphalt, tar, paint, wax, rust, release agents.
- B. Wipe joints surfaces clean with solvents or cleaner recommended by sealant manufacturer using clean cloths to eliminate residue.
- C. PRIMER - Where required, shall be used as recommended by manufacturer of sealant in writing to Architect, having been tested for staining and durability on samples of actual surfaces to be sealed.
 1. Do not thin primer apply at appropriate rate as indicated by manufacturer
 2. Allow primer to dry to a tack feel before applying sealant
 3. Sealant shall be installed the same day as primer
 4. Do not apply primer to backer rod or bond breaker tape
- D. BACKUP MATERIALS AND PERFORMED JOINT FILLERS - Shall be non-staining, compatible with sealant and primer, and of a resilient nature, such as closed cell resilient foam; or of a supporting type, such as closed cell rigid foam, cork or nonimpregnated fiberboard. Materials impregnated with oil, bitumen or similar materials shall not be used. Size and shape shall be as indicated by joint details in drawings. Sealant shall not adhere to backup materials and shall be as recommended by sealant manufacturer. Backer-Rod must be installed so as to maintain a suitable width to depth ratio as recommended by the manufacturer. Minimum joint width is 1/4". Minimum joint depth is 1/4".

- E. BOND BREAKERS - Where required, shall be as recommended by manufacturer of sealant.
- F. SOLVENTS, CLEANING AGENTS - And other accessory materials shall be as recommended by sealant manufacturer.

PART 3 - EXECUTION

3.1 WORKMANSHIP, INSTALLATION

- A. GENERAL - Use Contractors specializing in the application of sealants and apply in conformance with manufacturer's written directions.

Sealant subcontractor shall examine all other work and surfaces to receive the work of this section and report to the General Contractor all conditions not acceptable.

Apply sealant under pressure with power actuated gun or other appropriate means. Gun shall have nozzle of proper size and provide sufficient pressure to completely fill joints as detailed. All joint surfaces shall be neatly pointed or tooled to provide the contour as indicated drawings.

For application of sealant when air temperature is below 40 degrees F., consult sealant manufacturer for recommendations.

- B. PREPARATION - Thoroughly clean all joints, removing all foreign matter such as dust, oil, grease, water, surface dirt and frost. Sealant must be applied to the base surface; all old caulking material must be removed. Previously applied paint or primer must adhere permanently or be entirely removed.

Porous materials such as concrete, masonry, or stone should be cleaned where necessary by grinding, blast-cleaning, mechanical abrading, acid washing or combination of these methods as required to provide a clean, sound base surface for sealant adhesion:

1. Laitance shall be removed by grinding or mechanical abrading.
2. Form oils shall be removed by sandblast-cleaning.
3. Loose particles present or resulting from grinding, abrading, or blast-cleaning shall be removed by blowing out joints with compressed air, oil free, prior to application of primer or sealant.

Non-porous surfaces, such as metal and glass, shall be cleaned mechanically or chemically, protective coatings or metallic surfaces shall be removed by a solvent that leaves no residue. Solvent shall be used with clean, white cloths and wiped dry with clean, dry white cloths. Do not allow solvent to air dry without wiping. Joint areas protected with masking tape or strippable films shall be cleaned as above after removal of tape or film.

All joints to receive sealant shall be as indicated on drawings. Do not seal joints until they are in compliance with drawings or meet with the approval of the Architect.

1. Joints to receive sealant shall be minimum of 1/4" wide by 1/4" deep, unless otherwise approved.
2. For joints in concrete, masonry, or stone: Depth of sealant may be equal to the width in joints up to 1/2" wide. For joints 1/2 to 1 inch wide: Depth shall not be greater than 1/2 the applied sealant width. For joints exceeding 2" in width: Depth shall be as directed by sealant manufacturer.

3. For joints in metal, glass and other non-porous surfaces: Sealant depth shall be a minimum of $\frac{1}{2}$ the applied sealant width and shall in no case exceed the applied sealant width.

Joints to receive sealant, backup material or performed joint filler shall be cleaned out, raked to full width and depth as required.

Joints shall be of sufficient width and depth to accommodate specified backup material or performed joint filler and sealant. Concrete shall be fully cured and free of laitance, loose aggregate, mold release agents, curing compounds, water repellents, and other surface treatments. If surface treatments are present, test for adhesion before proceeding with sealant work.

- C. APPLICATION - Install backup material or joint filler, of type and size specified, at proper depth in joint to provide sealant dimensions as detailed. Backup material shall be of suitable size and shape so that when compressed (25 to 50%), it will fit in joints as required. Sealant shall not be applied without backup material and, if necessary, bond breaker strip. When using backup of hose or rod stock, roll the material into the joint to avoid lengthwise stretching. Hose or rod stock shall not be twisted or braided. Use specified bond breaker strip between sealant and supporting type backup material. Bond breaker strip shall be used in all joints where sufficient room backup does not exist.

Apply masking tape, where required, in continuous strips in alignment with joint edge. Remove tape immediately after joints have been sealed and tooled as directed.

Prime surfaces, where required, with primer as recommended by sealant manufacturer.

Follow sealant manufacturer's instructions regarding mixing, surface preparation, priming, application life, and application procedure.

- D. TOOLING:

1. Tool joints to required configuration in accordance with manufacturer's recommendations.
2. Completed sealant application shall resemble an extruded product.
3. Use tools of proper widths to coordinate with each individual joint width at project site.
4. Tooling Non-Sag Sealant:
 - a. Immediately after sealant application and prior to time skinning or curing begins, tool sealant to a smooth, uniform bead of required configuration.
 - b. Eliminate air pockets and ensure contact and adhesion with the bond line at sides of joint.
 - c. Remove excess sealant from surfaces adjacent to joint.
 - d. Do not use tooling tools or procedures which discolor sealant or adjacent surfaces or affect sealant curing/adhesion. Use procedures approved by sealant manufacturer.
 - e. Protect fresh sealant from impact and dust until surface sets.

- E. CLEANING: Clean adjacent surfaces free of sealant or soiling resulting from this work as work progresses. Use solvent or cleaning agent as recommended by sealant manufacturer. All finished work shall be left in a neat, clean condition.

END OF SECTION 07 92 00

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Related Sections:
 - 1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
 - 2. Division 08 Section "Flush Wood Doors".
 - 3. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
 - 4. Division 08 Section "Door Hardware".
 - 5. Division 08 Section "Access Control Hardware".
 - 6. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.
- B. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
 - 2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
 - 3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
 - 4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
 - 5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
 - 6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
 - 7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
 - 9. ANSI/BHMA A156.15 - Hardware Preparation in Steel Doors and Frames.
 - 10. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
 - 11. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
 - 12. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
 - 13. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
 - 14. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
 - 15. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.
- B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.
- C. Shop Drawings: Include the following:

1. Elevations of each door design.
 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 4. Locations of reinforcement and preparations for hardware.
 5. Details of anchorages, joints, field splices, and connections.
 6. Details of accessories.
 7. Details of moldings, removable stops, and glazing.
 8. Details of conduit and preparations for power, signal, and control systems.
- D. Samples for Verification:
1. Samples are only required by request of the architect and for manufactures that are not current members of the Steel Door Institute.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.
- B. Quality Standard: In addition to requirements specified, comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".
- C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 (neutral pressure at 40" above sill) or UL 10C.
1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
 2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
 3. Smoke Control Door Assemblies: Comply with NFPA 105.
 - a. Smoke "S" Label: Doors to bear "S" label and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.
- D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.
- E. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.
- F. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.
 - 1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
- B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. MANUFACTURERS

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CECO Door Products.
 - b. Curries Company.
 - c. Steelcraft.

B. MATERIALS

- 1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- 2. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- 3. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. STANDARD HOLLOW METAL DOORS

- 1. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.
- 2. Exterior Doors: Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

- a. Design: Flush panel.
 - b. Core Construction: Manufacturer's standard polystyrene. Where indicated, provide doors fabricated as thermal-rated assemblies with a minimum R-value 11 or better.
 - c. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
 - d. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
 - e. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
 - f. Doors to be labeled for wind load pressure requirements and supplied as a unit with frames and appropriate hardware.
3. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
- a. Design: Flush panel.
 - b. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.
 - 1. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
 - c. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
 - d. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
 - e. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
4. Manufacturer's Basis of Design:
- a. CECO Door Products Legion Series.
 - b. Curries Company 707 Series.

D. STANDARD HOLLOW METAL FRAMES

- 1. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- 2. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.
 - a. Fabricate frames with mitered or coped corners.
 - b. Fabricate frames, with "closed and tight" miter seams continuously welded on face, finished smooth with no visible seam unless otherwise indicated.
 - c. Frames for Level 3 Steel Doors (up to 48 inches in width): Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.
 - d. Frames for Level 3 Steel Doors (48 inches and up in width): Minimum 12 gauge (0.081-inch -2.7-mm) thick steel sheet.
 - e. Frames for Level 2 Steel Doors: Minimum 18 gauge (0.053-inch -1.3-mm) thick steel sheet.
 - f. Exterior frames are to be labeled for wind load (+/-60) by an independent testing agency such as Underwriters Laboratories (UL) or Intertek (WHI). They shall be furnished as a unit with doors.
 - g. Manufacturer's Basis of Design:

1. CECO Door Products SQ/SU/SR Series
 2. Curries Company M/G Series.
3. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.
 - a. Fabricate frames with mitered or coped corners.
 - b. Fabricate frames with "closed and tight" miter seams continuously welded on face, finished smooth with no visible seam unless otherwise indicated.
 - c. Frames for Level 2 Steel Doors: Minimum 18 gauge (0.053-inch -1.3-mm) thick steel sheet.
 - d. Frames for Level 3 Steel Doors (up to 48 inches in width): Minimum 18 gauge (0.053-inch -1.3-mm) thick steel sheet.
 - e. Frames for Level 3 Steel Doors (48 inches and up in width): Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.
 - f. Frames for Wood Doors: Minimum 18 gauge (0.053-inch-1.3-mm-) thick steel sheet.
 - g. Frames for Borrowed Lights: Minimum 18 gauge (0.053-inch-1.3-mm-) thick steel sheet.
 - h. Manufacturer's Basis of Design:
 1. CECO Door Products BQ/BU/DQ/DU/BR/DR Series (Drywall Profile).
 2. CECO Door Products SQ/SU/SR Series (Masonry Profile).
 3. Curries Company C/CM/CG Series (Drywall Profile).
 4. Curries Company M/G Series (Masonry Profile).
 4. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.
 5. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

E. FRAME ANCHORS

1. Jamb Anchors:
 - a. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
 - b. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.
 - c. Windstorm Opening Anchors: Types as tested and required for indicated wall types to meet specified wind load design criteria.
 - d. FEMA 361 Storm Shelter Anchors: Masonry T-shaped, wire masonry type, or existing opening type anchors.
 - e. Offset frame anchors shall be provided where indicated in details.
2. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.
3. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

F. HOLLOW METAL PANELS

1. Provide hollow metal panels of same materials, construction, and finish as specified for adjoining hollow metal work.

G. LOUVERS

1. Metal Louvers: Door manufacturer's standard metal louvers unless otherwise indicated.
 - a. Blade Type: Vision proof inverted V or inverted Y.
 - b. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.
2. Louvers for Fire Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire protection rating of 1-1/2 hours and less.
 - a. Manufacturers: Subject to compliance with requirements, provide door manufacturers standard louver to meet rating indicated.
 - b. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

H. LIGHT OPENINGS AND GLAZING

1. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.
2. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.
3. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.
4. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.
5. Glazing: Comply with requirements in Division 08 Section "Glazing" and with the hollow metal door manufacturer's written instructions.
 - a. Factory Glazing: Factory install glazing in doors as indicated. Doors with factory installed glass to include all of the required glazing material.

I. ACCESSORIES

1. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
2. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

J. FABRICATION

1. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.
2. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

3. Hollow Metal Doors:
 - a. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
 - b. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
 - c. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
 - d. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".

4. Hollow Metal Frames:
 - a. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - b. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 - c. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.
 1. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 - d. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
 - e. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
 - f. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
 - g. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
 - h. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 - i. Jamb Anchors: Provide number and spacing of anchors as follows:
 1. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - a. Two anchors per jamb up to 60 inches high.
 - b. Three anchors per jamb from 60 to 90 inches high.
 - c. Four anchors per jamb from 90 to 120 inches high.
 - d. Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
 2. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - a. Three anchors per jamb up to 60 inches high.
 - b. Four anchors per jamb from 60 to 90 inches high.
 - c. Five anchors per jamb from 90 to 96 inches high.
 - d. Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.

- e. Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
 - j. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
5. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
- a. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 - b. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
 - c. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
 - d. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

K. STEEL FINISHES

- 1. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.
 - a. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness.
- C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.
 - 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
 - 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
 - 4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
 - 1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
 - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat and Painted Finish Touch-up: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touch-up of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

END OF SECTION 08 11 13

SECTION 08 14 00 - WOOD DOORS

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete of Wood Doors as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, and complete installation shall be furnished and installed as part of this work.
- C. Related Documents
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- D. Related Sections
 - 1. Section 08 11 13 - Hollow Metal Doors and Frames
 - 2. Section 08 71 00 - Door Hardware
 - 3. Section 08 80 00 - Glazing
 - 4. Section 09 91 00 - Painting
- E. Standards and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A208.1 – Wood Particleboard. Intertek Testing Service (ITS Warnock Hersey) - Certification Listings for Fire Doors.
 - 2. NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
 - 3. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
 - 4. UL 10C - Positive Pressure Fire Tests of Door Assemblies; UL 1784 - Standard for Air Leakage Tests of Door Assemblies.
 - 5. Window and Door Manufacturers Association - WDMA I.S.1-A Architectural Wood Flush Doors.
 - 6. Current State Approved International Building Code (IBC)

1.2 SUBMITTALS

- A. Shop drawings: Submit schedules indicating door elevations and sections, door sizes, construction, thickness, door swing, label, stile and rail dimensions, veneers, undercuts, storage and erection details, applicable hardware blocking, locations of finish hardware by dimension and locations/details of all openings and louvers. Do not proceed with any fabrication until all details are approved. Dimension and detail openings for glass lites, louvers, and grills. Shop drawings shall indicate location, size and hand of each door; elevation of each kind of door; construction details not covered in product data; location and extent of hardware blocking; and other pertinent data.
 - 1. Indicate dimensions and locations of mortises and holes for hardware.
 - 2. Indicate dimensions and locations of cutouts.
 - 3. Indicate requirements for veneer matching.
 - 4. Indicate doors to be factory finished and finish requirements.
 - 5. Indicate fire protection ratings for fire doors.
- B. Certification of compliance; Submit any information necessary to indicate compliance to all of these specifications as requested.
- C. Submit samples of veneer and door construction.

1. Furnish three corner samples, 8" x 10" in the veneer specified showing door faces and edges and the construction of each door type for approval.
 - a. Provide samples for each species of veneer and solid lumber required.
 - b. Finish veneer faced door samples with same materials proposed for factory finished doors.
 - c. Frames for light openings, 6 inches long, for each material, type, and finish required.
 2. For factory pre-finished doors furnish three veneer samples of the veneer specified depicting color range to establish color variation allowed. Factory finish shall be applied to actual door face materials, approximately 8" x 10", for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finish work. Furnish samples in finish selected by Architect.
- D. All labeled fire door assemblies to be of a type which have been classified and listed in accordance with the latest edition of ANSI/NFPA 80 and tested in compliance with: NFPA-252, UL-10B, and UBC-7-2. A physical label to be permanently affixed to the fire door at an authorized facility. Furthermore, all 'A', 'B' and 'C' label fire doors are to have manufacturer's standard laminated stiles for improved screw holding and split resistance capabilities.
- E. Submit manufacturer's product description showing compliance with the specifications, along with finishing instructions, installation instructions, and any general recommendations manufacturer may have for the care and maintenance of each door type.

1.3 QUALITY ASSURANCE

- A. Wood door supplier to be a qualified direct distributor of products to be furnished. In addition, the distributor is to have in their regular employment an A.H.C./C.D.C. or person of equivalent experience who is to be made available at reasonable times to consult with the Architect, Contractor and/or Owner regarding any matters affecting the wood doors in this project.
- B. Source Limitations: Obtain flush wood doors through one source from a single manufacturer wherever possible.
- C. Provide doors meeting or exceeding the minimum standards as set forth by the following organizations unless standards are modified or exceeded by this specification.
 1. Architectural Woodwork Institution (AWI), Section 1300 and 1500.
National Wood Window & Door Association, (NWWDA) IS-1 Series.
National Fire Protection Association (NFPA)
- D. Fire Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing at positive pressure according to NFPA 252 (neutral pressure at 40" above sill) or UL 10C (neutral pressure testing according to UL 10B where specified).
 1. Smoke Control Door Assemblies: Comply with NFPA 105.
 - a. Smoke "S" Label: Doors to bear "S" label and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.
 2. Blocking: When through-bolts are not to be used, indicate size and location of blocking in 45, 60 and 90 minute mineral core doors.
- E. All doors shall be the product of the same manufacturer to insure uniformity of quality and appearance throughout the project.
- F. Fire doors shall bear labels approved by Underwriters Laboratories, Inc. or Warnock Hersey International. Any discrepancies between the architectural drawings and the

procedures and limitations as set forth by the testing agencies shall be brought to the attention of the Architect.

- G. Provide each fire rated door with a label permanently attached to the hinge side of the door, showing testing agency approval for classification scheduled.
- H. The top of each door shall bear a label from the manufacturer indicating the door construction, face veneer species, cut and grade. If the doors are factory finished the label shall also have the finishing information.
- I. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for receiving, handling, and installing flush wood doors.
- J. The door manufacturer shall provide a letter, signed by an authorized company representative, to the Architect stating that the doors have been manufactured in compliance with this specification.

1.4 COORDINATION

- A. Contractor shall be responsible for coordination and acquiring of all necessary information from hardware and frame suppliers. Door manufacturer shall be responsible for coordinating this information in order that doors be properly prepared to receive hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect doors during transit, storage and handling to help prevent damage, soiling and deterioration.
- B. Comply with manufacturer's instructions and with "on-site care" requirements of NWWDA I.S.1-A section G-20 "Care and Installation at Job Site."
- C. Deliver pre-finished components in manufacturer's original unopened protective covering or container, clearly marked with manufacturer's name, brand name and identifying number on the covering.
- D. Do not walk or stack other materials on top of stacked doors. Do not drag doors across one another.
- E. For all doors not factory finished - seal all four edges (stiles and rails) immediately after delivery.
- F. Doors shall be palletized at factory in stacks of no more than thirty doors per pallet. Doors edges shall be protected with heavy corner guards. Factory finished doors shall be individually wrapped in poly bags.
 - 1. Contractor shall provide a dry, weatherproof, storage area having a controlled temperature and humidity range between 30 and 60 percent. Stack doors flat and off the floor, supported to prevent warpage. Protect doors from damage and direct sunlight.
 - 2. Do not walk or place other material on top of stacked doors. Do not drag doors across one another. Contractor shall use all means necessary to protect doors from damage prior to, during, and after installation. All damaged doors shall be replaced by the Contractor at no cost to the Owner.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and HVAC system is operating

and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Delamination in any degree.
 - b. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - c. Telegraphing of stile, rail or core through face to cause surface variation in excess of 1/100 inch (.25) in any 3 inch (76.2) span.
 - d. Telegraphing of core construction and delaminating of face in decorative laminate-faced doors.
 - e. Any defect which may, in any way, impair or affect performance of the door for the purpose which it is intended.
 - f. Replacement under this warranty shall include hanging, installation of hardware, and finishing.
 2. When hanging doors, do not subject them to extremes of heat and/or humid conditions. Relative humidity shall not be less than 30% nor more than 60%.
 3. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.
 4. Warranty Period for Solid Core Interior Doors: Warranty to be in effect starting from substantial completion for the life of the original installation. Life of installation according to manufacturer's written warranty.
 5. Doors must be stored, finished, hung and maintained per manufacturer's recommendations set forth in their full door warranty.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. DOOR CONSTRUCTION – GENERAL

1. WDMA I.S.1-A Performance Grade: Extra Heavy Duty; Aesthetic Grade: Premium.
2. Fire Rated Doors: Provide construction and core specified above as needed to provide fire ratings indicated.
 - a. Category A Edge Construction: Provide 45, 60 and 90 minute fire rated doors edge construction with intumescent seals concealed by outer stile (Category A). Comply with specified requirements for exposed edges.
 - b. Pairs: Provide fire retardant stiles that are listed and labeled for applications indicated without formed steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
 1. Where required or specified, provide formed steel edges and astragals with intumescent seals. Finish steel edges and astragals with baked enamel.

B. CORE CONSTRUCTION

1. Particleboard Core Doors:
 - a. Particleboard: Wood fiber based materials complying with ANSI A208.1 Particleboard standard. Grade LD-2.
 - b. Adhesive: Fully bonded construction using Polyurethane (PUR) glue.
 - c. Blocking: When through-bolted hardware is not used, provide wood blocking in particleboard core doors as follows:
 1. 5-inch (125-mm) top-rail blocking, in doors indicated to have closers.

2. 5-inch (125-mm) mid-rail blocking, in doors indicated to have exit devices.
 - a. Optional Cores for Blocking: Provide doors with either glued-wood-stave or structural-composite-lumber core instead of particleboard core for doors indicated to receive closers and exit devices.
- d. Basis of Design:
 1. Graham: PC, PC5
 2. Approved Equals
 - a. Assa Abloy – Education Series Wooden Doors
2. Mineral Core Doors:
 - a. Core: Non-combustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire protection rating indicated.
 - b. Blocking: Provide composite blocking with improved screw holding capability approved for use in doors of fire protection ratings indicated as needed to eliminate through-bolting hardware.
 - c. Edge Construction: At hinge stiles, provide laminated edge construction with improved screw holding capability and split resistance. Comply with specified requirements for exposed edges.
 - d. Basis of Design: Graham FD.
 - e. Approved Equals
 - a. Assa Abloy – Education Series Wooden Doors

C. VENEERED DOORS FOR TRANSPARENT FINISH

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Assa Abloy: Education Series Wooden Doors
 - b. Graham: GPD
 - c. Marshfield: Signature
2. Interior Solid Core Doors:
 - a. Grade: Premium
 - b. Faces: Veneer grades as noted below; veneer minimum 1/50-inch (0.5mm) thickness at moisture content of 12% or less.
 1. Plain Sliced Clear Maple Mill grade faces.
 - c. Match between Veneer Leaves: Book match.
 - d. Assembly of Veneer Leaves on Door Faces:
 1. Running Match.
 - e. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
 - f. Room Match: Match door faces within each separate room or area of building. Corridor door faces do not need to match where they are separated by 10 feet or more.
 - g. Transom Match: Continuous match.
 - h. Vertical Edges: Matching same species as faces. Wood or composite material, one piece, laminated, or veneered. Minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors.
 - i. Horizontal Edges: Solid wood or structural coamposite material meeting the minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors
 - j. Construction: Five plies. Stiles and rails are bonded to core, then entire unit sanded before applying face veneers.
 - k. At doors over 40% of the face cut-out for lights and or louvers, furnish engineered composite lumber core.

D. LIGHT FRAMES AND GLAZING

1. Metal Frames for Light Openings in all Doors: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and shall also be approved for use in doors of fire protection rating indicated.
2. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with the flush wood door manufacturer's written instructions.

E. FABRICATION

1. Factory fit doors to suit frame opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
 - a. Comply with requirements in NFPA 80 for fire rated doors.
2. Factory machine doors for hardware that is not surface applied. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
 - a. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
 - b. Metal Astragals: Factory machine astragals and formed steel edges for hardware for pairs of fire rated doors.
3. Openings: Cut and trim openings through doors in factory.
 - a. Light Openings: Trim openings with moldings of material and profile indicated.
 - b. Glazing: Comply with applicable requirements in Division 08 Section "Glazing."
 - c. Louvers: Factory install louvers in prepared openings.
4. Electrical Raceways: Provide flush wood doors receiving electrified hardware with concealed wiring harness and standardized Molex™ plug connectors on both ends to accommodate up to twelve wires. Coordinate connectors on end of the wiring harness to plug directly into the electrified hardware and the through wire transfer hardware or wiring harness specified in hardware sets in Division 08 "Door Hardware". Wire nut connections are not acceptable.

F. FACTORY FINISHING

1. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - a. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
2. Transparent Finish: Provide a clear protective coating over the wood veneer allowing the natural color and grain of the selected wood species to provide the appearance specified. Stain is applied to the wood surface underneath the transparent finish to add color and design flexibility.
 - a. Grade: Premium.
 - b. Finish: Meet or exceed WDMA I.S. 1A TR6 Catalyzed Polyurethane finish performance requirements.
 - c. Staining: As selected by Architect from manufacturer's full range.
 - d. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXECUTION

A. EXAMINATION

1. Examine doors and installed door frames before hanging doors.
 - a. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - b. Reject doors with defects.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

B. INSTALLATION

1. Hardware: For installation, see Division 8 Section "Door Hardware."
2. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
 - a. Install fire rated doors in corresponding fire rated frames according to NFPA 80.
3. Factory Fitted Doors: Align in frames for uniform clearance at each edge.
4. Factory Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

C. ADJUSTING

1. Operation: Re-hang or replace doors that do not swing or operate freely.
2. Finished Doors: Replace doors that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08 14 00

SECTION 08 31 13 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of access doors and frames as shown on drawings and as specified in accordance with provisions of the contract documents and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.
- C. For additional information, refer to section:
 - 05 40 00 - Cold Formed Metal Framing
 - 05 50 00 - Metal Fabrications
 - 09 21 16 - Gypsum Board Assemblies
 - 09 91 00 - Painting

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Ceiling Access Doors: Shall be Nystrom non-rated access doors, Nystrom Architectural N Series or prior approved equal.
 - 1. Door: Fabricate from 14-gage cold rolled sheet steel.
 - 2. Frame: Fabricate from 16-gage cold rolled sheet steel. Provide 1/4 inch mounting holes and easy install tabs. Frame to include 1 inch flange at perimeter.
 - 3. Hinge: Concealed spring button type to allow for door removal.
 - 4. Latching/Locking Devices: Key operated cylinder cam lock with 2 keys per lock, keyed alike.
 - 5. Finish: White baked on powder coat finish.
 - 6. Size: Ceiling Access Doors shall be 2'-0" x 2'-0".
 - 7. Location: Exact Location of access doors shall be coordinated during construction with the Architect. **One (1) ceiling access door shall be located in each of the following rooms: #24 Girls Restroom, #25 Boys Restroom.**

2.2 FABRICATION

- A. Manufacture each access panel assembly as an integral unit ready for installation.
- B. Welded construction: Furnish with a sufficient quantity of 1/4 inch mounting holes to secure access panels to types of supports indicated.
- C. Recessed panel: Form face of panel to provide specified recess for application of finish material. Reinforce panel as required to prevent buckling.
- D. Furnish number of latches required to hold door in flush, smooth plane while closed.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Verify that rough openings for door and frame are correctly sized and located.
- B. Verify mechanical and electrical requirements for ceiling or wall access panels.

3.2 INSTALLATION:

- A. Install access door and frame units per manufacturer's written instructions.
- B. Install frames plumb and level in opening. Secure rigidly in place.
- C. Position Units to provide convenient access to concealed work requiring access.

3.3 ADJUSTING AND CLEANING:

- A. Adjust panel after installation for proper operation.
- B. Remove and replace panels or frames that are warped, bowed, or damaged.

END OF SECTION 08 31 13

SECTION 08 41 00 - ENTRANCES AND STOREFRONT

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete of Aluminum Entrances and Storefronts (includes fixed windows) as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.
- B. This Section includes Tubelite aluminum storefront and all components and installation accessories supplied with the system: 2" x 4-1/2"
 - 1. T14000 Storefront (thermal)
- C. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, and complete installation shall be furnished and installed as part of this work.

1.2 SUMMARY

- A. Related Documents: Conditions of the Contract, Division 1 - General requirements and drawings apply to work of this section.
- B. Single Manufacture: All products in sections listed below shall be supplied by a single manufacturer. To ensure consistency in quality, warranty, finish, and product compatibility, products supplied by different manufacturers are not acceptable.
 - 1. Section 08 44 13 - Glazed Aluminum Curtainwalls
- C. Section Includes:
 - 1. Storefront system, complete with reinforcing, fasteners, anchors, and attachment devices.
 - 2. Accessories necessary to complete work.
- D. Related Sections:
 - 1. Section 05 50 00 - Miscellaneous Metals
 - 2. Section 06 10 00 - Rough Carpentry
 - 3. Section 07 92 00 - Joint Sealers
 - 4. Section 08 71 00 - Finish Hardware
 - 5. Section 08 80 00 - Glass and Glazing

1.3 REFERENCES

- A. Aluminum Association (AA):
 - 1. DAF-45 -- Designation System for Aluminum Finishes.
- B. American Architectural Manufacturers Association (AAMA):
 - 1. 501 - Methods of Test for Exterior Walls.
 - 2. 501.2 -- Field Check of Metal Curtain Walls for Water Leakage
 - 3. 611 - Voluntary Specification for Anodized Architectural Aluminum.
 - 4. 701 - Voluntary Specifications for Pile Weatherstripping and Replaceable Fenestration Weatherseals.
 - 5. CW-10 - Care and Handling of Architectural Aluminum From Shop to Site.
 - 6. SFM1 - Aluminum Storefront and Entrance Manual.
- C. American National Standards Institute (ANSI):
 - 1. A117.1 -- Safety Standards for the Handicapped
 - 2. Z97.1 -- Safety Glazing Materials used in Buildings - Safety Performance Specifications and Methods of Test

- D. American Society for Testing and Materials (ASTM):
 - 1. A36 Structural Steel
 - 2. A123 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 - 3. B209 – Aluminum and Aluminum - Alloy Sheet and Plate
 - 4. B221 – Aluminum - Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
 - 5. B308 – Aluminum - Alloy 6061 - T6 Standard Structural Shapes, Rolled or Extruded
 - 6. E283 – Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors
 - 7. E330 – Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference
 - 8. E331 – Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference
- E. Federal Specifications (FS):
 - 1. TT-P-641G(1) – Primer Coating, Zinc Dust-Zinc Oxide (For Galvanized Surfaces)
 - 2. TT-P-645A – Primer, Paint, Zinc Chromate, Alkyd Type
- F. Steel Structures Painting Council (SSPC):
 - 1. Paint 12 – Cold-Applied Asphalt Mastic (Extra Thick Film)

1.4 SYSTEM REQUIREMENTS

- A. Design Requirements:
 - 1. Drawings are diagrammatic and do not purport to identify nor solve problems of thermal or structural movement, glazing, anchorage, or moisture disposal.
 - 2. Requirements shown by details are intended to establish basic dimension of units, sight lines and profiles of members.
 - 3. Provide concealed fastening.
 - 4. Provide entrance and storefront systems, including necessary modifications, to meet specified requirements and maintaining visual design concepts.
 - 5. Attachment considerations are to take into account site peculiarities and expansion and contraction movements so there is no possibility of loosening, weakening or fracturing connection between units and building structure or between units themselves.
 - 6. Provide for expansion and contraction due to structural movement without detriment to appearance or performance.
 - 7. Framing systems shall accommodate expansion and contraction movement due to surface temperature differentials of 180 degrees F without causing buckling, stress on glass, failure of joint seals, excessive stress on structural elements, reduction of performance, or other detrimental effects.
- B. Administrative Requirements:
 - 1. Coordinate with installation of other components that comprise the exterior enclosure.
 - 2. Pre-installation Meeting: Attendees shall be Owner's Representative, Architect, General Contractor, Storefront Manufacturer's Representative, Storefront Installer and installers whose work interfaces with storefront and glazing.
 - 3. Agenda:
 - a. Review and finalize construction schedule.
 - b. Review code and project performance compliance documentation and testing requirements including product certification for energy (U-value, SHGC), condensation, ADA, acoustics, etc.
 - c. Review product specific mockups and field testing requirements.
 - d. Verify availability of materials, installer's personnel, equipment, and facilities required to maintain schedule.
 - e. Review means and methods related to installation, including manufacturer's written instructions.

- f. Examine support conditions for compliance with requirements including alignment and attachment to structural members.
 - g. Review flashings, membrane interface with storefront, wall penetrations, openings, and conditions of other construction affecting this Work.
 - h. Review temporary protection requirements for during and after installation of this Work.
- C. Performance Requirements:
 - 1. **Wind loads:** All Codes and standards adopted by the State of Louisiana shall be adhered to. The system shall be designed to meet or exceed the wind load requirements set forth by the current International Building Code (IBC) to resist 138 M.P.H. Vult wind zone pressures.
 - 2. **Air infiltration:** Air leakage through fixed light areas of storefront shall not exceed 0.06 cfm per square foot of surface area when tested in accordance with ASTM E283 at differential static pressure of 6.24 psf.
 - 3. **Water infiltration:** No uncontrolled leakage when tested in accordance with ASTM E331 at test pressure of 10 psf as defined in AAMA 501.
 - 4. **Structural Performance at design loads:** System to withstand +/- 30 psf when tested per ASTM E330. Maximum allowable deflection of L/175 of the clear span for spans up to 13'-6" or L/240 of clear spans plus 1/4" for spans greater than 13'-6" or an amount that restricts edge deflection of individual glazing lites of glass to 3/4" whichever is smaller.
 - 5. **Structural Performance at 1.5x design loads:** System to withstand +/- 45 psf when tested per ASTM E330. There shall be no permanent deformation of main frame members in excess on 0.2% of its clear span, glass breakage, or permanent damage to fasteners or anchors.
 - 6. **Interstory Differential Horizontal Movement per AAMA 501.4.** 3 cycles, 0.75" left, back to zero, 0.75" right, back to zero (one complete cycle)
 - 7. **Seismic Horizontal Movement at 1.5x design displacement per AAMA 501.4.** 3 cycles, 3" left, back to zero, 3" right, back to zero (one complete cycle). There shall be no glass breakage, permanent damage to frame members or anchors.
 - 8. **Acoustic Performance:** The system shall have a sound transmission class (STC) and an outdoor-indoor transmission class (OITC) rating when tested per ASTM E90 and ASTM E1332. Coordinate performance with 08 80 00 Glazing. 1" glazing, STC(32), OITC (26). Test results using glass-only values are not acceptable.
 - 9. Framing systems shall accommodate expansion and contraction movement due to surface temperature differentials of 180°F without causing buckling, stress on glass, failure of joint seals, excessive stress on structural elements, reduction of performance, or other detrimental effects.
 - 10. Ensure doors function normally within limits of specified temperature range.
 - 11. **Thermal Requirements:** System shall be designed and constructed to achieve a minimum U-Factor of **0.40**, in accordance with industry standards and energy efficiency requirements of the state of Louisiana. The system shall comply with all applicable building codes and thermal performance criteria.

1.5 SUBMITTALS

- A. General: Submit in accordance with the following:
- B. Product Data:
 - 1. Submit manufacturer's descriptive literature and product specifications for each specified system.
 - 2. Components within assembly, including material descriptions, component profiles, finishes, anchorage and fasteners, glazing, and internal drainage. Include information for factory finishes, hardware, accessories, and other required components.
- C. Shop Drawings:

1. Submit shop drawings covering fabrication, installation and finish of specified systems. Shop drawings shall be prepared by a qualified engineering service under the employ of the window wall manufacturer or installer.
 2. Include following:
 - a. Fully dimensioned plans, framed opening requirements and tolerances, expansion and contraction joint locations and details, field welding required with locations and elevations with detail coordination keys.
 - b. Locations of exposed fasteners and joints.
 3. Provide detailed drawings of:
 - a. Composite members.
 - b. Joint connections for framing systems and for entrance doors.
 - c. Anchorage.
 - d. System reinforcements.
 - e. System expansion and contraction provisions.
 - f. Glazing methods and accessories along with flashing, internal drainage, joinery, and provisions for thermal expansion.
 - g. Internal sealant requirements.
 - h. For design data, submit framing member structural and physical characteristics, with engineering calculations and dimensional limitations.
 4. Schedule of finishes.
- D. Samples:
1. For system components, submit corner samples, anchors, fasteners, trim, and other materials as requested by the architect.
 2. For the finish, submit two (2) aluminum sheet stock samples, 2" x 3" for each finish type showing quality of finish.
 3. If texture or color variations occur, include additional samples illustrating range of variation to be expected.
 4. Submit samples for each type of glass, 12 x 12 inch size.
- E. Test Reports:
1. Standard Systems: Submit certified copies of previous test reports substantiating performance of system in lieu of retesting. Include other supportive data as necessary.
- F. Manufacturer's Instructions: Submit manufacturer's printed installation instructions.
- G. For the **warranty**, submit manufacturer sample warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

- A. Single Source Responsibility:
1. To ensure quality of appearance and performance, obtain the storefront and all products listed in Section 1.2 from a single manufacturer.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with at least **Twenty (20) years of documented experience**.
- C. Designer Qualifications: Design structural support framing components under direct supervision of a **Professional Structural Engineer experienced in design of this Work and licensed in the State that the Project is located**.
- D. Installer Qualifications: Certified in writing by system manufacturer as qualified for performing work of this section with at least **five (5) years of documented installation experience**.
- E. Perform work in accordance with AAMA SFM-1 and manufacturer's written instructions.
- F. Conform to requirements of ANSI A117.1 and local amendments.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Materials to be packed, loaded, shipped, unloaded, stored and protected in accordance with AAMA CW-10. Protect finished surfaces as necessary to prevent damage.
- B. Do not use adhesive papers or sprayed coatings, which become firmly bonded to aluminum when exposed to sun.
- C. Do not leave coating residue on any surfaces.
- D. Replace damaged units.

1.8 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of this Work to be performed according to manufacturer's installation instructions and warranty requirements.
- B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before fabrication of storefront framing and indicate measurements on Shop Drawings.
- C. Install sealant according to sealant manufacturer guidelines.
- D. Coordinate installation with other applicable trades.

1.9 WARRANTY

- A. Provide written warranty in form acceptable to Owner jointly signed by manufacturer, installer and contractor warranting work to be watertight, free from defective materials, defective workmanship, glass breakage due to defective design, and agreeing to replace components which fail within **One (1) year from date of Substantial Completion**.
- B. Manufacturer Aluminum Storefront Framing Warranty: Manufacturer agrees to replace defective storefront components for a period of **two (2) years from the date of Substantial Completion**. Warranty shall also cover the following:
 - 1. Complete watertight and airtight system installation within specified tolerances.
 - 2. System is structurally sound and free from distortion.
- C. Finish Warranty: Warranty covers factory-applied anodic finishes on exposed extruded aluminum surfaces without standing water accumulation, against peeling, checking, cracking, chalking and change of color, per applicable AAMA specifications.
 - 1. Clear Anodized Coatings - AAMA 611 Class I: 5 years

PART 2 - PRODUCTS

2.1 Manufacturers and Products

- A. Subject to compliance with requirements indicated, provide products by (All products listed below shall meet the standards set forth in this specification.):
 - 1. Tubelite Inc., Walker, Michigan
 - 2. Oldcastle Building Envelope, Terrell, TX.
 - 3. Kawneer Company, Inc., Norcross, GA.
 - 4. or prior approved equal
- B. Substitutions: Submit under provisions of Section 01 33 24 a minimum of 7 days prior to bid date and include the following:
 - 1. Submittal information shall include test reports as specified in performance sections.

2. Copy of manufacturer's warranty.
 3. Any additional information as requested
 4. System details and samples.
- C. Basis of Design: Aluminum Framed Storefront:
1. Tubelite Inc T14000 Series Storefront: 2" x 4-1/2", thermally insulated (exterior).
 - a. Series T14000 - 2" x 4-1/2' thermally insulated accommodates 1" glazing with 1/4" outside layers as an option or laminated safety glass depending on location. (refer to drawings and Section 08 80 00 - Glazing)
 2. Tubelite Series 4500 Storefront: 1-3/4" x 4-1/2" Flush Glazed System (Interior), center set glazing using 1/4" laminated safety glass throughout interior spaces of building. (refer to drawings and Section 08 80 00 - Glazing)
 3. Tubelite - ForceFront Storm Wide Stile aluminum entry door with 1" laminated insulating glass. Door to be hurricane rated per ASTM E1996, ASTM E1886, TAS 201 and TAS 203 with C, D, and E large missile options. All other glazing adjacent to ForceFront storefront door shall be 1" laminated-insulating glass. Bottom rail and mid-rail shall be 10". Thresholds shall be ADA accessible and equipped with bulb weather seal gaskets to meet building code air infiltration requirements. (Refer to Drawings, Specification Section 08 80 00 - Glazing along with Specification Section 08 71 00 - Door Hardware. The Aluminum Frame Storefront Contractor shall not bid door hardware. Glazing Contractor is responsible for installing hardware.)
 4. Or equivalent Kawneer System, Oldcastle Building Envelope or prior approved equal.

2.2 ALUMINUM FRAMED STOREFRONT

- A. Aluminum Framed Storefront: Factory or field fabricated, field glazed, factory finished aluminum, screw spline construction with infill and related flashings, anchorage and attachment devices.
1. System dimensions: 2" x 4-1/2"
 - a. Primary Mullions: 2"
 - b. Depth: 4-1/2"
 - c. Corner mullions: 90 degree inside and outside corners as indicated in Contract Documents
 2. Glazing:
 - a. Position: Center of system
 - b. Thickness: 1" insulated
 - c. Method: Captured and retained with gaskets on all four sides
 3. T14000 thermal barriers
 - a. Standard: Thermally Broken
 1. Primary frames: Pour-debridge
 2. Vertical snap-in filler: Polyamide strut.
 3. PVC filler at head and sill

2.3 FINISHES

- A. Finish all exposed areas of aluminum storefront components in accordance with applicable AAMA Voluntary Finish Guide Specifications:
1. Color: Clear anodized
 2. Specification and designation: Conforming to AAMA 611 specification and AA-M10C21A41 designation.
 3. Description: Class I - Clear anodized coating Eco-friendly etch (0.7 mils thick min.)

2.4 MATERIALS

- A. Aluminum Extrusions:
 - 1. ASTM B221, alloy 6063-T6 or 6063-T5 for extrusions; Aluminum extrusions shall be extruded within commercial tolerances and free from defects that impair strength and/or durability.
- B. Primary extruded framing members shall be a minimum thickness of 0.075" thick.
- C. Extruded or formed trim components shall be a minimum 0.060" thick.
- D. Exposed Flashings where indicated on drawings: 0.0625" thick aluminum sheet; finish matching framing members.
- E. Structural Steel Reinforcement and anchors necessary to meet the performance requirements of 1.2.
 - 1. ASTM A36/A36M; Galvanized steel per ASTM A123/A123M.
 - 2. Where galvanizing is not compatible with alloy of component parts, apply heavy coating of epoxy paint where necessary to prevent galvanic action with dissimilar materials.
- F. Galvanizing Repair Paint: High zinc content paint for over welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight and in compliance with SSPC Paint 20.
- G. Bituminous Paint: Cold applied asphalt mastic, containing no asbestos fibers.
- H. Thermal Break:
 - 1. Pour and debridge thermal barrier shall be a two part chemically curing polyurethane casting resin poured in place specified. Thermal barrier extrusion pour cavities shall be mechanically lanced or azo-braded to secure the thermal break material.
 - 2. Continuous extruded polyamide with 25% glass fiber reinforcing, mechanically crimped into cross-knurled cavities at vertical filler extrusion.
- I. Glazing and Sealant material:
 - 1. Setting blocks and Edge Blocking: Provide in sizes and locations recommended by GANA Glazing Manual. Setting blocks used in conjunction with soft-coat low-e glass shall be silicone.
 - 2. Glazing gaskets shall be EPDM, weather-resistant, and compatible with all materials in contact.
 - 3. All sealants shall comply with applicable provisions of AAMA 800 and/or Federal Specifications FS-TT-001 and 002 Series.
 - 4. Frame joinery sealants shall be suitable for application specified and as tested and approved by the window wall manufacturer.
 - 5. Refer to Section 08 80 00 - Glazing for glass and glazing accessories.

2.5 FABRICATION

- A. Ensure joints and corners are flush, hairline and weatherproof, accurately fitted and secured.
 - 1. Prepare framework to receive anchors and hardware.
 - 2. Conceal fasteners and attachments from view.
 - 3. Reinforce framework as required for imposed loads.
- B. Expansion and Contraction: Fabricate to allow for thermal movement of materials when subjected to project temperature differential requirements.

- C. System Internal Drainage: Drain to exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
 - 1. Fabricate drainage system so weeps and flashings are integral to system and others are not required.
- D. Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
- E. Provide for membrane interface as indicated on drawings.

2.6 COMPONENTS

- A. Glass
 - 1. Provide in accordance with Section 08 80 00 - Glazing.
- B. Glazing
 - 1. Glazing method shall be in accordance with manufacturer's installation instruction and the GANA Glazing Manual for specified glass type, or as approved by the glass fabricator.
 - 2. Provide in accordance with Section 08 80 00 - Glazing.

PART 3 - EXECUTION

3.1 VERIFICATION OF CONDITIONS

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of this Work.
- B. Notify Contractor in writing, with a copy sent to Owner and Architect, of any conditions detrimental to proper and timely completion of this Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Start of this Work shall indicate acceptance of areas and conditions as satisfactory by the Installer.

3.2 INSTALLATION

- A. Preparation: Coordinate and furnish anchors, concrete inserts, sleeves, anchor bolts, and other accessories to be embedded in concrete or masonry construction or welded to structural steel. Coordinate delivery of these items to project site.
- B. Install aluminum storefront framing in accordance with manufacturer's installation instructions, reviewed product data, approved shop drawings, and as indicated on Drawings.
- C. Do not install damaged components.
- D. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- E. Provide alignment attachments and shims to permanently fasten system to building structure.
- F. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- G. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

- H. Coordinate attachment and seal of membrane materials per drawings.
- I. Install accessories with positive anchorage to building, weather tight mounting, provisions for thermal expansion, and coordinate installation with flashings and other components.
- J. Install hardware using templates provided.
 - 1. Refer to Section 08 71 00 - Door Hardware.
- K. Install glass in accordance with Section 08 80 00 - Glazing, using glazing method required to achieve performance criteria.
- L. Install perimeter sealant in accordance with Section 07 92 00 - Joint Sealants.
- M. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.
- N. Adjust operating hardware for smooth operation.
- O. Tolerances:
 - 1. Maximum variation from plumb: 1/16" every 3' non-cumulative, or 1/16" per 10', whichever is least.
 - 2. Maximum Misalignment of two adjoining members abutting in plane: 1/32"

3.3 CLEANING

- A. Comply with AANA 609 and 610 for methods, equipment, and materials to clean finished aluminum after installation and for subsequent periodic maintenance.
- B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths.
- C. Take care to remove dirt from corners, and wipe surfaces clean.
- D. Remove excess sealant from glass and aluminum by method acceptable to sealant and finish manufacturer.

3.4 PROTECTION

- A. Protect installed products from damage during subsequent construction.
- B. Protect anodized finishes from prolonged exposure to alkaline, such as lime in masonry mortar, or acidic and other corrosive materials.

3.5 ADJUSTING

- A. Test door operating functions. Adjust closing and latching speeds and other hardware in accordance with manufacturer's instructions to ensure smooth operation.

END OF SECTION 08 41 00

SECTION 08 52 00 – ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SCOPE

- A. The contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of Aluminum Windows as shown on drawings and as specified in accordance with provisions of the contract documents and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.

1.2 SECTION INCLUDES

- A. Refer to all project drawings and other sections of this specification to determine the type and extent of work therein affecting the work of this section, whether such work is specifically mentioned herein.
- B. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of thermal insulated windows. Peerless products are listed in this specification to establish a standard of quality. Any substitutions to this specification shall be submitted to and receive approval from the Architect at least 10 days before bidding. Proof of equality shall be borne by the submitter.
- C. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, and complete installation shall be furnished and installed as part of this work.
- D. Fixed Window Units - ENERGSAVE Architectural
 - 1. Peerless G641 Fixed Thermal Aluminum Windows
 - 2. Peerless G661 Left Hand Casement Inswing Thermal Aluminum Windows

1.3 Related Sections

- A. Section 07 92 00 - Joint Sealants

1.4 References

- A. AAMA - American Architectural Manufacturers Association:
 - 1. AAMA/ WDMA/CSA 101/I.S.2/ A440-08 "Standard/Specification for windows, doors, and unit skylights".
 - 2. AAMA 502-12 "Voluntary Specification for Field Testing of Newly Installed Fenestration Products".
 - 3. AAMA 901-10 "Voluntary Specification for Rotary & Linear Operators in Window Applications".
 - 4. AAMA 904-09 "Voluntary Specification for Multi-bar Hinges in Window Applications".
 - 5. AAMA 910-10 "Voluntary - Life Cycle- Specifications and Test Methods for AW Class Architectural Windows and Doors".
 - 6. AAMA 1503-09 "Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors, and Glazed Wall Sections".
 - 7. AAMA 2605-13 "Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels"

8. AAMA CW-10-12 "Care and Handling of Architectural Aluminum from Shop to Site"
 9. AAMA 513-12 "Standard Laboratory Test Method for Determination of Forces and Motions Required to Activate Operable Parts of CW and AW Class Operable Windows, Sliding Glass Doors and Terrace Doors in Accessible Spaces"
- B. ASTM International:
1. ASTM E90-09 "Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements".
 2. ASTM E283-12 "Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen".
 3. ASTM E330-14 "Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights, and Curtain Walls by Uniform Static Air Pressure Difference".
 4. ASTM E331-09 "Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference".
 5. ASTM E547-09 "Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Differential".
 6. ASTM E2190-10 "Standard Specification for Insulating Glass Unit Performance and Evaluation".
 7. ASTM F588-07 "Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact".
- C. IGCC - Insulating Glass Certification Council:
- D. NFRC - National Fenestration Rating Council:
1. NFRC 100-2014 "Procedure for Determining Fenestration Product U Factors".
 2. NFRC 102-2014 "Procedure for Measuring the Steady-State Thermal Transmittance of Fenestration Systems".
- E. SGCC - Safety Glazing Certification Council:
1. ANSI Z97.1-09 "American National Standard for Safety Glazing Materials used in Buildings - Safety Performance Specifications and Methods of Test".
 2. 16 CFR 1201 "Consumer Product Safety Commission Safety Standard for Architectural Glazing Materials - codified at Title 16, Part 1201 of the Code of Federal Regulations 2011 Edition".

1.5 Submittals

- A. Product Data: test reports or waiver from an AAMA accredited laboratory; manufacturer's specifications.
- B. Shop Drawings: Window location chart; typical window elevations; details of assemblies, hardware and glazing details for units glazed by the window manufacturer.
- C. Samples: each specified finish for aluminum; other samples as requested.

1.6 Quality Assurance

- A. Installer Qualifications: Skilled craftspeople who have demonstrated a successful history of installing windows for five years.
- B. Product Requirements:
 1. Acceptance will be by addendum only as no verbal approval will be allowed.
 2. Submit bid on prequalified products in Prebid written addendum. Bidder must identify manufacturer and model of product on which the bid is based.

3. Furnish a valid AAMA "Authorization for Product Certification" or waiver indicating that the windows for the project conform to AAMA/WDMA/CSA 101/I.S.2/A440-08.
 4. Furnish visible, permanent SGCC certification labels indicating conformance with ANSI Z97.1-09 and/or 16 CFR 1201 on tempered glass lites, if included on the project, and laminated glass lites, if included on the project.
 5. Furnish visible, permanent IGCC certification labels indicating compliance with ASTM E 2190-10 on the insulating glass units.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
1. Finish areas designated by Architect.
 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by the Architect.
 3. Refinish mock-up area as required to produce acceptable work.
- 1.7 Delivery, Storage and Handling
- A. Store Products in manufacturer's unopened packaging until ready for installation.
- B. Handle and protect windows and accessories in accordance with AAMA CW-10-15 until project completion.
- 1.8 Project Conditions
- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside the manufacturer's absolute limits.
- 1.9 Warranty
- A. Manufacturer's Warranties:
1. Windows: Manufacturer shall warrant for one year against defects in material and workmanship under normal use.
 2. Insulating Glass Units: Glass manufacturer shall warrant seal for ten years against visual obstruction from film formation or moisture collection between internal glass surfaces, excluding that caused by glass breakage or abuse.
 3. Powder Paint Finish: Finish conforming to AAMA 2605 shall be warranted for twenty years against checking, cracking, chalking, or fading.
 4. Powder Paint Finish: Finish conforming to AAMA 2604 shall be warranted for twenty years against checking, cracking, chalking, or fading.

PART 2 - PRODUCTS

2.1 Manufacturers

- A. Acceptable Manufacturer:
1. Peerless Products, Inc., which is located at: 2403 S. Main St.; Ft. Scott, KS 66701; Toll Free Tel: 866-420-4000; Tel: 620-223-4610; Fax: 620-224-3107; Email: request info (dereks@peerlessproducts.com)
 2. Kawneer Company Inc; Located at 555 Guthridge Court, Norcross, GA 30092; Tel: 770-449-5555
- B. Substitutions: Not permitted after the bid.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01 33 24 – Substitutions

2.2 CASEMENT WINDOW UNITS – ENERGSAVE ARCHITECTURAL

- A. Product: Peerless G661 Left Hand Casement Inswing Thermal Aluminum Window.
1. AAMA Certification: Conformance with C-AW100.
- B. Casement Inswing Configuration:
1. Vent hinged at the jamb and pulls in to open.
 2. Vent-to-vent with a vertical integral mullion in one master frame; vent hinged at the jamb and pulls in to open.
 3. Vent-to-fixed with a vertical integral mullion in one master frame; vent hinged at the jamb and pulls in to open.
 4. Vent-under-fixed with a horizontal integral mullion in one master frame; vent hinged at the jamb and pulls in to open.
 5. Vent-over-fixed with a horizontal integral mullion in one master frame; vent hinged at the jamb and pulls in to open.
- C. Construction:
1. Aluminum Extrusions: Extruded by the window manufacturer from commercial quality 6063-T5 alloy; free from defects impairing strength and durability.
 2. Frame: Double tubular head, sill, and jambs miter cut and fastened with two Zamac corner gussets per corner; double tubular integral mullion, if required, fastened with two Zamac gussets per frame member without penetrating the frame member with fasteners; corners sealed by the window manufacturer with sealant conforming to AAMA 800-10.
 3. Vents: Double tubular horizontal and vertical vent rails and stiles miter cut and fastened with two zamac corner gussets per corner; corners sealed by window manufacturer with sealant conforming to AAMA 800-10.
 4. Water control: continuous compression gasket within the internal frame to utilize pressure equalization and to allow water to drain by gravity through exterior covered weep slots covered with weep flaps and weep hoods finished to match window.
 5. Window Frame: Extruded aluminum with integral structural thermal break installed by the window manufacturer in the frame and vent members; exterior and interior finishes applied by the window manufacturer; frames and vents assembled by the window manufacturer.
 - a. Frame Depth: 3-1/4 inches (83 mm).
 6. Thermal Break: The thermal break separating the exterior and interior aluminum extrusions shall be a mechanical crimp-in-place system utilizing multi-directional glass fiber reinforced polyamide nylon struts with locking mechanical connections to the aluminum extrusions. The thermal break shall not be compromised by hardware or metal fasteners.
 7. Glazing: exterior ExxonMobil Santoprene foam gasket; 1 inch (25 mm) insulating glass; two weep holes under each glass pocket for drainage; foam backer rod and silicone heel bead forming an internal seal; interior Santoprene bulb gasket threaded into aluminum glazing beads; glazed by the window manufacturer.
 8. Weatherstrip: secured in extruded ports; Santoprene seals conforming to AAMA 702-11; flap seal single row mounted on the vent interior on the bottom rail, top rail, and stiles; center vent gasket seal single internal row mounted on the head, sill and jamb frame members.
 9. Hardware: Mounted in concealed extruded grooves to avoid penetrating frame or vent members with fasteners; two concealed stainless steel hinges conforming to AAMA 904-09 per vent to rotate the vent on vertical axis;
 - a. One single-action ADA long handle with multiple point locks per vent, painted to match the finish of the window.
- D. Performance:
1. Air Infiltration: Not to exceed the standard of maximum 0.1 cfm/square foot when tested per ASTM E283-12 at a static air pressure difference of 6.24 psf.
 2. Water Penetration: No uncontrolled water leakage when tested per ASTM E331-09 and ASTM E547-09 at a static air pressure difference of 15 psf.

3. Forced-Entry Resistance: Latching devices shall provide reasonable security against forced entry and the test window shall achieve a Grade 40 when tested per ASTM F588-07.
 4. The window assembly shall have a U-factor equal to or less than 0.40.
 5. The window assembly shall not have an solar heat gain coefficient equal to or less than 0.25.
- E. Thermal NFRC Simulation: Thermal computer simulation per NFRC 100-2010 on a 48 inches by 71 inches test size glazed with 1 inch (25 mm) insulating made with 1/4 inch (6 mm) soft coat low E coating on surface #2, argon gas in the airspace made with a polymer-coated stainless steel spacer, and 1/4 inch (6 mm) clear glass, with the following test result:
1. Standardized Thermal Transmittance to be maximum 0.343 btu/hr/sq.ft/degree F.
- F. Acoustical Performance: Testing per ASTM E90-09 on a 23-1/2 inches (597 mm) by 59 inches (1499 mm) test size glazed with 1-5/16-inch (33 mm) dual glazed unit made with exterior 1/4-inch (6 mm) monolithic glass, 3/4 inch (19 mm) airspace with a stainless steel spacer, and interior 5/16 inch (8 mm) monolithic glass: minimum 40 STC and 34 OITC.

2.3 FIXED WINDOW UNITS - ENERGSAVE ARCHITECTURAL

- A. Product: Peerless G641 Fixed Thermal Aluminum Windows
1. AAMA Certification: Conformance with FW-AW90.
- B. Configuration:
1. Fixed, glass plane in line with the window exterior plane.
 2. Fixed-to-fixed with a vertical integral mullion in one master frame: glass plane in line with the window exterior plane.
- C. Construction:
1. Aluminum Extrusions: extruded by the window manufacturer from commercial quality 6063-T5 alloy; free from defects impairing strength and durability.
 2. Window Frame: Extruded aluminum with integral structural thermal break installed by the window manufacturer in the frame members; exterior and interior finishes applied by the window manufacturer; frames assembled by the window manufacturer.
 - a. Frame Depth: 3 1/4 Inches (83 mm).
 - b. Fabricated with equal-leg frame.
 3. Frame: Double tubular head, sill, and jambs miter cut and fastened with two zamac corner gussets per corner; corners sealed by window manufacturer with sealant conforming to AAMA 800-10.
 4. Integral Mullions: Double tubular integral mullion fastened with two Zamac gussets per frame member without penetrating the frame member with fasteners; joints sealed by window manufacturer with sealant conforming to AAMA 800-10.
 5. Thermal Break: The thermal break separating the exterior and interior aluminum extrusions shall be a mechanical crimp-in-place system utilizing multi-directional glass fiber reinforced polyamide nylon ribbed struts with locking mechanical connections to the aluminum extrusions. The thermal break shall not be compromised by hardware or metal fasteners.
 6. Glazing: exterior ExxonMobil Santoprene™ foam gasket; 1 inch (25 mm) insulating glass; two weep holes under each glass pocket for drainage with hooded weeps painted to match the window finish; foam backer rod and silicone heel bead forming an internal seal; interior Santoprene™ bulb gasket threaded into aluminum glazing beads; specified glass glazed by the window manufacturer.
 7. Weatherstrip: secured in extruded ports; Santoprene™ bulb seal conforming to AAMA 702-11 in interior aluminum glazing beads; Teflon-coated bulb with a foam core conforming to AAMA 702-11: single row on the exterior of the stiles and rails of the interior take-out panel.

- D. Performance:
1. AAMA Certification: Conformance to AW-PG90-FW specifications in AAMA/WDMA/CSA 101/I.S.2/A440-08 when tests are performed on the prescribed 60 inches by 99 inches (1524 mm by 2515 mm) minimum test size with the following test results:
 2. Air Infiltration: Not to exceed AAMA 101 standard of maximum 0.1 cfm/square foot when tested per ASTM E283-12 at a static air pressure difference of 6.24 psf.
 3. Water Penetration: No uncontrolled water leakage when tested per ASTM E331-09 and ASTM E547-09 at a static air pressure difference of 15 psf.
 4. Uniform Deflection: No more than L/175 when tested per ASTM E330-14 at a static air pressure difference of 70 psf.
 5. Uniform Structural Load: No glass breakage or permanent damage to fasteners, and maximum .2% permanent deformation of the span of any frame member when tested per ASTM E330-14 at a static air pressure difference of 105 psf.
 6. Forced-entry Resistance: Reasonable security against forced entry and the test window shall achieve a Grade 40 when tested per ASTM F588-07.
 7. The window assembly shall have a U-factor equal to or less than 0.40.
 8. The window assembly shall not have an solar heat gain coefficient equal to or less than 0.25.
- E. Thermal NFRC Simulation: Thermal computer simulation per NFRC 100-2010 on a 60 inches by 99 inches (1524 mm by 2515 mm) test size glazed with 1 inch (25 mm) insulating made with 1/4 inch (6 mm) soft coat low E coating on surface #2, argon gas in the airspace made with a stainless steel spacer, and 1/4 inch (6 mm) clear glass, with the following test result:
1. Standardized Thermal Transmittance to be maximum 0.29 btu/hr/sq.ft/degree F.
- F. Thermal AAMA Testing: Per AAMA 1503-09, on a 47 inch by 59 inches (1194 mm by 1499 mm) test size glazed with 1 inch (25 mm) insulating glass made with 1/4 inch (6 mm) soft coat low E coating on surface #2, argon in the airspace made with a stainless-steel spacer, and 1/4 inch (6 mm) clear glass, with the following test results:
1. Condensation Resistance Factor: minimum 67 frame CRF and 73 glass CRF.
 2. Thermal Transmittance: maximum 0.35 btu/hr/sq.ft/degree F U value.
- G. Thermal NFRC Testing: Per NFRC 102-2010 on a 47 inch by 59 inches (1194 mm by 1499 mm) test size glazed with 1 inch (25 mm) insulating glass made with 1/4 inch (6 mm) soft coat low E coating on surface #2, plain air in the airspace made with a stainless-steel spacer, and 1/4 inch (6 mm) clear glass, with the following test result:
1. Standardized Thermal Transmittance to be maximum 0.34 btu/hr/sq.ft/degree F.
- H. Acoustical Performance: Testing per ASTM E90-09 on a 46-1/4 inches by 59 inches (1175 mm by 1499 mm) test size glazed with 1 1/4-inch (31.8 mm) dual glazed units which were made with exterior 1/4-inch (6 mm) monolithic glass, 3/4 inch (19.1 mm) airspace with a stainless steel spacer, and interior 1/4 inch (6 mm) laminated glass. The laminated glass utilized a .030-inch (.76 mm) interlayer: minimum 38 STC and 28 OITC.

2.4 MUNTINS

- A. Material: Extruded aluminum with exposed surfaces finished to match window color; concealed fasteners; designed for unrestricted expansion and contraction.
- B. Design: Muntin bar cross-section profile and material chosen from manufacturer's standards.
- C. Patterns: Grid patterns to be designated by architect.
- D. Location: exterior grids: separate extrusion which slides into the grid pocket of the window frame without penetrating the perimeter frame.
1. Exterior.

2.5 INSTALLATION ACCESSORIES

- A. Material: Extruded aluminum; nominal .062-inch (1.6 mm) wall; with exposed surfaces finished to match window color and finish performance; concealed fasteners; required weather seals; designed for unrestricted expansion and contraction.
- B. Exterior:
 - 1. Two-piece receptor with polyamide strip thermal break.
 - 2. 10 psf subsill with polyamide strip thermal break.
- C. Interior: Two-piece snap trim and trim clip.
- D. Mullions:
 - 1. Horizontal stack mullion with polyamide strip thermal break.
 - 2. Vertical three-piece mullion with polyamide strip thermal break
- E. Steel strap anchor.
- F. Head expander with polyamide strip thermal break.

2.6 INSULATING GLASS UNITS

- A. Materials:
 - 1. Spacer: tubular stainless steel.
 - 2. Spacer color: Stainless metal color.
 - 3. Primary seal: polyisobutylene.
 - 4. Secondary seal: Silicone.
 - 5. Airspace Fill: Argon filled.
- B. Performance:
 - 1. Dual-seal durability: AAMA Certification: Conformance with ASTM E 2190-10; visible, permanent IGCC certification label.
- C. Exterior Glass Lite:
 - 1. Thickness: 1/4 inch (6 mm).
 - 2. Tint: Solar Gray.
 - 3. Type: Annealed. Or Tempered as required by code.
 - 4. Coating: low E on #2 surface; Cardinal Glass 270 or Cardinal Glass 366 or equivalent.
- D. Interior Glass Lite:
 - 1. Thickness: 1/4 inch (6 mm).
 - 2. Tint: Clear.
 - 3. Type: Annealed.

2.7 FINISH ON EXTERIOR ALUMINUM EXTRUSIONS

- A. Application: on clean extrusions free from objectionable surface blemishes; on exposed surfaces visible when installed product's operating sash is closed. Electrostatic spray by an Approved Applicator and appropriate oven bake process.
- B. Coating: Superior Performance Powder coating: One-coat dry system with resin containing 70% fluoropolymer; thermosetting; alternative finishes will not be acceptable.
- C. Quality Standard: Conforming to AAMA 2605-13, including 10 years Florida exposure. [AAMA 2604-13, including 5 years Florida exposure.]

- D. Pretreatment: Mechanically clean and chemically pretreat fabricated items in accordance with coating manufacturer's requirements and AAMA requirements with a Chrome Free Treatment.
- E. Coating Quantity: One single color coating, additional coating quantities will not be accepted. This includes, but is not limited to barrier coats, primers, and clear coats.
- F. Dry Film Thickness: Eighty percent of measurements on primary exposed surfaces shall exceed 1.9 mils with a standard thickness range of 1.9 to 3.14 mils, except inside corners and channels.
- G. Environmental Factors: Less than 3% harmful VOC's (Volatile Organic Compounds) emitted during powder coating application process.
- H. Color: Chosen from manufacturer's standards.
 - 1. Quality Standard: Conforming to AAMA 2604.
 - 2. Quality Standard: Conforming to AAMA 2605.

2.8 FINISH ON INTERIOR ALUMINUM EXTRUSIONS

- A. Application: on clean extrusions free from objectionable surface blemishes; on exposed surfaces visible when installed product's operating sash is closed. Electrostatic spray by an Approved Applicator and appropriate oven bake process.
- B. Coating: Superior Performance Powder coating: One-coat dry system with resin containing 70% fluoropolymer; thermosetting; alternative finishes will not be acceptable.
- C. Quality Standard: Conforming to AAMA 2605-13, including 10 years Florida exposure. [AAMA 2604-13, including 5 years Florida exposure.]
- D. Pretreatment: Mechanically clean and chemically pretreat fabricated items in accordance with coating manufacturer's requirements and AAMA requirements with a Chrome Free Treatment.
- E. Coating Quantity: One single color coating, additional coating quantities will not be accepted. This includes, but is not limited to barrier coats, primers, and clear coats.
- F. Dry Film Thickness: Eighty percent of measurements on primary exposed surfaces shall exceed 1.9 mils with a standard thickness range of 1.9 to 3.14 mils, except inside corners and channels.
- G. Environmental Factors: Less than 3% harmful VOC's (Volatile Organic Compounds) emitted during powder coating application process.
- H. Color: Chosen from manufacturer's standards.
 - 1. Quality Standard: Conforming to AAMA 2604.
 - 2. Quality Standard: Conforming to AAMA 2605.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until the substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Prepare openings to be in tolerance, plumb, level, provide for secure anchoring, and in accordance with approved shop drawings.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install windows in accordance with approved shop drawings and window manufacturer's recommendations with skilled craftspeople who have demonstrated a successful history of installing windows for a specified number of years. Provide required support and securely fasten and set windows plumb, square, and level without twist or bow. Install in proper relationship with adjacent construction.
- B. Apply sealant per sealant manufacturer's recommendations at joints, wipe off excess, and leave exposed sealant surfaces clean and smooth.

3.4 FIELD TESTING

- A. Test installed units in conformance with AAMA 502-12 minimum requirements for air and water infiltration with the window manufacturer, dealer, Contractor, and Owner present.
- B. Select test units as directed by the owner's representative and use an AAMA-accredited laboratory provided by the Owner or Contractor not to be tested higher than 8psf or 2/3rd reduction of 12 psf.

3.5 ADJUSTING

- A. Adjust windows as necessary for smooth and weathertight operation.

3.6 CLEANING

- A. Peel the Preserve protective film from the window or door glass surfaces when the window or door installation is complete, leaving these surfaces ready for use without the need for glass cleaning.
- B. Leave the installed windows and doors clean and free of construction debris.

3.7 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 08 52 00

SECTION 08 71 00 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Electromechanical door hardware.
 - 3. Cylinders specified for doors in other sections.
- C. Related Sections:
 - 1. Division 01 Section "Product Allowances".
 - 2. Division 01 Section "Closeout Procedures".
 - 3. Division 08 Section "Operations and Maintenance".
 - 4. Division 08 Section "Door Schedule".
 - 5. Division 08 Section "Hollow Metal Doors and Frames".
 - 6. Division 08 Section "Flush Wood Doors".
 - 7. Division 08 Section "Aluminum-Framed Entrances and Storefronts".
 - 8. Division 08 Section "All-Glass Entrances".
 - 9. Division 28 Section "Access Control Hardware Devices".
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. NFPA 105 - Installation of Smoke Door Assemblies.
 - 7. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:
 - 1. ANSI/BHMA Certified Product Standards - A156 Series.
 - 2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
 - 3. ANSI/UL 294 - Access Control System Units.
 - 4. UL 305 - Panic Hardware.
 - 5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - h. Warranty information for each product.
 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Shop Drawings: Details of electrified access control hardware indicating the following:
1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
 - a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
 - b. Complete (risers, point-to-point) access control system block wiring diagrams.
 - c. Wiring instructions for each electronic component scheduled herein.
 2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.
- D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- E. Informational Submittals:
1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

1.4 CLOSEOUT SUBMITTALS

- A. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.
1. Maintenance manual must be provided for tornado/hurricane storm shelter impact protective systems.

- B. Project Record Documents: Provide record documentation of as-built door hardware sets in digital format (.pdf, .docx, .xlsx, .csv) and as required in Division 01, Project Record Documents.
- C. Project Record Documents: Provide record documentation of as-built door hardware sets in digital format (.pdf, .docx, .xlsx, .csv) or acceptable integrated file format for updating of Openings Studio™ management software and as required in Division 01, Project Record Documents.

1.5 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).
- C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
 - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
 - 2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.
- F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.
- G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
 - 1. Function of building, purpose of each area and degree of security required.
 - 2. Plans for existing and future key system expansion.
 - 3. Requirements for key control storage and software.
 - 4. Installation of permanent keys, cylinder cores and software.
 - 5. Address and requirements for delivery of keys.
- H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
 - 1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum,

hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.

2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

- I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.7 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.8 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 1. Structural failures including excessive deflection, cracking, or breakage.
 2. Faulty operation of the hardware.
 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 4. Electrical component defects and failures within the systems operation.

- C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 MATERIALS

- A. Hardware shall not have any visible manufacturer names on exposed materials when the door is in a closed position.

2.3 BUTT HINGES

- A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
1. Quantity: Provide the following hinge quantity:
 - a. Two Hinges: For doors with heights up to 60 inches.
 - b. Three Hinges: For doors with heights 61 to 90 inches.
 - c. Four Hinges: For doors with heights 91 to 120 inches.
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
 3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
 4. Hinge Options: Comply with the following:
 - a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for all out-swinging lockable doors.
 5. Manufacturers:
 - a. Hager Companies (HA) - BB Series, 5-knuckle.
 - b. Ives (IV) - 5BB Series, 5-knuckle.
 - c. McKinney (MK) - TA/T4A Series, 5-knuckle.

- d. dormakaba BEST (ST) - F/FBB Series, 5-knuckle.

2.4 CONTINUOUS HINGES

- A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.
 - 1. Where specified, provide modular continuous geared hinges that ship in two or three pieces and form a single continuous hinge upon installation.
 - 2. Manufacturers:
 - a. Hager Companies (HA).
 - b. Ives (IV).
 - c. Pemko (PE).
 - d. Select Hinges (SL).
 - e. dormakaba BEST (ST).

2.5 POWER TRANSFER DEVICES

- A. Electrified Quick Connect Continuous Geared Transfer Hinges: Provide electrified transfer continuous geared hinges with a removable service panel cutout accessible without de-mounting door from the frame. Furnish with Molex™ standardized plug connectors with sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.
 - 1. Manufacturers:
 - a. Ives (IV) - Connect.
 - b. Pemko (PE) - SER-QC (# wires) Option.
- B. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.
 - 1. Manufacturers:
 - a. Pemko (PE) - EL-CEPT Series.
 - b. Securitron (SU) - EL-CEPT Series.
 - c. dormakaba BEST (ST) EPT-12C Series.
 - d. Von Duprin (VD) - EPT-10 Series.
- C. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.
 - 1. Provide one each of the following tools as part of the base bid contract:
 - a. McKinney (MK) - Electrical Connecting Kit: QC-R001.
 - b. McKinney (MK) - Connector Hand Tool: QC-R003.
 - 2. Manufacturers:
 - a. Hager Companies (HA) - Quick Connect.
 - b. Falcon (FA) - Connect.
 - c. McKinney (MK) - QC-C Series.
 - d. Schlage (SC) - Connect.

- e. dormakaba BEST (ST) - WH Series.
- f. Von Duprin (VD) - Connect.

2.6 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.
 - 1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
 - 2. Furnish dust proof strikes for bottom bolts.
 - 3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
 - 4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
 - 5. Manufacturers:
 - a. Ives (IV).
 - b. Rockwood (RO).
 - c. Trimco (TC).
- B. Coordinators: ANSI/BHMA A156.3 door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.
 - 1. Manufacturers:
 - a. Ives (IV).
 - b. Rockwood (RO).
 - c. Trimco (TC).
- C. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
 - 1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
 - 2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
 - 3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
 - 4. Pulls, where applicable, shall be provided with a 10" clearance from the finished floor on the push side to accommodate wheelchair accessibility.
 - 5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets. When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
 - 6. Manufacturers:
 - a. Ives (IV).
 - b. Rockwood (RO).
 - c. Trimco (TC).

2.7 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
- B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:
 - 1. Threaded mortise cylinders with rings and cams to suit hardware application.
 - 2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 - 3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.

4. Tubular deadlocks and other auxiliary locks.
 5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
 6. Keyway: Match Facility Standard.
- C. Large Format Interchangeable Cores: Provide removable cores (LFIC) as specified, core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.
- D. Patented Cylinders: ANSI/BHMA A156.5, Grade 1 Certified Products Directory (CPD) listed cylinders employing a utility patented and restricted keyway requiring the use of a patented key. Cylinders are to be protected from unauthorized manufacture and distribution by manufacturer's United States patents. Cylinders are to be factory keyed with owner having the ability for on-site original key cutting.
1. Patented key systems shall not be established with products that have an expired patent. Expired systems shall only be specified and supplied to support existing systems.
 2. Manufacturers:
 - a. ASSA ABLOY ACCENTRA, formerly known as Yale (YA) - Keymark.
 - b. No Substitution.
- E. Keying System: Each type of lock and cylinders to be factory keyed.
1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
 2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
 3. New System: Key locks to a new key system as directed by the Owner.
- F. Key Quantity: Provide the following minimum number of keys:
1. Change Keys per Cylinder: Two (2)
 2. Master Keys (per Master Key Level/Group): Five (5).
 3. Construction Keys (where required): Ten (10).
- G. Construction Keying: Provide construction master keyed cylinders.
- H. Construction Keying: Provide temporary keyed construction cores.
- I. Key Registration List (Bitting List):
1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
 2. Provide transcript list in writing or electronic file as directed by the Owner.

2.8 KEY CONTROL

- A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.
1. Manufacturers:
 - a. Lund Equipment (LU).
 - b. MMF Industries (MM).
 - c. Telkee (TK).

2.9 MORTISE LOCKS AND LATCHING DEVICES

- A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational and Security Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.
1. Electromechanical locksets shall have the following functions and features:

- a. Universal Molex plug-in connectors that have standardized color-coded wiring and are available in fail safe or fail secure and operate from 12vdc to 24vdc regulated.
- b. EcoFlex or equivalent technology that reduces energy consumption up to 92% as certified by GreenCircle.
- c. Options to be available for request-to-exit or enter signaling, latchbolt and deadbolt monitoring.
- d. Optional high security monitoring with internal end-of-line monitoring alongside deadbolt privacy and integrated door position monitoring.
- e. Two-year limited warranty on electrified functions.
- 2. Manufacturers:
 - a. ASSA ABLOY ACCENTRA, formerly known as Yale (YA) - 8800FL Series.
 - b. Sargent Manufacturing (SA) - 8200 Series.
 - c. Schlage (SC) - L9000 Series.

2.10 RESIDENTIAL LOCKING DEVICES

- A. Residential Locking Devices: Provide ANSI A156.2, Series 4000, Grade 1 products (knobs, levers, deadbolts, interconnected, handlesets) as specified.
 - 1. Provide residential locking devices with functions and features as follows:
 - a. Locksets, deadbolts, and handle sets designed to fit ANSI standard door preps.
 - b. Meets UL and ULC Standard 10C Positive Pressure, Fire Test of Door Assemblies.
 - c. Non-handed levers.
 - d. Single motion for retraction of latchbolt and deadbolt.
 - e. Provide levers of like design and style as specified.
 - 2. Manufacturers:
 - a. Baldwin (BA) - Estate Series.
 - b. No Substitution.
- B. Residential Locking Devices: Provide ANSI A156.2, Series 4000, Grade 2 products (knobs, levers, deadbolts, interconnected, handlesets) as specified.
 - 1. Provide residential locking devices with functions and features as follows:
 - a. Locksets, deadbolts, and handle sets designed to fit ANSI standard door preps.
 - b. Meets UL and ULC Standard 10C Positive Pressure, Fire Test of Door Assemblies.
 - c. Non-handed levers.
 - d. Single motion for retraction of latchbolt and deadbolt.
 - e. Provide levers of like design and style as specified.
 - 2. Manufacturers:
 - a. ASSA ABLOY ACCENTRA - Heritage Series.
 - b. Baldwin (BA) - Reserve Series.
 - c. Kwikset (KW) - Signature Series.
 - d. No Substitution.
- C. Residential Pivot Devices: Provide ANSI A156.36, Grade 2 push/pull paddle devices as specified.
 - 1. Provide residential locking devices with functions and features as follows:
 - a. ADA compliant.
 - b. Two-year limited warranty.
 - 2. Manufacturers:
 - a. ASSA ABLOY ACCENTRA - Navis Paddle Series.
 - b. No Substitution.
- D. Residential Locking Devices: Provide ANSI A156.2, Series 4000, Grade 3 products (knobs, levers, deadbolts, interconnected, handlesets) as specified.
 - 1. Provide residential locking devices with functions and features as follows:

- a. Locksets, deadbolts, and handle sets designed to fit ANSI standard door preps.
- b. Meets UL and ULC Standard 10C Positive Pressure, Fire Test of Door Assemblies.
- c. Non-handed levers.
- d. Single motion for retraction of latchbolt and deadbolt.
- e. Provide levers of like design and style as specified.
- 2. Manufacturers:
 - a. ASSA ABLOY ACCENTRA - Heritage Series.
 - b. Kwikset (KW) - Safelock Series.
 - c. Weiser (WE) - Residential Series.
 - d. No Substitution.

2.11 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
 - 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 - 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 - 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
 - 4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
- B. Standards: Comply with the following:
 - 1. Strikes for Mortise Locks and Latches: BHMA A156.13.
 - 2. Strikes for Bored Locks and Latches: BHMA A156.2.
 - 3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
 - 4. Dustproof Strikes: BHMA A156.16.

2.12 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
 - 1. Exit devices shall have a five-year warranty.
 - 2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
 - 3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
 - 4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
 - 5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
 - 6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
 - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
 - 7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise

- indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
 9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
 10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
 11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.
1. Electromechanical exit devices shall have the following functions and features:
 - a. Universal Molex plug-in connectors that have standardized color-coded wiring and are field configurable in fail safe or fail secure and operate from 12vdc to 24vdc regulated.
 - b. EcoFlex or equivalent technology that reduces energy consumption up to 92% as certified by GreenCircle.
 - c. Options to be available for request-to-exit or enter signaling, latchbolt and touchbar monitoring.
 - d. Field configurable electrified trim to fail-safe or fail-secure that operates from 12-24VDC.
 - e. Five-year limited warranty for electromechanical features.
 2. Manufacturers:
 - a. ASSA ABLOY ACCENTRA, formerly known as Yale (YA) - 7000 Series.
 - b. Sargent Manufacturing (SA) - 80 Series.
 - c. Von Duprin (VD) - 35A/98 XP Series.

2.13 SURFACE DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
 2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
 3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
 4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
 5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
 6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.
1. Heavy duty surface mounted door closers shall have a 30-year warranty.
 2. Manufacturers:

- a. ASSA ABLOY ACCENTRA, formerly known as Yale (YA) - 4400 Series.
- b. Corbin Russwin Hardware (RU) - DC8000 Series.
- c. No Substitution.

2.14 OVERHEAD CONCEALED DOOR CLOSERS

2.15 ARCHITECTURAL TRIM

- A. Door Protective Trim
 - 1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
 - 2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
 - 3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
 - 4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:
 - a. Stainless Steel: 300 grade, 050-inch thick.
 - 5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
 - 6. Manufacturers:
 - a. Ives (IV).
 - b. Rockwood (RO).
 - c. Trimco (TC).

2.16 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
 - 1. Manufacturers:
 - a. Ives (IV).
 - b. Rockwood (RO).
 - c. Trimco (TC).

2.17 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
 - 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
 - 1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NFPA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Manufacturers:
 - 1. National Guard Products (NG).
 - 2. Pemko (PE).
 - 3. Reese Enterprises, Inc. (RE).

2.18 ELECTRONIC ACCESSORIES

- A. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.
 - 1. Manufacturers:
 - a. Sargent Manufacturing (SA) - 3280 Series.
 - b. Security Door Controls (SD) - DPS Series.
 - c. Securitron (SU) - DPS Series.

2.19 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturer's recognized installation standards for application intended.

2.20 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
 - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
- E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- F. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
 - 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
 - 1. Quantities listed are for each pair of doors, or for each single door.
 - 2. The supplier is responsible for handling and sizing all products.
 - 3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
 - 4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.
- B. Manufacturer's Abbreviations:
 - 1. MK - McKinney
 - 2. PE - Pemko
 - 3. RO - Rockwood
 - 4. YA - ASSA ABLOY ACCENTRA
 - 5. OT - Other
 - 6. SU - Securitron
 - 7. GS - ASSA ABLOY Glass Solutions

Hardware Sets

END OF SECTION 08 71 00

SECTION 08 80 00 - GLAZING

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete of glass and glazing as shown on drawings and as specified in accordance with provisions of the contract documents and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, and complete installation shall be furnished and installed as part of this work.
- C. All glass and glazing shall conform to Federal Standard 16 CFR 1202 C1 and C2. Installation of noncomplying glass in location requiring safety glazing materials is strictly prohibited. Willful violators of Federal Standards are subject to criminal penalties. In addition, all glass and glazing shall conform to local, state and national and OSHA code and guidelines especially including Louisiana Revised Statutes R.S. 40:1631-1635. This contractor shall be responsible for installing tempered, laminated or safety glass, in areas as deemed necessary to comply with all codes and regulations mentioned above, as well as part 1201 Safety Standard for Architectural Glazing materials as authorized by the Consumer Products Safety Commission. Glazing Contractor shall apply these regulations to glazing products listed in 2.1 MATERIALS.
- D. For additional information refer to sections:
 - 08 11 13 - Hollow Metal Doors and Frames
 - 08 14 00 - Wood Doors
 - 08 41 00 - Entrances and Storefront
 - 08 44 13 - Glazed Aluminum Curtainwall

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Exterior Glass
 - 1. Solarcool Tinted Glass: Size and thickness as required (1/4" minimum thickness) single glazing, visible light transmission of 14% (based on 1/4" thickness). NOTE: Where required by law and where shown on plans provide laminated safety glass.
 - 2. Vistacool Tinted Glass: Size and thickness as required (1/4" minimum thickness) single glazing, visible light transmission of 26% (based on 1/4" thickness). NOTE: Where required by law and where shown on plans provide laminated safety glass.
 - 3. Solarcool (2) Solargray + Solarban 60 Tinted Glass at Exterior Door Storefront Entrances: Size as required with 1" thickness. Outside glass shall be 1/4" thick Solarcool Solargray + Solarban 60, air space of 1/2" and inside glass 1/4" clear. (All glass shall be laminated safety glass.)
 - 4. 1" insulating glass units on this project as follows:
 - a. Where indicated on drawings, provide 1/4" Solarcool (2) Solargray + Solarban 60 Low-E tinted glass with the glass facing the interior being 1/4" clear. Where required by law and where shown on drawings provide laminated safety glass.
 - 1. 1" insulating glass units shall be constructed as follows:

- a. OB: 1/4" Vitro Solarcool (2) Solargray + Solarban 60 Low-E
 - b. AS: 1/2" (Air Filled)
 - c. IB: 1/4" Clear
 - d. Note that glass at storefront doors shall be laminated safety glass.
 - e. as provided by Vitro Architectural Glass or prior approved equal.
2. Performance requirements of insulating glass units
- a. Visible light transmittance of 14%
 - b. Solar heat gain coefficient of 0.17
 - c. Light-to-solar gain (LSG) of 0.82

B. Interior Glass

- 1. Clear Glass: Size and thickness as required (1/4" minimum thickness) single glazing, clear. NOTE: Where required by law and where shown on plans provide laminated safety glass.
- 2. Clear Safety Glass: Size and thickness as required (1/4" minimum thickness) single glazing laminated safety glass to match (a) above, this subsection.
- 3. Install fire-lite plus (5/16" fire safety) glazing with 90 minute rating in 1-1/2 hour rated doors as indicated in door schedule and dimensioned in door types Sheet A-3.1 glazing shall be polished clear laminated glass ceramic as supplied by Technical Glass Products (TGP) 1-800-426-0279.

C. Reflective Interior Film

- 1. Install on entire surface of interior fixed lites and door lites visible from hallways and corridors throughout the project. Film shall be installed to function as a one way mirror with visual contact eliminated from the hallway/ corridor side of fixed lites and door lites.
- 2. Reflective Interior Film shall be DR OptiTune 05i as manufactured by Avery Dennison Graphics Solutions, Mentor, Ohio 1-800-660-5559 or prior approved equal.

2.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.
- B. In addition to complying with pertinent codes and regulations of governmental agencies having jurisdiction, comply with pertinent recommendations contained in:
 - 1. Flat Glass Marketing Association:
 - a. "Glazing Sealing Systems Manual"
 - b. "Glazing Manual"
- C. Plate or float glass: Comply with Fed. Spec. DD-G-451, Type I, Class 1, Quality q3.2. Where plate glass is called for, plate glass or float may be used.
- D. Sheet glass: Provide Type II, Class I, Quality q5.
- E. Laminated Safety Glass:
 - 1. Provide laminated safety glass where indicated on the drawings, and elsewhere as required by governmental agencies having jurisdiction.
 - 2. Laminated Safety Glass shall have a minimum .030" pvb interlayer complying with ANSI Z97.1-1984 and CPSC 16 CFR 1201, which are the industry safety

standards. Provide in color as shown on drawings or otherwise selected by the Architect.

3. Laminated safety glass shall provide 99% UV light blockage at the wavelength range of ~300-380 nanometers.

PART 3 - EXECUTION

3.1 WORKMANSHIP

A. Surface Conditions

1. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.
2. Clean glazing channels, stops, and rabbets to receive the glazing materials, making free from obstructions and deleterious substances which might impair the work.
 - a. Remove protective coatings which might fail in adhesion or interfere with bond of sealants.
 - b. Comply with manufacturers' instructions for final wiping of surfaces immediately prior to application of primer and glazing compounds or tapes.
 - c. Prime surfaces to receive glazing compounds in accordance with manufacturers' recommendations.

B. Installation

1. Inspect each piece of glass immediately prior to start of installation.
 - a. Do not install items which are improperly sized, have damaged edges, or are scratched, abraded, or damaged in any other manner.
 - b. Do not remove labels from glass until so directed by the Architect.
 - c. Install glass so distortion waves, if present, run in the horizontal direction.
2. Locate setting blocks at sills one quarter of the width of the glass in from each end of the glass, unless otherwise recommended by the glass manufacturer.
 - a. Use blocks of proper size to support the glass in accordance with the manufacturer's recommendations.
 - b. Provide spacers for all glass sizes larger than 50 where continuous glazing gaskets or felts are provided.
 1. Locate spacers no more than 24" apart, and no closer than 12" to a corner.
 2. Place spacers opposite one another.
 3. Make bit of spacer on glass 1/4" or more.
3. Set glass in a manner which produces the greatest possible degree of uniformity in appearance.
4. Do not use two different glazing materials in the same joint system unless the joint use is approved in advance by the Architect.
5. Mask, or otherwise protect, surfaces adjacent to installation of sealants.
6. Miter-cut and seal the joints of glazing gaskets in accordance with the manufacturers' recommendations, to provide watertight and airtight seal at corners and other locations where joints are required.

C. Protection

1. Protect glass from breakage after installation by promptly installing streamers or ribbons, suitably attached to the framing and held free from glass. Do not apply warning markings, streamers, ribbons, or other items directly to the glass except as specifically directed by the Architect.

END OF SECTION 08 80 00

SECTION 09 21 16 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of gypsum drywall as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, and complete installation shall be furnished and installed as part of this work.

PART 2 - PRODUCTS

- 2.1 Gypsum Board: Provide gypsum wallboard complying with Fed. Spec. SS-L-30D and ASTM 1396, in 48" widths and in such lengths as will result in a minimum of joints.

- A. Moisture Resistant Wallboard: Refers to all interior drywall specifically labeled as "Moisture Resistant" in the room finish schedule. This is to include interior partitions and ceilings as well as the interior face of exterior perimeter walls.
 - 1. Moisture/Abuse Resistant Wallboard from 0 to 4 feet: Provide moisture resistant wallboard from 0 to 4 feet above the finished floor **throughout the entire building (whether or not it is labeled as "Moisture Resistant" in the room finish schedule)**. This board shall be 5/8" Firecode X panels with both mold and abuse resistance:
 - a. USG Sheetrock Brand – Mold Tough AR Firecode X Panels
 - b. National Gypsum – Gold Bond Hi-Abuse XP Gypsum Board
 - c. Or prior approved equal
 - 2. Moisture Resistant Wallboard from finish floor to ceiling: Provide moisture resistant wallboard in all wet rooms, janitor's closets, exterior perimeter walls, and other areas indicated on the finish schedule as "Moisture Resistant".
 - a. USG Sheetrock Brand – Mold Tough AR Firecode X Panels
 - b. National Gypsum – Gold Bond Hi-Abuse XP Gypsum Board
 - c. Or prior approved equal
- B. Regular wallboard from 4 foot to ceiling: Refers to all interior gypsum drywall from 4 foot to ceiling not specifically labeled as "Moisture Resistant" in the room finish schedule. This is to include interior partitions and ceilings as well as the interior face of exterior perimeter walls.
 - 1. Regular gypsum wallboard above 4 foot from the finished floor throughout the entire building shall be 5/8" Firecode X panels with mold resistance only.
 - a. USG Sheetrock Brand – Mold Tough Firecode X Panels
 - b. National Gypsum - Gold Bond XP Gypsum Board
 - c. Or prior approved equal

- 2.2 Gypsum Board Sheathing: Where gypsum wallboard sheathing is indicated on the Drawings, provide Type "X" Dens-Glass Gold Fireguard Sheathing as manufactured by Georgia Pacific. (Refer to Section 06 16 43 - Gypsum Sheathing (Exterior) for additional information.)

2.3 Metal Trim

- A. Form from zinc-coated steel not lighter than 26 gauge, complying with Fed. Spec. QQ-S-775, Type I, Class d or e.

- B. Casing beads:
 - 1. Provide channel-shapes with an exposed wing, and with a concealed wing not less than 7/8" wide.
 - 2. The exposed wing may be covered with paper cemented to the metal but shall be suitable for joint treatment.
- 2.4 Corner Beads: Provide angle shapes with wings not less than 7/8" wide and perforated for nailing and joint treatment, or with combination metal and paper wings bonded together, not less than 1-1/4" wide and suitable for joint treatment.
- 2.5 Joining System
 - A. Provide a jointing system, including reinforcing tape and compound, designed as a system to be used together and as recommended for this use by the manufacturer of the gypsum wallboard approved for use on this work:
 - B. Jointing compound may be used for finishing if recommended by its manufacturer.
- 2.6 Fastening Devices
 - A. For fastening gypsum wallboard in place on metal studs and metal channels, use flat-head screws, shouldered, specially designed for use with power-driven tools, not less than 1" long, with self-tapping threads and self-drilling points.
 - B. For fastening gypsum wallboard in place on wood, use 1-1/4" Type W bugle-head screws, or use annular ring type nails complying with ASTM C514 and of the length required by governmental agencies having jurisdiction.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. Installation
 - 1. General: Install the gypsum wallboard in accordance with the drawings and with the separate boards in moderate contact but not forced into place.
At internal and external corners, conceal the cut edges of the boards by the overlapping covered edges of the abutting boards.
Stagger the boards so that corners of any four boards will not meet at a common point except in vertical corners.
 - 2. Ceilings: Install the gypsum wallboard to ceilings with the long dimension of the wallboard at right angles to the supporting members.
Wallboard may be installed with the long dimension parallel to supporting members that are spaced 16" on centers when attached members are provided at end joints.
 - 3. Walls: Install the gypsum wallboard to studs at right angles to the furring or framing members.
Make end joints, where required, over framing or furring members.
 - 4. Attaching: Drive the specified screws with clutch-controlled power screwdrivers, spacing the screws 12" on centers at ceilings and 16" on centers at walls.
Where framing members are spaced 24" apart on walls, space screws 12" on centers.
Attach double layers in accordance with the pertinent codes and the manufacturer's recommendations as approved by the Architect.
- B. Joint Treatment
 - 1. General: Inspect areas to be joint treated, verifying that the gypsum wallboard fits snugly against supporting framework.
In areas where joint treatment and compound finishing will be performed, maintain a temperature of not less than 55 degrees for 24 hours prior to commencing the treatment, and until joint and finishing compounds have dried.

Apply the joint treatment and finishing compound by machine or hand tool.
Provide a minimum drying time in poorly ventilated areas.

2. Embedding compounds: Apply to gypsum wallboard joints and fastener heads in a thin uniform layer.
Spread the compound not less than 3" wide at joints, center to reinforcing tape in the joint, and use setting compound to embed the paper tape. Then spread a thin layer of compound over the tape.
After this treatment has dried, apply a second coat of embedding compound to joints and fastener heads, spreading in a thin uniform coat to not less than 6" wide at joints, and feather edged.
Sandpaper between coats as required.
When thoroughly dry, sandpaper to eliminate ridges and high points.
3. Finishing compounds: After embedding compound is thoroughly dry and has been completely sanded, apply a coat of finishing compound to joints and fastener heads. The entire surface shall be floated to give a uniform finish when painted.
When thoroughly dry, sandpaper to obtain a uniformly smooth surface, taking care to not scuff the surface of the wallboard.
4. For exterior gypsum board sheathing, all gaps resulting from cuts, corners, joints and machine end cuts of the sheathing should be sealed with exterior caulk (as per sealant manufacturer) at the time of erection.
 - a. Exterior gypsum shall be covered with a weatherization barrier within 30 days of erection.

C. Corner Treatment

1. Internal corners: Treat as specified for joints, except fold the reinforcing tape lengthwise through the middle and fit neatly into the corner.
2. External corners: Install the specified corner bead, fitting neatly over the corner and securing with the same type fasteners used for installing the wallboard. Space the fasteners approximately 6" on centers, and drive through the wallboard into the framing or furring member.
After the corner bead has been secured into position, treat the corner with joint compound and reinforcing tape as specified for joints, feathering the joint compound out from 8" to 10" on each side of the corner.

D. Control Joint

At all areas above openings (doors, windows, cased openings, furred openings, etc.) install zinc control joint no. 093. See plans for some locations. Provide control joints at all locations recommended by the manufacturer of gypsum wallboard.

E. Other Metal Trim

The drawings do not purport to show all locations and requirements for metal trim. Carefully study the drawings and the installation and provide all metal trim normally recommended by the manufacturer of the gypsum wallboard approved for use in this work. **And as indicated in G A - 216 - 2016 application a finishing of gypsum panel products.**

3.2 CLEANING UP

- A. In addition to other requirements for cleaning, use necessary care to prevent scattering gypsum wallboard scraps and dust, and to prevent tracking gypsum and joint finishing compound onto floor surfaces.
- B. At completion of each segment of installation in a room or space, promptly pick up and remove from the working area all scrap, debris, and surplus material of this section.

END OF SECTION 09 21 16

SECTION 09 24 00 – CEMENT PLASTERING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Refer to all project drawings and other sections of this specification to determine the type and extent of work therein affecting the work of this section, whether such work is specifically mentioned herein.
- B. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of Three-Coat stucco system with enhanced water resistive barrier coating and optional crack resistance. Senergy products are listed in this specification to establish a standard of quality. Any substitutions to this specification shall be submitted to and receive approval from the Architect at least 10 days before bidding. Proof of equality shall be borne by the submitter.
- C. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, and complete installation shall be furnished and installed as part of this work.

1.2 RELATED SECTIONS

- A. Section 05 40 00 - Cold-formed Metal Framing
- B. Section 06 16 00 – Gypsum Sheathing (Exterior)
- C. Section 07 27 00 – Air Infiltration/Weatherization Barrier
- D. Section 09 21 16 - Gypsum Board Assemblies

1.3 REFERENCES

- A. ASTM C150 - Standard Specification for Portland Cement
- B. ASTM C926 - Standard Specification for Application of Portland Cement-Based Plaster
- C. ASTM C1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster
- D. ASTM C847 - Standard Specification for Metal Lath
- E. ASTM C933 - Standard Specification for Welded Wire Lath
- F. ASTM C1764 - Standard Test Methods for Non-Metallic Plaster Bases (Lath) used with Portland Cement Based Plaster in Vertical Applications
- G. ASTM C1787 - Standard Specification for Installation of Non-Metallic Plaster Bases (Lath) used with Portland Cement Based Plaster in Vertical Applications
- H. ASTM C1788 - Standard Specification for Installation of Non-Metallic Plaster Bases (Lath) used with Portland Cement Based Plaster in Vertical Applications
- I. ASTM D226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
- J. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (PVC) Compounds
- K. ICC-ES AC11 - Cementitious Exterior Wall Coatings
- L. CCRR 0230 - Intertek Code Compliance Research Report for STUCCOBASE™/STUCCOBASE™ PREMIX
- M. CCRR 0249 - Intertek Code Compliance Research Report (PERMALATH 1000)
- N. ESR-2986 - ICC Evaluation Service, Inc., ES Report™ (SENERSHIELD-R/RS)

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 33 24 – Substitutions.
- B. Product Data: Provide data on Sentry Stucco Plus Wall System materials, product characteristics, performance criteria, limitations and durability.

- C. Code Compliance: Provide manufacturer's applicable code compliance report.
- D. Samples: Submit Two Inch size samples of Sentry Stucco Plus Wall System design illustrating Finish Coat color and texture range.
- E. Certificate: System manufacturer's approval of applicator.
- F. Sealant: Sealant manufacturer's certificate of compliance with ASTM C920
- G. System manufacturer's current specifications, typical details, system design guide and related product literature which indicate preparation required, storage, installation techniques, jointing requirements and finishing techniques.

1.5 QUALITY ASSURANCE

- A. Manufacturer: More than 10 years in the exterior wall systems industry.
- B. Applicator: Approved by Master Builders Solutions in performing work of this section.
- C. Regulatory Requirements: Conform to applicable code requirements.
- D. Field Samples
 - 1. Construct one field sample panel for each color and texture, 4'x8'in size of system materials illustrating method of attachment, surface Finish color and texture.
 - 2. Prepare each sample panel using the same tools and techniques to be used for the actual application.
 - 3. Locate sample panel where directed.
 - 4. Accepted sample panel May not remain as part of the work.
 - 5. Field samples shall be comprised of all wall assembly components including substrate, SENERSHIELD-R, Slip Sheet, PERMALATH 1000 or metal plaster base, Stucco Base, Senergy Base Coat), Senergy Reinforcing Mesh, Senergy Finish Coat and typical sealant/flashing conditions.
- E. Testing:
 - 1. General Air/Water-Resistive Barrier Minimum Performance:

TEST	METHOD	CRITERIA	RESULTS
Water-resistive barrier coatings used under EIFS	ASTM E2570		Meets all performance requirements
Air Leakage of Air Barrier Assemblies	ASTM E2357	0.2 l/(s.m ²) @75 Pa (0.04 cfm/ft ² @ 1.57 psf)	0.0007 l/s.m ² (0.0001 cfm/ft ²) @ 75 Pa (1.57 psf) positive / post conditioning 0.0014 l/s.m ² (0.0003 cfm/ft ²) @ 75 Pa (1.57 psf) negative / post conditioning
Air Permeance of Building Materials	ASTM E2178	0.02 l/(s.m ²) @75 Pa (0.004 cfm/ft ² @ 1.57 psf)	0.0049 l/s.m ² @ 75 Pa (0.00098 cfm/ft ² @ 1.57 psf)
Rate of Air Leakage	ASTM E283		0.0185 l/s.m ² @ 75 Pa (0.0037 cfm/ft ² @ 1.57 psf)
Water Vapor Transmission	ASTM E96	Report value	Senershield-R - 18 Perms (grains/Hr. in Hg. ft ²) @ 10 mils wet film thickness Senershield-RS 18 Perms (grains/Hr. in Hg. ft ²) @ 12 mils wet film thickness Senershield-R/RS - 14 Perms (grains/Hr. in Hg. ft ²) @ 20 mils wet film thickness Senershield-VB - 0.09 Perms (grains/Hr. in Hg. ft ²) @ 26 mils wet film thickness
Pull-Off Strength of Coatings	ASTM D4541	Min. 110 kPa (15.9 psi) or substrate failure	Pass - Tested over exterior gypsum sheathing, ASTM C1177 glass-mat sheathing, cement board, OSB, plywood; pvc and galvanized flashing
Nail Sealability (without Sheathing Fabric)	ASTM D1970	No water penetration at galvanized roofing nail penetration under 127 mm (5") head of water after 3 days at 4° C (40° F)	Pass
Surface Burning	ASTM E84	Flame Spread < 25 Smoke Development < 450	Meets Class A: Flame spread =15 Smoke developed = 95

2. Air/Water-Resistive Barrier ICC-ES AC-212:

TEST	METHOD	CRITERIA	RESULTS
Sequential Testing: 1. Structural 2. Racking 3. Restrained Environmental Conditioning 4. Water Penetration	1. ASTM E 1233 Procedure A 2. ASTM E 72 3. ICC-ES AC-212 4. ASTM E 331	No cracking at joints or interface of flashing No water penetration after 15 min @ 137 Pa (2.86 psf)	Pass - Tested over OSB and gypsum sheathing No water penetration after 90 min @ 299 Pa (6.24 psf)
Sequential Testing: 1. UV Light Exposure 2. Accelerated Aging 3. Hydrostatic Pressure Test	1. ICC-ES AC-212 2. ICC-ES AC-212 3. AATCC 127-1985	No cracking or bond failure to substrate No water penetration after 21.7 in (550 mm) water for 5 hours	Pass
Freeze-Thaw	ASTM E 2485 (Method B)	No sign of deleterious effects after 10 cycles	Pass - Tested over exterior gypsum sheathing, ASTM C1177 glass-mat sheathing, cement board, OSB, plywood
Water Resistance	ASTM D2247	No deleterious effects after 14-day exposure	Pass - Tested over exterior gypsum sheathing, ASTM C1177 glass-mat sheathing, cement board, OSB, plywood
Tensile Bond	ASTM C 297	Minimum 103 kPa (15 psi)	Pass - Tested over exterior gypsum sheathing, ASTM C1177 glass-mat sheathing, cement board, OSB, plywood, CMU; pvc and galvanized flashing
Tensile Bond (after freeze-thaw)	ASTM C 297	Minimum 103 kPa (15 psi) avg; no failure after 10 cycles freeze-thaw	Pass

3. Air/Water-Resistive Barrier ICC-ES AC 148:

TEST	METHOD	CRITERIA	RESULTS
Sequential Testing: A. UV Light Exposure B. Accelerated Aging C. Hydrostatic Pressure Test	1. ICC-ES AC 148 2. ICC-ES AC 148 3. AATCC 127-1985	No cracking or bond failure to substrate No water penetration after 21.7 in (550 mm) water for 5 hours	Pass
Peel Adhesion	ASTM D 3330 Method F	After UV Exposure After Accelerated Aging After Elevated Temperature Exposure After Water Immersion	Pass - tested over ASTM C1177 glass-mat sheathing, OSB, plywood, PVC and uncoated aluminum
Nail Sealability after Thermal Cycling	ASTM D 1970 (Modified), AAMA 711	No water penetration at galvanized roofing nail penetration under 31 mm (1.2") head of water after 24 hours at 4° C (40° F)	Pass
Tensile Strength after UV Exposure	ASTM D 5034, AAMA 711	Minimum 0.5 N/mm (2.9 lbs./in)	Pass
Cold Temperature Pliability	ASTM D 1970, AAMA 711	No cracking after bending around a 25 mm (1") mandrel after 2-hour exposure to -18° C (0° F)	Pass
Resistance to Peeling	AAMA 711	No signs of distress or failure after 24 hours of exposure at room temperature, 50° C (122° F), 65° C (149° F), 80° C (176° F)	Pass

4. Sentry Stucco Plus Wall System and Component Performance:

TEST	METHOD	CRITERIA	RESULTS
Water penetration of exterior windows, curtain walls and doors by uniform static air pressure	4. ASTM E 331	No water penetration on the face of the test specimen at 136.9 Pa (2.86 psf).	Pass
Freeze-thaw Resistance	Per ICC-ES acceptance criteria AC-11	No sign of deleterious effects after 10 cycles	STUCCOBASE passed with no visible evidence of deterioration when examined under 5x magnification
Water Vapor Transmission	ASTM E96 -Wet Cup	Report Value	StuccoBase 20.4 perms
Racking Load Test	ASTM E72	Report Value	Maximum load resistance 5530 pounds (250 kg)
Compressive Strength	ASTM C109	Report Value	22.4 MPa (3245 psi) average for STUCCOBASE

Flexural Strength	ASTM C348	Report Value	4.57 MPa (663 psi) average for STUCCOBASE
Surface Burning	ASTM E84	Report Value	<25 Flame Spread <450 Smoke Developed Includes PermaLath 1000, StuccoBase, and Senergy Finishes
Non-Combustibility	ASTM E136	No flaming, excess temperature rise or weight loss when exposed to 750°C (1382°F)	Pass StuccoBase with PermaLath 1000 or metal plaster base
Fire Resistance Rated Assemblies	ASTM E119	No transmission of heat greater than 250°F above ambient; no passage of flame or hot gasses; no passage of water from hose stream test; for loadbearing walls – ability to withstand load under test conditions	1 Hour Rated Assemblies ¹ : • Load bearing wood stud wall with 10.9 mm (7/16") OSB and 9.5 mm (3/8") STUCCOBASE. • Load bearing wood stud wall with 16 mm (5/8") Type X gypsum sheathing and 9.5 mm (3/8") STUCCOBASE • Load bearing wood stud wall with 10.9 mm (7/16") OSB, PERMALATH 1000 & • 12.7 mm (1/2") STUCCOBASE • (from inside only). • Non-load bearing steel framed wall with 16 mm (5/8") Type X gypsum sheathing, PERMALATH 1000 & 12.7 mm (1/2") STUCCOBASE

Reference Intertek Evaluation Reports CCRR-0230 and CCRR-0249 for more information

5. ASTM E330 Wind-Load:

FRAMING	SHEATHING	LATH	ALLOWABLE WIND LOAD	
Minimum 2x4 wood with a maximum spacing of 24" on center	Fiberboard, gypsum board and wood structural panels	Minimum No. 20 gage by 1" metal lath installed with 11 gage roofing nails or NO. 16 gage staples spaced as follows: 6 in. o.c. for framing with G=0.50 5 in. o.c. for framing with G=0.46 4 in. o.c. for framing with G=0.42	40 psf positive	40 psf negative
Min. 3-5/8 in. No. 20 gage steel studs with a maximum spacing of 24 in. o.c.	Fiberboard, gypsum board and wood structural panels	Min. No. 20 gage by 1-in. metal lath installed with No 7, S-12-20 self-drilling, self-tapping panhead screws, spaced at 6 in. o.c.	40 psf positive	40 psf negative

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver Master Builders Solutions materials in original unopened packages with manufacturer's labels intact.
- B. Protect Master Builders Solutions materials during transportation and installation to avoid physical damage.
- C. Store Master Builders Solutions materials in cool, dry place protected from freezing. Store at no less than 40°F/4°C (50°F/10°C AURORA STONE, AURORA TC-100 and ALUMINA finish).
- D. Store MAXFLASH at a minimum of 40F. In cold weather, keep containers at room temperature for at least 24 hours before using.
- E. Store insulation boards flat and protected from direct sunlight and extreme heat.
- F. Store Reinforcing Mesh, SHEATHING FABRIC and WS FLASH flexible flashing in cool, dry place.

1.7 PROJECT/SITE CONDITIONS

- A. Do not apply Master Builders Solutions material in ambient temperatures below 40°F/4°C (50°F/10°C for AURORA STONE, AURORA TC-100 and ALUMINA Finish). Provide properly vented, supplementary heat during installation and drying period when

temperatures less than 40°F/4°C (50°F/10°C for AURORA STONE, AURORA TC-100 and ALUMINA Finish) prevail.

- B. Do not apply materials to frozen surfaces.
- C. Maintain ambient temperature at or above 40°F/4°C (50°F/10°C for AURORA STONE, AURORA TC-100 and ALUMINA Finish) during and at least 24 hours after Sentry Stucco Ultra Wall System installation and until dry.

1.8 SEQUENCING AND SCHEDULING

- A. Coordinate and schedule installation of Sentry Stucco Plus Wall System with related work of other sections.
- B. Coordinate and schedule installation of trim, flashing, and joint sealers to prevent water infiltration behind the system.

1.9 WARRANTY

- A. Provide Master Builders Solutions – Senergy standard warranty for Senergy Sentry Stucco Plus Wall System installations. Reference Senergy's Warranty Schedule technical bulletin for specific information.
- B. Comply with Master Builders Solutions notification procedures to assure qualification for warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

All components of the Sentry Stucco Plus Wall System shall be obtained from the system manufacturer or through an authorized distributor.

2.2 MATERIALS

- A. Air/Water-Resistive Barrier Components:
 - 1. Air/Water-Resistive Barrier:
 - a. SENERSHIELD-R: A one-component fluid-applied vapor permeable air/water-resistive barrier.
 - 2. Rough Opening and Joint Treatment:
 - a. MAXFLASH: A one-component elastomeric material for use as a flexible flashing membrane.
- B. Slip Sheet: Minimum one layer of building paper.
- C. Lath/Plaster Base:
 - 1. PERMALATH 1000 by Master Builders Solutions: An open weave, three-dimensional self-furring, nominal 1/4" thick glass fiber reinforcing lath is for use with a minimum thickness of 1/2" (12.7mm). Complies with ASTM C1764, C1787 and C1788.
- D. Fastening for Lath/Plaster Base:
 - 1. PERMALATH 1000: Washers: ULP-302 (1 3/4") or Lath Plate (1 1/4") Mechanical Fastening Systems by Wind-Lock Corp.
 - a. Heavy Gauge Steel Framing (18 to 12 Gauge maximum): metal type [S] bugle head screws with ULP 302 (1 3/4") diameter washer or Lath Plate or 1 1/4" (32 mm) long x 1/8" (2.5 mm) diameter VersaPin Gripshank® fasteners by Aerosmith Fastening Systems with Lath Plates; 5/8" (16 mm) minimum penetration to framing 6" o.c. vertically and 16" o.c. horizontally.

- E. Stucco Base Coat:
 - 1. STUCCOBASE PREMIX by Master Builders Solutions: Factory-blended stucco mixture of Portland cement, reinforcing fibers, sand, and proprietary ingredients.
- F. Water: Clean and potable without foreign matter.
- G. Senergy Adhesive/Base Coat
 - 1. ALPHA DRY Base Coat: A dry-mix polymer adhesive and base coat containing Portland cement, and requiring only water for mixing.
- H. DIAMONDSHIELD Stucco Reinforcing Mesh by Master Builders Solutions: A balanced, open-grid triaxial glass fiber mesh that distributes stress across three directions for superior crack resistance properties on new or retrofit stucco applications.
- I. FLEXGUARD 4 Senergy Reinforcing Mesh: A 4 oz. Balanced, open-weave glass, fiber reinforcing mesh, twisted multi-end strands treated for compatibility with Senergy Base Coats
- J. STUCCOPRIME by Master Builders Solutions: A 100% acrylic-based primer; color to closely match the selected Senergy Finish Color.
- K. Senergy Finish Coat:
 - 1. SENERFLEX TERSUS Finish: Modified acrylic based finish with water repellent properties, compatible with base coat; Senergy finish color as selected by the architect from the manufacture's standard color options; finish texture:
 - a. F1.0: A 1.0 mm uniform aggregate creating a fine texture.

2.3 ACCESSORIES

Trim: Casing bead, corner bead, expansion joint and weep screed accessories shall meet the requirements of ASTM C1063. Accessories shall be: vinyl, meeting ASTM D1784; galvanized, meeting ASTM A525 and ASTM A526; or zinc, meeting ASTM B69. Vinyl or zinc accessories are recommended where highly humid or salt-laden service conditions exist. Refer to Senergy's Accepted Stucco Wall Systems Lath and Trim Accessories bulletin for additional information.

- 1. Foundation weep screed: Beveled edge designed to terminate finish system and drain internal moisture.
- 2. Casing bead: Square edge style.
- 3. Corner bead: Small radius nose style.
- 4. Control joints: W-shaped accordion profile style.
- 5. Expansion joints: pair of casing beads spaced for application of sealant bead

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify project site conditions.
- B. Walls:
 - 1. Substrates:
 - a. Acceptable substrates are PermaBase® Cement Board and other cement-boards conforming with ASTM C1325 (Type A-exterior) , poured concrete/unit masonry, e²XP™ sheathing (ASTM C1177), GlasRoc® sheathing (ASTM C1177), Securock™ glass-mat sheathing (ASTM C1177), DensGlass and DensElement (sheathing only) exterior sheathing (ASTM C1177), Weather Defense™ Platinum sheathing (ASTM C1177), GreenGlass® sheathing (ASTM C1177), gypsum

- sheathing (ASTM C79/C1396), Exposure I or exterior plywood (Grade C/D or better), Huber Zip (sheathing only), or Exposure I OSB.
- b. Sheathings must be securely fastened per applicable building code requirements and manufacturer's recommendations.
- c. Examine surfaces to receive system and verify that substrate and adjacent materials are dry, clean, and sound. Verify substrate surface is flat, free of fins or planar irregularities greater than 1/4" in 10' (6 mm in 3 m).
- d. When applying Senergy Air/Water-Resistive Barriers to concrete/unit masonry, verify concrete/unit masonry is free of dust, dirt, grease, oils, laitance, efflorescence, biological residue, existing paint or coatings, curing compounds, form release agents, or any other contaminants which might affect the bond. Masonry walls should be properly cured to full load bearing capacity, laid true, and with joints tooled. Properly prepared concrete will have an open texture similar to fine grit sandpaper.

2. Flashings:

- a. All flashings are by others and must be installed in accordance with specific manufacturer's requirements. Where appropriate, end-dams must be provided.
- b. Openings must be flashed prior to window/door, HVAC, etc. installation. Refer to Senergy's Secondary Moisture Protection Barrier Guidelines for Senergy Stucco Wall System bulletin for further guidance.
- c. Windows and openings shall be flashed according to design and building code requirements.
- d. Individual windows that are ganged to make multiple units require continuous head flashing and/or the joints between the units must be fully sealed.

3. Roof: Verify that all roof flashings have been installed in accordance with the guidelines set by the Asphalt Roofing Manufacturers Association (ARMA).

4. Kick-out flashing: Kick-out flashing must be installed where required. The kick-out flashing must be leak-proof and angled (min 100°) to allow for proper drainage and water diversion. Refer to Senergy's Sentry Stucco Plus Wall System typical details.

C. Do not proceed until all unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect all surrounding areas and surfaces from damage and staining during application of Senergy Sentry Stucco Plus Wall System.

B. Protect finished work at end of each day to prevent water penetration.

3.3 MIXING

General: No additives are permitted unless specified in product mixing instructions. Close containers when not in use. Prepare in a container that is clean and free of foreign substances. Do not use a container which has contained or been cleaned with a petroleum-based product. Clean tools and equipment with water immediately after use. Dried material can only be removed mechanically.

A. Air/Water-Resistive Barriers:

- 1. SENERSHIELD-R: Mix with a clean, rust-free paddle and drill until thoroughly blended. Do not add water.

B. Stucco Base Coat:

- 1. STUCCOBASE PREMIX: Use mixer which is clean and free of foreign substances. Add 2-2.5 gallons (7.6-9.5 liters) of clean potable water to mixer. Slowly add one bag of STUCCOBASE PREMIX. Mix for one minute at normal

mixing speed. Allow material to set for 2-4 minutes with mixing blades at rest. Then re-mix, adding water to achieve desired consistency. Desired consistency varies with type of application (trowel or gun), substrate (paper-backed lath or block) and whether the stucco is applied to a wall or a ceiling. Note: Continuous mixing may cause excessive air entrainment.

- C. Senergy Base Coat:
 - 1. ALPHA DRY Base Coat: Mix and prepare each bag in a 5-gallon (19-liter) pail. Fill the container with approximately 1.5-gallons (5.6-liters) of clean, potable water. Add ALPHA DRY Base Coat in small increments, mixing after each additional increment. Mix ALPHA DRY Base Coat and water with a clean, rust-free paddle and drill until thoroughly blended. Additional ALPHA DRY Base Coat or water may be added to adjust workability
- D. STUCCOPRIME Primer: Mix the factory-prepared material with a clean, rust-free paddle and drill until thoroughly blended. A small amount of clean, potable water may be added to adjust workability. Do not overwater.
- E. Senergy Finishes: SENERFLEX TERSUS Finish: Mix the factory-prepared material with a clean, rust-free paddle and drill until thoroughly blended. A small amount of clean, potable water may be added to adjust workability. Do not overwater.

3.4 APPLICATION

- A. Accessories: Attach Window/Door Drip Edge level and per manufacturer's instructions.
- B. Air/Water-Resistive Barrier:
 - 1. All sheathing joints and windows/openings must be protected and the air/water-resistive barrier applied in accordance with Air/Water-Resistive/Vapor Barrier Application Guideline technical bulletin.
 - 2. Substrate shall be dry, clean, sound, and free of releasing agents, paint, or other residue or coatings. Verify substrate is flat, free of fins or planar irregularities greater than 1/4" in 10' (6.4 mm in 3 m).
 - 3. Unsatisfactory conditions shall be corrected before application of the Senergy air/water-resistive barriers.
 - 4. Apply the SHEATHING FABRIC and Senergy air/water-resistive barrier in accordance with the Senergy air/water-resistive barrier product bulletin.
 - 5. Apply the MAXFLASH in accordance with MAXFLASH product bulletin.
 - 6. Installed materials shall be checked before continuing system application.
 - 7. Ensure SHEATHING FABRIC Senergy air/water-resistive barrier or MAXFLASH overlaps the top flange of the starter track.
 - 8. Installed materials shall be checked before continuing system application.
- C. Slip Sheet:
 - 1. Install slip sheet over dry Senergy Air/Water-Resistive Barrier per manufacturer's recommendations.
- D. Trim: Refer to Senergy Stucco Wall Systems Lath and Trim Accessories technical bulletin.
- E. Lath: Install in accordance with all local code requirements, applicable standards and application procedures.
 - 1. PERMALATH 1000:
 - a. Apply with minimum 3" (76mm) overlap at vertical and horizontal edges and overlap on flange of trim accessories. PERMALATH 1000 can be applied horizontally or vertically and should be applied such that it is flat and free of ripples, wrinkles, etc. Fastener System type appropriate for application and substrate. Fastener spacing 6" o.c. (152 mm) vertically and 16" o.c. (406 mm) horizontally.
 - b. Apply STUCCOBASE within 60 days of PERMALATH 1000 application.

- F. Stucco Base Coat:
1. Senergy Sentry Stucco Plus Wall System application 3/8"-1/2" thickness (9.5-12.7 mm).
 - a. Following surface preparation and installation of the lath and accessories apply selected stucco base mixture to the approved substrate by hand troweling or machine spraying to a thickness of 3/8" to 1/2" (9.5-12.77 mm), completely embedding the lath.
 - b. Use rod and darby to level the applied base coat without exposing the lath.
 - c. After initial set begins and surface has sufficiently hardened, use sponge or hard rubber float as required to fill voids, holes or imperfections, leaving the surface ready to receive Senergy Finish.
 - d. At subcontractor's option, the double back method of application, whereby the first and second coats are applied and cured as one system, may be used. If this system is used, the second coat (brown) should be applied as soon as the first coat is rigid.
 - e. Damp cure for at least 48 hours by lightly and evenly fogging the surface with water at least twice a day. Direct sunlight, hot temperatures, low humidity and windy conditions may make additional fogging necessary.
 - f. Allow stucco base to cure a minimum of 6 days prior to application of EPS board shapes, Senergy Base Coat, STUCCOPRIME or Senergy Finish application.
 2. Senergy Sentry Stucco Plus Wall System application 3/4"-7/8" thickness (19-22mm).
 - a. Nominal plaster base coat thickness:
 - i. First coat "scratch": 3/8" (9.5mm)
 - ii. Second coat "brown": 3/8" (9.5mm)
 - b. Apply selected stucco base mixture to the approved substrate by hand troweling or machine spraying with sufficient force to develop full adhesion between stucco base mixture and the substrate.
 - c. Apply first coat to completely embed lath. Cross rake to provide key for second brown coat. Coat must be uniform in thickness. Ensure the first coat is properly "scratched" and sufficiently rigid to resist cracking prior to application and leveling of the second or "brown" coat.
 - d. Dampen scratch coat, apply second brown coat to provide the required total thickness. Trowel stucco base into trim to seat trim. The lath shall be fully embedded in the coating and shall be completely covered. Coat must be uniform in thickness. Rod off to desired thickness, leveled with screeds, to provide a true, flat plane. Follow this by wood floating or darbying the surface.
 - e. After the surface has sufficiently hardened, use sponge or hard rubber float as required to fill voids, holes or imperfections, leaving the surface ready to receive Senergy Finish.
 - f. Damp cure for at least 48 hours by lightly and evenly fogging the surface with water at least twice a day. Direct sunlight, hot temperatures, low humidity and wind may make additional fogging necessary.
 - g. Allow stucco base to cure a minimum of 6 days prior to application of EPS board shapes, Senergy Base Coat, STUCCOPRIME or Senergy Finish application.
- G. DIAMONDSHIELD Reinforcing Mesh:
1. Base coat shall be applied to achieve reinforcing mesh embedment with no reinforcing mesh color visible.
 2. Install DIAMONDSHIELD over properly cured Senergy Sentry Stucco Plus Wall System "brown coat" of stucco base.
 3. Apply mixed Senergy Base Coat to entire surface of "brown coat" with a stainless-steel trowel to embed the reinforcing mesh.

4. Immediately place DIAMONDSHIELD Reinforcing Mesh against wet base coat and embed the reinforcing mesh into the base coat by troweling from the center to the edges.
5. Lap reinforcing mesh 2 1/2" (64 mm) minimum at edges.
6. Ensure reinforcing mesh is continuous at corners, void of wrinkles and embedded in base coat so that no reinforcing mesh color is visible.
7. If required, apply a second layer of base coat to achieve total nominal base coat/reinforcing mesh thickness of 1/16" (1.6 mm).
8. Allow base coat with embedded reinforcing mesh to dry hard (normally 8 to 10 hours).

H. Decorative Shapes:

1. Apply mixed Senergy Base Coat to entire surface of insulation board using a stainless-steel trowel with 1/2"x 1/2" (13mm x 13mm) notches spaced 1/2" (13mm) apart or 3/8"x 3/8" (10mm x 10mm) notches spaced 3/8" (10 mm) apart.
2. Immediately set shape into place and apply pressure over entire surface of board to ensure positive uniform contact and high initial grab. Do not allow base coat to dry prior to installing.
3. Abut all joints tightly and ensure overall flush level surface.
4. Check adhesion periodically by removing a shape prior to set. Properly installed shapes will be difficult to remove, and Senergy Adhesive/Base Coat will be adhered to both the Stucco Base and the shape.
5. Fill 1/16" (1.6mm) and larger gaps between shapes with slivers of insulation board.
6. Allow application of shapes to dry (normally 8 to 10 hours) prior to application of base coat/reinforcing mesh.
7. Rasp flush any irregularities of the shapes greater than 1/16" (1.6 mm). Senergy Base Coat / Reinforcing Mesh: Base coat shall be applied to achieve reinforcing mesh embedment with no reinforcing mesh color visible.
8. For Senergy FLEXGUARD 4, apply Senergy Base Coat to entire surface of insulation board with a stainless-steel trowel to embed the reinforcing mesh.
9. Immediately place Senergy FLEXGUARD 4 Reinforcing Mesh against wet base coat and embed the reinforcing mesh into the base coat by troweling from the center to the edges.
10. Lap reinforcing mesh 2 1/2" (64 mm) minimum at edges and 3" (75 mm) minimum onto STUCCOBASE.
11. Ensure reinforcing mesh is continuous at corners, void of wrinkles and embedded in base coat so that no reinforcing mesh color is visible.
12. If required, apply a second layer of base coat to achieve total nominal base coat/reinforcing mesh thickness of 1/16" (1.6 mm).
13. Allow base coat with embedded reinforcing mesh to dry hard (normally 8 to 10 hours).

I. STUCCOPRIME:

1. Base coat shall be clean, dry, sound and free of paint, contaminants or other residue or coatings. Verify substrate is flat, free of fins or planar irregularities greater than 1/4" in 10' (6.4 mm in 3 m).
2. Apply STUCCOPRIME to substrate with a sprayer, 3/8" (10 mm) nap roller, or good quality latex paint brush at a rate of approximately 150-250 sq. ft. per gallon (3.6-6.1 m² per liter).
3. STUCCOPRIME shall be dry to the touch before proceeding to the Senergy Finish application.

J. Senergy Finish Coat: SENERFLEX TERSUS FINISH.

1. Apply Senergy Finish directly to the base coat with a clean, stainless steel trowel.
2. Apply and level Senergy Finish during the same operation to minimum obtainable thickness consistent with uniform coverage.
3. Maintain a wet edge on Senergy Finish by applying and texturing continually over the wall surface.

4. Work Senergy finish to corners, joints or other natural breaks and do not allow material to set up within an uninterrupted wall area.
5. Float Senergy Finish to achieve final texture.

3.5 CLEANING

- A. Clean work in accordance with manufacturer's instructions.
- B. Clean adjacent surfaces and remove excess material, droppings, and debris.

3.6 PROTECTION

- A. Protect STUCCOBASE from rain, snow and frost for 48-72 hours following application.
- B. Protect Senergy base coat, air/water-resistive barriers, primer and finish from rain and temperatures below 40°F (4°C) for 24 hours or until dry.
- C. Protect installed construction.

END OF SECTION 09 24 00

SECTION 09 30 14 - PORCELAIN TILING

PART 1 - GENERAL

1.1 SCOPE

A. GENERAL

1. SECTION INCLUDES
 - a. Porcelain Mosaic Tile
 - b. Crack Isolation
 - c. Transition Trims
 - d. Porcelain trim
 - e. Tile and grout sealant

B. REFERENCES

1. ANSI A108.1A, 1999 - Specifications for Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar.
2. ANSI A108.1B, 1999 - Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar.
3. ANSI A108.1C, 1999 - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar -or- Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar.
4. ANSI A108.4, 1999 - Specifications for Ceramic Tile Installed with Organic Adhesives or Water-Cleanable Tile Setting Epoxy Adhesive.
5. ANSI A108.5, 1999 - Specifications for Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
6. ANSI A108.6, 1999 - Specifications for Ceramic Tile Installed with Chemical-Resistant, Water-Cleanable Tile-Setting and -Grouting Epoxy.
7. ANSI A108.8, 1999 - Specifications for Ceramic Tile Installed with Chemical-Resistant Furan Mortar and Grout.
8. ANSI A108.9, 1999 - Specifications for Ceramic Tile Installed with Modified Epoxy Emulsion Mortar/Grout.
9. ANSI A108.10, 1999 - Specifications for Installation of Grout in Tilework.
10. ANSI A118.1, 1999 - Standard Specification for Dry-Set Portland Cement Mortar.
11. ANSI A118.3, 1999 - Chemical-Resistant, Water-Cleanable, Tile-Setting and -Grouting Epoxy and Water-Cleanable Tile-Setting Epoxy Adhesive.
12. ANSI A118.4, 1999 - Latex-Portland Cement Mortar.
13. ANSI A118.5, 1999 - Chemical-Resistant Furan Mortar and Grout.
14. ANSI A118.6, 1999 - Standard Ceramic Tile Grouts.
15. ANSI A118.7, 1999 - Polymer Modified Cement Grouts
16. ANSI A118.8, 1999 - Modified Epoxy Emulsion Mortar/Grout.
17. ANSI A118.9, 1999 - Test Methods and Specifications for Cementitious Backer Units
18. ANSI A118.10, 1999 - Load bearing, Bonded, Waterproof Membranes for Thinset Ceramic Tile and Dimensional Stone.
19. ANSI A118.11, 1999 - Exterior Grade Plywood (EGP) Latex-Portland Cement Mortar.
20. ANSI A136.1, 1999 - Organic Adhesives for Installation of Ceramic Tile.
21. ANSI A137.1, 1988 - Specifications for Ceramic Tile.
22. ASTM C50 - Standard Specification for Portland Cement.
23. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
24. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
25. ASTM C241 - Test Method For Abrasion Resistance of Stone Subjected to Foot Traffic.
26. ASTM C503 - Specification for Marble Building Stone (Exterior).
27. ASTM C615 - Specification for Granite Dimension Stone.
28. ASTM C629 - Specification for Slate Dimension Stone.
29. ASTM C847 - Standard Specification for Metal Lath.

30. ASTM C1028 - Test method for Determining the Static Coefficient of Friction or Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull meter Method.
31. ASTM D4397 - Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications.
32. TCA (HB) - Handbook for Ceramic Tile Installation; Tile Council of America, Inc.

C. PERFORMANCE REQUIREMENTS

1. Static Coefficient of Friction: Tile on walkway surfaces shall be provided with the following values as determined by testing in conformance with ASTM C 1028.
 - a. Level Surfaces: Minimum of 0.6 (Wet).
 - b. Step Treads: Minimum of 0.6 (Wet).
 - c. Ramp Surfaces: Minimum of 0.8 (Wet).

D. SUBMITTALS

1. Submit manufacturer's data sheets on each product to be used, including:
 - a. Preparation instructions and recommendations.
 - b. Storage and handling requirements and recommendations.
 - c. Installation methods.
2. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.
3. Selection Samples: Color charts illustrating full range of colors and patterns.
4. Selection Samples: Samples of actual tiles for selection.
5. Samples: Mount tile and apply grout on two plywood panels, 12" x 12" in size illustrating pattern, color variations, and grout joint size variations.
6. Submit sample of transition trims with color charts or chips indicating all available colors.
7. Submit profile of threshold indicating compliance with ADAAG 2010.
8. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

E. QUALITY ASSURANCE

1. Maintain one copy each of all Referenced standards and specifications on site. Include the TCNA Handbook, ANSI A108 Series, ANSI A118 Series ANSI A136.1 and ANSI A137.1 and others as specified under paragraph References.
2. Installer Qualifications: Company specializing in performing the work of this section with minimum five (5) years experience.
3. Single Source Responsibility:
 - a. Obtain each type and color of tile from a single source.
 - b. Obtain each type and color of mortar, adhesive and grout from the same source.

F. DELIVERY, STORAGE, AND HANDLING

1. Deliver and store products in manufacturer's unopened packaging until ready for installation.

2. Protect adhesives and liquid additives from freezing or overheating in accordance with manufacturer's instructions.
3. Store tile and setting materials on elevated platforms, under cover and in a dry location and protect from contamination, dampness, freezing or overheating.

G. ENVIRONMENTAL REQUIREMENTS

1. Do not install adhesives in an unventilated environment.
2. Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.

H. ATTIC STOCK

1. Provide the Owner with 2% of each tile specified (color, size, trims, etc.) in unopened boxes, clearly labeled.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. American Olean as provided by BPI, Harahan, LA, 504-733-3662, Contact: Connie Banderas or William LeBlanc, 504-733-3662.
- B. Daltile as provided by Daltile Corporation, Dallas, TX 800-933-TILE.
- C. Or prior approved equals. The Architect's decision for equal match shall be final.

2.2 TILE

- A. General: Provide tile that complies with ANSI A137.1 for types, compositions and other characteristics indicated. Provide tile in the locations and of the types colors and pattern indicated on the Drawings and identified in the Schedule and the end of this Section. Tile shall also be provided in accordance with the following:
 1. Factory Blending: For tile exhibiting color variations within the ranges selected under Submittal of samples, blend tile in the factory and package so tile taken from one package shows the same range of colors as those taken from other packages.
 2. Mounting: For factory mounted tile, provide back or edge mounted tile assemblies as standard with the manufacturer, unless otherwise specified.
 3. Factory Applied Temporary Protective Coatings: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with a continuous film of petroleum paraffin wax applied hot. Do not coat unexposed tile surfaces.
- B. Floors: 2" x 2" Unglazed Porcelain Mosaic Tile; ANSI A137.1, and as follows:
 1. Product:
 - American Olean, unglazed porcelain mosaics - "Theoretical" mosaic tile.
 - Daltile, color body porcelain mosaics - "Keystones" mosaic tile.
 2. Moisture Absorption: 0 to 0.5 percent.
 3. Size and Shape: As indicated on drawings.
 4. Thickness: 1/4 inch (6.4 mm).
 5. Edges: Cushioned.
 6. Surface Finish: Unglazed without abrasive admixture, coefficient of friction equal to or exceeding 0.6 wet.
 7. Colors: To be selected from manufacturer's standard range, groups 1 thru 3.

8. Pattern: As indicated on the Drawings.
 9. Mounted Sheet Size: 12 by 24 inches (305 by 610 mm).
 10. Trim Units: Matching bead, 6" x 12" cove base, and surface bullnose shapes in sizes coordinated with field tile and as indicated in drawings.
- C. Walls: 12" x 24" Porcelain Tile; ANSI A137.1 and as follows:
1. Product:
American Olean, color body porcelain - "Theoretical" wall tile.
Daltile, color body porcelain - "Formula" wall tile.
 2. Moisture Absorption: 0 to 0.5 percent.
 3. Size and Shape: As indicated on drawings.
 4. Thickness: 1/4 inch (6.4 mm).
 5. Edges: Cushioned.
 6. Surface Finish: Unglazed without abrasive admixture,
 7. Colors: To be selected from manufacturer's standard range, groups 1 thru 3.
(Available colors shall include American Olean "Theoretical Bold" line as accent options. Available colors shall include Daltile "Volume 1.1" line as accent options.)
 8. Pattern: As indicated on the Drawings.
 9. Mounted Sheet Size: 12 by 24 inches (305 by 610 mm).
 10. Trim Units: Matching bead, cove, and surface bullnose shapes in sizes coordinated with field tile and as indicated in drawings.

2.3 TRIM AND ACCESSORIES

- A. Stone Thresholds shall not be used on this project. Provide type 304 stainless steel Pre-manufactured Transition Profiles for use with ceramic tile or stone of appropriate size and configuration at all floor and wall transitions involving porcelain or mosaic tiles. All transitions shall have fins to permanently embed transitions into tile setting material. All thresholds and transitions shall comply with the ADAAG-2010.
1. Materials:
 - a. Schluter -Schiene, Schluter -Reno U, Schluter -Reno, Schluter - Reno TK , Schluter-RONDEC or appropriate transition by Schluter in finish indicated. All transitions shall be sized as required for adjoining materials.
 2. Or prior equal as manufactured by Blanke or Mercer
 3. Color/Finish:
 - a. Type 304 stainless steel.
 4. Size:
 - a. Pre-fabricated in the sizes and profiles as required to accommodate adjoining materials.
 - b. Profile of transitions shall comply with ADAAG 2010.
 5. Stainless steel trims shall be used in the following minimum locations:
 - a. Open edges of floor tiles/ wall tiles.
 - b. Transitions between floor finishes of differing heights
 - c. Thresholds at door openings
 - d. Expansion and control joints
 - e. Exposed outside wall corners bullnose trim

2.4 SETTING MATERIALS FOR PORCELAIN AND MOSAIC TILE

Shall be products manufactured by Laticrete Int. Inc., 1-800-243-4788 (www.laticrete.com) or prior approved equal.

- A. FLOOR TILE (Thin Set Method TCNA F-131-09):
1. Thinset Tile Bonding Coat: shall be Laticrete 254 Platinum.
 2. Waterproofing and Crack Suppression Membrane: shall be Laticrete 9255 "Hydroban" (liquid applied).

3. Epoxy Grout: shall be Laticrete "Spectralok Pro Epoxy Grout. (ANSI 118.3)
 4. Expansion and control joint sealant shall be Laticrete Latasil; installed as per TCNA Method "EJ-171".
 5. Grout release agent shall be Miracle 511 Impregnator as manufactured by Miracle Sealants Company.
- B. WALL TILE (Thin Set Method TCNA W202-09):
1. Thinset Tile Bonding Coat: shall be Laticrete 254 Platinum.
 2. Waterproofing and Crack Suppression Membrane: shall be Laticrete 9255 "Hydroban" (liquid applied). (On all walls)
 3. Latex Portland Cement Grout: shall be Laticrete "1500" Sanded Grout. (ANSI 118.3)
 4. Expansion and control joint sealant shall be Laticrete Latasil; installed as per TCNA Method "EJ-171".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are dust-free, and free of substances which would impair bonding of setting materials to surfaces and are smooth and flat within tolerances specified in ANSI A137.1.
- B. Verify that concrete surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.
- C. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

- A. Protect surrounding work from damage.
- B. Remove any curing compounds or other contaminants.
- C. Vacuum clean surfaces and damp clean.
- D. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.
- E. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.3 INSTALLATION - GENERAL

- A. Install tile and grout in accordance with applicable requirements of ANSI A108.1 through A108.13, manufacturer's instructions, and TCA Handbook recommendations.
- B. Lay tile to pattern indicated. Arrange pattern so that a full tile or joint is centered on each wall and that no tile less than 1/2 width is used. Do not interrupt tile pattern through openings.
- C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
- D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.
- E. Form internal angles square and external angles bullnosed.

- F. Install ceramic accessories rigidly in prepared openings.
- G. Install non-ceramic trim in accordance with manufacturer's instructions.
- H. Install thresholds where indicated.
- I. Sound tile after setting. Replace hollow sounding units.
- J. Keep expansion joints free of adhesive or grout. Apply sealant to joints.
- K. Allow tile to set for a minimum of 48 hours prior to grouting.
- L. Grout tile joints. Use standard grout unless otherwise indicated.
- M. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.
- N. Grout release agent is required due to the use of epoxy grout on floors. Any tile found to have grout hazing after cleaning and curing shall be removed, regardless of location.

3.4 ESTABLISHING SLOPE TO DRAIN FOR CERAMIC TILE FLOORS

- A. Structural concrete slabs shall be sloped to drain in all toilet room areas scheduled to receive tile. This has been designed to allow the tile to slope gradually and consistently from all points to the floor drains. (Minimum slope shall be 3/4" to drains in Group Restrooms and 3/8" in Unisex Restrooms).
- B. The floor tile installer shall verify exact heights of all floor drains prior to setting of tiles. Coordinate any adjustments needed to provide drain heights which will produce total and gradual slopes to drain from perimeters of tiled areas to floor drains. Do not exceed 1 on 50 slope as per ADAAG, 2010 (approximately 1/4" per foot).

3.5 LOCATION OF EXPANSION JOINTS

- A. Located expansion joints as per ANSI An 3.4 and An 3.7. Expansion joints shall be spaced a maximum of 24'0" o.c. in any direction.
- B. Joints shall be the same width as grout joints but not less than 1/4".
- C. Expansion joints shall be located above all construction joints, cold joints, and structural expansion joints.
- D. Expansion joints shall continue up wall base in an unbroken run.

3.6 CLEANING

- A. Clean excess mortar from veneer surfaces with water before they harden and as work progresses. Do not contaminate open grout/caulk joints while cleaning. Sponge and wash veneers diagonally across joints. Do not use acids for cleaning. Polish with clean dry cloth. Remove surplus materials and leave premises broom clean.

3.7 PROTECTION OF FINISHED WORK

- A. Do not permit traffic over finished floor surface for 72 hours after installation.
- B. Cover floors with kraft paper and protect from dirt and residue from other trades.
- C. Where floor will be exposed for prolonged periods cover with plywood or other similar type walkways.

END OF SECTION 09 30 14

SECTION 09 30 16 - QUARRY TILE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Quarry tile flooring and base.
- B. Quarry tile trim and accessories.
- C. Crack isolation and waterproofing membranes.
- D. Epoxy grout.
- E. Stainless steel transition profiles.
- F. Tile and grout sealant.

1.2 REFERENCES

- A. ANSI A108/A118/A136.1 (2024) – American National Specifications for the Installation of Ceramic Tile.
- B. ANSI A137.1 (2022) – Specifications for Ceramic Tile.
- C. ANSI A326.3 (2021) – Dynamic Coefficient of Friction Test Method.
- D. ASTM C150 – Standard Specification for Portland Cement.
- E. ASTM C144 – Aggregate for Masonry Mortar.
- F. ASTM C207 – Hydrated Lime for Masonry Purposes.
- G. ASTM D4397 – Polyethylene Sheeting for Construction Applications.
- H. TCNA Handbook for Ceramic, Glass, and Stone Tile Installation (latest edition).
- I. TCNA EJ171 (latest edition) – Guide for Expansion Joint Placement.
- J. 2010 ADA Standards for Accessible Design.

1.3 PERFORMANCE REQUIREMENTS

- A. Slip Resistance (ANSI A326.3 DCOF AcuTest):

- 1. Interior walkways and level surfaces: Minimum DCOF ≥ 0.42 (wet).
- 2. Ramps and incline surfaces: Minimum DCOF ≥ 0.60 (wet).

1.4 SUBMITTALS

- A. Submit 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 methods.
- B. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, quarry tile accessories, and setting details.
- C. Selection Samples: Color charts illustrating full range of colors and patterns.
- D. Selection Samples: Samples of actual tiles for selection.
- E. Samples: Mount tile and apply grout on two plywood panels, 12" x 12" in size illustrating pattern, color variations, and grout joint size variations.
- F. Submit sample of transition trims with color charts or chips indicating all available colors.
- G. Submit profile of threshold indicating compliance with ADAAG 2010.

- H. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum five (5) years' experience.
- B. Single Source Responsibility:
 - 1. Obtain each type and color of tile from a single source.
 - 2. Obtain each type and color of mortar, adhesive and grout from the same source.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in manufacturer's unopened packaging until ready for installation.
- B. Protect adhesives and liquid additives from freezing or overheating in accordance with manufacturer's instructions.
- C. Store tile and setting materials on elevated platforms, under cover and in a dry location and protect from contamination, dampness, freezing or overheating.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not install adhesives in an unventilated environment.
- B. Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.

1.8 ATTIC STOCK

- A. Provide the Owner with 2% of each tile specified (color, size, trims, etc.) in unopened boxes, clearly labeled.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: DalTile Corporation, Dallas, TX;
- B. American Olean
- C. Or prior approved equals.

2.2 TILE

- A. General: Provide tile that complies with ANSI A137.1 for types, compositions and other characteristics indicated. Provide tile in the locations and of the types colors and pattern indicated on the Drawings and identified in the Schedule and the end of this Section. Tile shall also be provided in accordance with the following:

1. Factory Blending: For tile exhibiting color variations within the ranges selected under Submittal of samples, blend tile in the factory and package so tile taken from one package shows the same range of colors as those taken from other packages.
 2. Mounting: For factory mounted tile, provide back or edge mounted tile assemblies as standard with the manufacturer, unless otherwise specified.
 3. Factory Applied Temporary Protective Coatings: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with a continuous film of petroleum paraffin wax applied hot. Do not coat unexposed tile surfaces.
- B. Unglazed Quarry Tile: ANSI A137.1, and as follows:
1. Product: Daltile Quarry "Suretread," 6" x 6"; or American Olean, "Surestep II" - tread pattern
 2. Moisture absorption less than 3.0 percent.
 3. Size and Shape: 6 inch square nominal.
 4. Thickness: 3/8 inch.
 5. Edges:
 - a. Square.
 6. Coefficient of Friction: Minimum ANSI A326.3 values as specified..
 7. Colors: To be selected from manufacturer's standard range.
 8. Trim Units: Matching bullnose, cove and cove base in sizes coordinated with field tile.

2.3 TRIM AND ACCESSORIES

- A. Provide Type 304 stainless steel Pre-manufactured Transition Profiles for use with ceramic tile or stone appropriate size and configuration at all transitions involving porcelain or mosaic tiles. All transitions shall have fins to permanently embed transitions into tile setting material. All thresholds and transitions shall comply with the ADAAG-2010. (Stone thresholds **shall not** be used on this project.)
1. Material:
 - a. Schluter- Schiene, Schluter – Reno U, Schluter- Reno, Schluter- Reno TK or appropriate transition by Schluter in finish indicated. All transitions shall be sized as required for adjoining materials.
 2. Or prior approved equal as manufactured by Blanke or Mercer
 3. Color/Finish:
 - a. Type 304 stainless steel.
 4. Size:
 - a. Pre-fabricated in the sizes and profiles as required to accommodate adjoining materials.
 - b. Submit profile of transition indicating compliance with ADAAG 2010.
 5. Stainless Steel Trims shall be used in the following minimum location:
 - a. Open edges of floor tiles.
 - b. Transitions between floor finishes of differing heights.
 - c. Thresholds at door openings.
 - d. Expansion and control joints.

2.4 SETTING MATERIALS FOR QUARRY TILE

Shall be products manufactured by Laticrete Int. Inc., 1-800-243-4788 (www.laticrete.com) or prior approved equal.

- A. Mortar Bed Materials:
 - 1. Thick bed mortar shall be Laticrete 226 with Laticrete 3701 mortar admix.
 - 2. Bond coat shall be Laticrete 254 Platinum.
- B. Crack suppression membrane shall be Laticrete 9235.
- C. Industrial Epoxy Grout shall be Latipoxy 2000 by Laticrete
 - 1. Color of grout to be selected by Owner/Architect.
- D. Expansion and control joint sealant shall be Laticrete Latasil; installed as per ATCI Method "EJ-171".
- E. Reinforcing mesh: 2" x 4" size weave of 16/16 wire size, welded fabric, galvanized.
- F. Cleavage membrane shall be 15# felt or 4 mil polyethelene.
- G. Grout release agent shall be Miracle 511 Impregnator as manufactured by Miracle Sealants Company.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that sub-floor surfaces are dust-free, and free of substances which would impair bonding of setting materials to sub-floor surfaces, and are smooth and flat within tolerances specified in ANSI A137.1.
- B. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.
- C. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

- A. Protect surrounding work from damage.
- B. Remove any curing compounds or other contaminants.
- C. Vacuum clean surfaces and damp clean.
- D. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.
- E. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.3 INSTALLATION - GENERAL

- A. Install tile and grout in accordance with applicable requirements of ANSI A108.1 through A108.13, manufacturer's instructions, and TCA Handbook recommendations.
- B. Lay tile to pattern indicated. Arrange pattern so that a full tile or joint is centered on each wall and that no tile less than 1/2 width is used. Do not interrupt tile pattern through openings.
- C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
- D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.
- E. Form internal angles square and external angles bullnosed.
- F. Install quarry tile accessories rigidly in prepared openings.
- G. Install non-ceramic trim in accordance with manufacturer's instructions.
- H. Install thresholds where indicated.
- I. Sound tile after setting. Replace hollow sounding units.
- J. Keep expansion joints free of adhesive or grout. Apply sealant to joints.
- K. Allow tile to set for a minimum of 48 hours prior to grouting.
- L. Grout tile joints. Use epoxy grout unless otherwise indicated.
- M. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.
- N. After floor is thoroughly cleaned, install grout and tile sealer to entire floor surface in strict accordance with manufacturer's recommendations.
- O. Grout release agent is required due to the use of epoxy grout on floors. Any tile found to have grout hazing after cleaning and curing shall be removed, regardless of location.

3.4 INSTALLATION - FLOORS - MORTAR BED METHODS

- A. Over interior concrete substrates, install in accordance with TCA Handbook Method F111, with cleavage membrane, unless otherwise indicated.
 - 1. Where waterproofing membrane is indicated, with standard grout or no mention of grout type, install in accordance with TCA Handbook Method F121.
 - 2. Where epoxy bond coat and grout are indicated, install in accordance with TCA Handbook Method F132, bonded.
 - 3. Where epoxy or furan grout is indicated, but not epoxy or furan bond coat, install in accordance with TCA Handbook Method F114, with cleavage membrane.
- B. Cleavage Membrane: Lap edges and ends.

- C. Waterproofing Membrane: Install as specified in ANSI A108.13.
- D. Mortar Bed Thickness: 1-1/4 to 2 inch (32 to 51 mm) maximum, unless otherwise indicated.

3.5 INSTALLATION - WALL TILE / COVE BASE TILE

- A. Over gypsum wallboard on wood or metal studs install in accordance with TCA Handbook Method W243, thin-set with dry-set or latex-portland cement bond coat, unless otherwise indicated.
 - 1. Where mortar bed is indicated, install in accordance with TCA Handbook Method W222, one coat method.
 - 2. Where waterproofing membrane is indicated other than at showers and bathtub walls, install in accordance with TCA Handbook Method W222, one coat method.
- B. Over interior concrete and masonry install in accordance with TCA Handbook Method W202, thin-set with dry-set or latex-portland cement bond coat.

3.6 ESTABLISHING SLOPE TO DRAIN FOR QUARRY TILE FLOORS

- A. Structural concrete slabs shall be depressed 2" minimum in all areas scheduled to receive tile. This has been designed to allow the mortar bed and tile to slope gradually and consistently from all points in the room to the floor drains.
- B. The inclusion of marble thresholds at all transitions will allow the mortar bed to be installed to a thickness higher than surrounding floor tiles, to increase slope to drain as required.
- C. The floor tile installer shall verify exact heights of all floor drains prior to setting of mortar beds or tiles. Coordinate any adjustments needed to provide drain heights which will produce total and gradual slopes to drain from perimeters of tiled areas to floor drains. Do not exceed 1 on 50 slope as per ADAAG, 1994 (approximately 1/4" per foot).

3.7 LOCATION OF EXPANSION JOINTS

- A. Located expansion joints as per ANSI An 3.4 and An 3.7. Expansion joints shall be spaced a maximum of 24'0" o.c. in any direction.
- B. Joints shall be the same width as grout joints but not less than 1/4".
- C. Expansion joints shall be located above all construction joints, cold joints, and structural expansion joints.
- D. Expansion joints shall continue up wall base in an unbroken run.

3.8 CLEANING

- A. Clean excess mortar from veneer surfaces with water before they harden and as work progresses. Do not contaminate open grout/caulk joints while cleaning. Sponge and wash veneers diagonally across joints. Do not use acids for

cleaning. Polish with clean dry cloth. Remove surplus materials and leave premises broom clean.

3.9 PROTECTION OF FINISHED WORK

- A. Do not permit traffic over finished floor surface for 72 hours after installation.
- B. Cover floors with kraft paper and protect from dirt and residue from other trades.
- C. Where floor will be exposed for prolonged periods cover with plywood or other similar type walkways.

END OF SECTION 09 30 16

SECTION 09 46 66 – WOOD ATHLETIC FLOORING

A. GENERAL

1. Description
 - a. Related work specified under other sections.
 1. 03 30 00 – Cast-in-place Concrete
 - a. Slab depression is:
2-1/2" for 25/32" flooring
 - b. The general contractor shall furnish and install the concrete subfloor depressing the slab sufficiently to accommodate the floor system. The slab shall be steel troweled and finished smooth to a tolerance of 1/8" in any 10' radius by the general contractor. High spots shall be ground level, and low spots filled in with approved leveling compound by the general contractor to the full approval of the installer.
 2. Thresholds - section 0554 - metal expansion joints
2. References
 - a. MFMA - Maple Flooring Manufacturers Association
 - b. DIN - Performance Standard DIN 18032, Part 2.
 - c. MFMA PUR Standards – Performance and Uniformity Rating
3. Quality Assurance
 - a. Manufacturer
 1. Manufacturer of resilient flooring shall be a firm specializing in manufacturing products specified in this section.
 2. Manufacturer of flooring and subfloor components must be ISO 9001:2015.Certified to assure quality control of materials provided.
 3. Basis of design shall be "NeoShok" sports floor system as provided by Conner Hardwood Flooring, www.connorfloor.com, (800-833-7144) or AcerFlex TP 3/4" Blue 55 Durometer Aerobics Pad as manufactured by Acer Flooring, www.acerflooring.com, (1-877-582-1181).
 4. The two flooring systems indicated in 3.a.3. above are pre-approved equals.
 - b. Installer
 1. The complete installation of the flooring system, as described in the scope of these specifications, shall be carried out by an experienced installer, and the work shall be performed in accordance with most recent installation instructions of the manufacturer.
 2. Installer shall be liable for all matters related to installation for a period of one year after the floor has been substantially installed and completed.
 - c. Performance Testing
 1. Flooring system shall have been independently tested and evaluated for Athletic Performance according to the International Standard DIN 18032, Part 2.
 2. Independent DIN testing laboratory shall have Scientific body membership in the International Association of Sports Surface Sciences (ISSS). Test equipment shall have been calibrated and certified through the ISSS.
 3. DIN testing engineer shall be an ISO 17025 System member rated for each performed test conducted.
 4. Flooring system shall have been independently test and evaluated for Engineering Performance according to the Structural Testing and Engineering Measures (STEM).

4. Submittals
 - a. Specification - Submit Connor NeoShok or AacerFlex specification sheets.
 - b. Sample - Submit one sample of specified system.
 - c. Maintenance Literature - Upon completion of floor installation, send to owner comprehensive maintenance literature with instructions including temperature and humidity ranges for areas where flooring is installed.
5. Working Conditions
 - a. The wood flooring specified herein shall not be installed until all masonry, painting, plaster, tile, etc. work is completed, and overhead mechanical trades and painters have finished in the wood floor areas. The building shall be enclosed and weathertite.
 - b. The concrete subfloor shall be determined dry by industry standard testing procedures, free of foreign materials and turned over to the installer broom clean. Moderate room temperature of 65 degrees or more shall be maintained a week preceding and throughout the duration of the work. Humidity conditions within the building shall approximate the humidity condition that will prevail when the building is occupied.
 - c. Permanent heat, light and ventilation shall be installed and operating during and after installation, maintaining a range of temperature and humidity compatible with the expected low and high moisture content of the flooring. The wood moisture content range is determined by the flooring contractor based on the facility's mechanical controls and/or geographical location.
 - d. Flooring must be stored in a dry, well-ventilated area, not in contact with masonry, to acclimate to building conditions and shall be installed at moisture content compatible with the normally expected environmental range of temperature and relative humidity achieved while the facility is occupied.
 - e. General Contractor shall lock floor area after floor is finished to allow proper cure time. If the general contractor or owner requires use of gym after proper cure time, he shall protect the floor by covering with non marring kraft paper or red rosin paper with taped joints until acceptance by owner of complete gymnasium floor.
 - f. Working conditions as described above shall be followed.
6. Humidity Control
 - a. Since all wood flooring will expand and contract as relative humidity varies, it is important to minimize extremes between low and high. Hardwood flooring is manufactured at moisture content most compatible with a 35%-50% relative humidity range. Geographical regions and available mechanicals determine the typical range of temperature and humidity provides limited shrinkage and growth. Facility managers should make use of available HVAC systems to prevent excessive tightening and shrinkage of flooring.
7. Warranty
 - a. Connor or Aacer warrants that the materials it has supplied will be free from manufacturing defects for a period of one year. The foregoing warranty is in lieu of and excludes all other warranties not expressly set forth herein, whether express or implied in operation of laws or otherwise, including, but not limited to, any implied warranties of merchantability or fitness. This warranty is expressly limited to the flooring materials (goods) supplied by Connor or Aacer. This warranty does not cover floor damage caused (wholly or in part) by fire, winds, floods moisture, other unfavorable atmospheric conditions or chemical actions, nor does it apply to damage caused by ordinary wear, misuse, negligent or intentional misconduct, aging, faulty building construction, concrete

slab separation, faulty or unsuitable subsurface or site preparation, settlement of the building walls or faulty or unprofessional installation of Connor or Acer flooring systems.

- b. Connor or Acer shall not be liable for incidents or consequential losses, damages or expenses directly or indirectly arising from the sale, handling or use of the materials (goods) or from any other cause relating thereto, and their liability hereunder in any case is expressly limited to the replacement of materials (goods) not complying with the agreement, or at their elections, to the repayment of, or crediting buyer with, an amount equal to the purchase price of such materials (goods), whether such claims are for breach of warranty or negligence. Any claim shall be deemed waived by buyer unless submitted to Connor or Acer in writing within 30 days from the date buyer discovered, or should have discovered, any claimed breach.

B. PRODUCTS

1. Acceptable Manufacturers
 - a. Floor system - Subject to compliance with the requirements, provide wood aerobics flooring by one of the following:
 1. Connor NeoShok Floating System - slab depression of 2-1/2" for 25/32" flooring.
(Connor NeoShok Floating System is specified to illustrate the performance and material quality.)
 2. AcerFlex TP - 3/4" Blue 55 Durometer Aerobics Pad System - slab depression of 2-1/2" for 25/32" flooring.
 3. **The above manufacturers are pre-approved equals.**
2. Materials
 - a. **Vapor Barrier - 6-mil polyethylene laid at bottom of concrete recess and turned up a minimum of 1". ASTM E1745 vapor retarder, Class A**
 - b. Install +/- 3/8" treated plywood over entire recessed floor leaving 1-1/2" expansion at the perimeter. **Verify thickness of plywood in order to achieve the top of maple floor and adjacent carpet tile at the same horizontal plane.**
 - c. Resilient Pads
 1. Connor NeoShok pads, 3/4", hemispherical, two stage, polyurethane, Black-50D durometer.
 - d. Subfloor - 2 layers of 15/32" APA PS 1 Structural I, rated plywood sheathing, Exposure 1.
 - e. Flooring (Connor Laytite Maple)
 1. 25/32" x 2-1/4", Second & Better Grade, Northern Hard Maple Flooring, TGEM (Tongue and Groove End Matched), MFMA Grade marked and stamped as manufactured by Connor Hardwood Floors, Amasa, MI.
 - f. Fasteners
 1. Flooring fasteners - 2" barbed cleats or coated staples.
 2. Subfloor fasteners - 1" staples
 - g. Finish Materials - Connor oil modified polyurethane seal and finish.
 - h. Game Lines - Games line paint shall be compatible with finish.
 - i. Wall Base - 3" x 4", heavy duty, molded, vented cove base with pre-molded outside corners.

C. EXECUTION

1. Execution

- a. Inspect concrete slab for proper tolerance and dryness. Report any discrepancies to general contractor and Architect in writing.
 - b. Concrete slab shall be broom cleaned by general contractor.
 - c. Installer shall document all working conditions provided in General Specifications prior to commencement of installation.
2. Installation
 - a. Subfloor
 1. Cover concrete with poly, sealing with tape and lapping joints a minimum of 6".
 2. Subfloor
 - a. Install lower layer of subfloor perpendicular to finish maple flooring spacing all edges 1/4" and stagger joints 4'. Provide 1-1/2" expansion voids at perimeter and at all vertical obstruction. The underside of first layer shall have NeoShok pads attached 12" on center (32 per sheet) and 6" from edges on all sides. Install solid blocking at doorways.
 - b. The second layer of subfloor shall be laid at a 45-degree angle over the first layer, spacing all edges 1/4" stagger joints 4'. Provide 1-1/2" expansion voids at perimeter and at all vertical obstructions. Attach second layer of subfloor with fasteners 12" on center.
 - b. Maple Flooring
 1. Install maple flooring by power nailing or stapling approximately 12" on center with end joints properly driven up.
 2. If required, size joints between flooring strips to allow for intermediate expansion in accordance with local humidity conditions.
 3. Provided 1-1/2" expansion voids at perimeter and at all vertical obstructions.
3. Finishing
 - a. Maple Flooring
 1. Machine sand with coarse, medium, and fine paper to a smooth, even and uniform surface.
 2. Remove sanding dust from entire surface by tack or vacuum.
 3. Inspect entire area of floor to insure that surface is acceptable for finishing, clean and completely free from sanding dust.
 4. Apply two (2) coats of approved seal and two (2) coats of approved finish per manufacture's instructions.
 5. Buff and clean floor between coats.
4. Base Installation
 - a. Install vent cove base to walls with base cement or manufacturer's approved adhesive. Use pre-molded outside corners and mitered inside corners.
5. Cleaning
 - a. Remove excess and waste materials from the area of work.

SECTION 09 51 00 - ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SCOPE

- A. Furnish all labor, materials, services, equipment and perform all work and services necessary for or incidental to the furnishing and installation complete, of coiling doors and grilles as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.
- B. It shall be the responsibility of this subcontractor to coordinate the acoustical ceiling suspension system with all phases of the work that shall be using his layout to locate their work such as light fixtures, speakers, A/C grilles, diffusers, sprinkler heads, etc. Items such as those previously mentioned shall be mounted in the center of the lay-in panels. Contractor may submit equals to items specified herein for prior approval.
- C. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. USG Corp
 - 1. Type I Ceiling - Shall be USG Radar Climaplush #2220, 2'x2'x5/8" Tegular edge ceiling panels for 15/16" USG DONN DX hot dipped galvanized exposed tee grid OR Armstrong Fine Fissured Humiguard #1732 angled tegular for Armstrong Prelude XL grid.
 - a. (In all hallways and corridors throughout use USG Radar Climaplush Fireguard #2225 or Armstrong Fine Fissured Humiguard #1833 Fire Resistant. These tiles shall be 1.05 lbs. per square foot or greater for smoke resistance.)
 - 2. Type II Ceiling - Shall be USG Rockface Climaplush #56335, 2'x2'x5/8" Tegular edge ceiling panels for 15/16" USG DONN ZXLA hot dipped galvanized exposed tee grid with white aluminum cap face OR Armstrong Armatuff Humiguard #861 Tegular edge for Armstrong Prelude PLUS grid.
 - 3. Type III Ceiling - Shall be USG Sheetrock Climaplush Lay-in Ceiling Panels with white vinyl face #3260, 2'x2'x1/2" Square edge for USG DONN ZXLA hot dipped galvanized exposed tee grid with white aluminum cap face OR Armstrong Clean Room VL Humiguard - nonperforated #868 for Armstrong Prelude PLUS grid.
 - 4. Extruded Aluminum Perimeter Trim – shall be installed in Dining Room – Cafeteria Building
 - a. Shall be Armstrong "Axiom Classic" with 8" profile height for use with Prelude Grid system, utilizing all premanufactured inside and outside corners, bracing and splices.
 - b. USG "Compasso Elite" with 8" profile height for use with DONN DX Grid system, utilizing all premanufactured inside an outside corners braces and splices.
- B. General Notes
 - 1. At wet areas, such as restrooms, janitor rooms, kitchen, etc., shall receive a 15/16" USG DONN ZXLA hot dipped galvanized grid with a white aluminum cap face.

2. At all exterior entry foyers and 20' inside the building after the exterior entry or foyer entry shall receive hold-down clips to prevent ceiling uplift. (This includes 20' inside an exit that does not have a foyer.) Armstrong UHDC "Universal Hold Down Clips" or prior approved equal, to prevent ceiling uplift.
3. Install extra wire from the structure for the electrical contractor to independently support lighting fixtures. (Install two (2) extra wires per light fixture)
NOTE! Prior approved equals shall be reviewed.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All ceilings shall be installed according to ASTM C636 Installation of Metal Suspension System for Acoustical Tile and Lay-in Panels.
- B. The suspension system shall be installed according to the general recommended procedures of Ceiling and Interior Systems Contractors Association (CISCA).
- C. Contractor shall, after the project is complete, furnish Owner with 2% of the total amount of tiles of each type used on the project. All of these tiles shall be in unbroken packages for use by the Owner. No broken tiles will be accepted.
- D. Install acoustical tile and panels according to manufacturer recommendations.
- E. Suspend exposed metal grid system by not less than #12 gauge galvanized steel wire hangers

3.2 WORKMANSHIP

- A. The manufacturer of the acoustical panel material shall provide to the Architect and Owner a 10-year product or 15-year system warranty of dimensional stability against sag up to 104 degrees Fahrenheit and 90% relative humidity.
- B. Provide reflected ceiling plan/shop drawings and one sample of finish material for approval prior to installation. (See Section 01 33 23 - Shop Drawings, Product Data and Samples)
- C. Upon completion, the acoustical ceiling work shall be left clean, straight and level without sag or buckle and be acceptable to the Architect.

END OF SECTION 09 51 00

SECTION 09 62 12 - EPOXY FLOORING

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete of Ceramic-Filled Polyamine Epoxy Flooring System (Deco-Tread) as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, and complete installation shall be furnished and installed as part of this work.
- C. Related Work
 - 1. All drawings and general provisions of the contract including General and Special Conditions and Division I, excepting special submittal and quality assurance provisions in this section.
 - 2. Section 0330 - Cast-in-Place Concrete (Concrete for Epoxy Floor areas shall be water cured. Concrete shall be cured for a minimum of 28 days.)
 - 3. Division 15100 - Mechanical/Plumbing (Floor drains, cleanouts, etc. shall be of the "floor-flange" type as manufactured for use with composition floors by most major drain manufacturers.)
 - 4. Section 0120 - Samples and Shop Drawings (Submit manufacturer's technical data, application instructions and general recommendations for the epoxy resin composition flooring. Provide 4" x 4" actual sample of colors selected by Architect from manufacturer's color chart.)

1.2 QUALITY ASSURANCE

- A. Applicator's Qualifications
 - 1. Installation shall be performed by an industrial epoxy flooring specialist with skilled mechanics having not less than three years of satisfactory experience in the application of the type and complexity of system as specified in this section. The industrial epoxy flooring specialist shall be approved in writing by the manufacturer of the epoxy resin composition flooring.
- B. Single-Source Responsibility: Obtain epoxy resin composition flooring materials, including primers, resins, hardening agents, and finish or sealing coats, from a single manufacturer.
- C. Delivery, Storage and Handling

1. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels containing brand name and directions for storage and mixing with other components.
2. Store materials to comply with manufacturer's directions to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

D. Project Conditions

1. Environmental Conditions: Comply with epoxy resin composition flooring manufacturer's directions for maintenance of ambient and substrate temperature, moisture, humidity ventilation, and other conditions required to execute and protect Work.
2. Lighting: Permanent lighting will be in place and working before installing resinous flooring.

E. Manufacturer's representative shall be available to advise applicator on proper surface preparation and application techniques.

1.3 JOB CONDITIONS

A. Apply coatings only under the following conditions:

1. Air and surface temperatures should be between 70°F and 90°F. For application below 70°F, a Tnemec Representative should be contacted for instructions and precautions.
2. Relative humidity is below 75% and the surface temperature is at least 5°F above the dew point.

PART 2 - PRODUCTS

- 2.1 Specified products are those manufactured by Tnemec Company, Inc., North Kansas City, Missouri and are specified as the standard of quality.
- 2.2 Equivalent materials of other manufacturers may be substituted only by prior approval of the architect. Requests for substitution shall include manufacturer's literature for each product giving the name, generic type, descriptive information, solids by volume, recommended film thicknesses and a list of five projects where each product has been used and rendered satisfactory service. No request for substitution shall be considered that would decrease film thickness or offer a change in the generic type of coating or flooring specified.
- 2.3 Products for each specified function and system shall be of a single manufacturer.
- 2.4 Materials (Quartz Flooring System)
 1. First coat: Tnemec Series 241 Ultra-Tread MVT(70 - 80 sq.ft. / kit).
(Broadcast to rejection with Tnemec Series 222 C quartz)
 2. Second coat: Tnemec Series 222 Deco-Tread (80 - 100 sq.ft. / gal)
(Broadcast to rejection with Tnemec Series 222 C quartz)

3. Third coat: Tnemec Series 284 Deco-Clear (10.0 to 12.0 mils)
4. Fourth coat: Tnemec Series 284 Deco-Clear (10.0 to 12.0 mils)
5. Fifth coat: Tnemec Series 285 Satinglaze (4.0 to 6.0 mils)

Important: A sample shall be made for approval of the slip resistance by the owner. (Orange peel finish is required. As indicated in the 2010 ADAAG page A5 the recommended coefficient of friction on the walking surface is between 0.5 and 0.6. This coefficient is recommended for the Epoxy Flooring.)

2.5 Material Preparation

1. Mix materials according to manufacturer's latest printed instructions paying particular attention to mixing times and temperatures.
2. Do not use materials beyond manufacturer's recommended pot life or shelf life.

2.6 It is required that the coefficient of the friction be no less than 0.6.

2.7 Color shall be selected by Architect from manufacturer's color chart.

PART 3 - EXECUTION

3.1 Pre-Work Inspection

- A. Examine surfaces to be coated and report conditions that would adversely affect appearance or performance of systems and which cannot be put into an acceptable condition by preparatory work.
- B. Do not proceed with surface preparation and application until surface is acceptable or authorization to proceed is given by the manufacturer.

3.2 Surface Preparation

A. Concrete Floors (New)

1. Allow new concrete to cure for 28 days. Verify dryness by testing for moisture with "plastic film tape down test" (reference ASTM D 4263). Should moisture be present perform Calcium Chloride test in accordance with ASTM F 1869. If moisture levels are outside the limitations of the flooring manufacturer, consult flooring manufacturer.
2. Remove all oil and greases by degreaser or other suitable means.
3. Mechanically shotblast or scarify floor with self-contained blasting equipment as manufactured by Blastrac to remove all laitance and surface contaminants and achieve a profile equivalent to ICRI CSP 3-5 (Reference SSPC-SP13).
4. After shotblasting, verify that all surfaces are clean, dry and free of any contaminants which could adversely affect the adhesion of the flooring system.

5. At all openings / transition of floor material, The Epoxy Flooring shall be terminated by adding a depression in the slab by cutting $\frac{1}{2}$ " wide x $\frac{1}{2}$ " deep groove. This will create a "beam" edge like termination.
6. Epoxy Flooring shall be coved up perimeter walls a minimum of 8". Transitions of cove to wall shall be radiused. All top edge terminations shall be straight, clean and consistent to produce a finished edge.

3.3 APPLICATION

- A. Materials shall be mixed and applied according to manufacturer's latest printed instructions.
- B. Apply systems to match finish of mock-up sample.
- C. Unless indicated otherwise, slope surfaces to drain.
- D. Allow flooring systems to cure fully in accordance with manufacturer's instructions prior to allowing traffic.
- E. All transitions or terminations at change of flooring material (1/8" vinyl composition tile) shall be prior approved by Architect. (Provide 3" scale detail cuts of all termination conditions.)
- F. NOTE: Prior to floor installation: Repair all surface defects and cracks greater than 1/32" with a mixture of Tnemec Series 201 Epoxoprime and silica fume as recommended by the manufacturer.
- G. In rooms with concrete block walls, the Epoxy Flooring shall be coved at the base block and terminated at the raked top mortar joint to form a straight edge +/- 8" up wall surface. (typ.)

3.4 INSPECTION

- A. Request acceptance of surface preparation prior to applying the flooring material or prior to primer application.
- B. Request acceptance of completed flooring system application.
- C. Correct work that is not acceptable and request reinspection.

3.5 CLEANING

- A. Keep areas clean of excess materials and rubbish during and after application. Remove all spatters from surrounding equipment and substrates and leave area in neat and clean condition.

END OF SECTION 09 62 12

SECTION 09 65 19 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of Resilient Tile Flooring as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, and complete installation shall be furnished and installed as part of this work. Contractor may submit equals to items specified herein for prior approval.
- C. For additional information refer to:
Room finish schedule of plans and all floor plans.
- D. Two percent (2%) of each color tile to be left on job in unbroken packages.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Vinyl Composition Tile:
 - 1. Dimension: Provide 12" x 12" x 1/8"
 - 2. Shall comply with Fed. Spec. SS-T-312 B (1) Type IV, Comp. 1
 - 3. Acceptable manufacturers shall be Armstrong and Tarkett.
 - 4. A maximum of three colors of tiles shall be used in a pattern to be furnished by the Architect. Approved tile groups are:
 - a. Armstrong - "Excelon Imperial Texture" series
 - 1. VCT Type 1 – White
 - 2. VCT Type 2 - Yellow
 - 3. VCT Type 3 – Black
 - b. Tarkett - "Expressions" series to match Armstrong Type 1, 2 and 3 above
 - c. Or prior approved equals
 - 5. Tiles shall be used throughout the project as indicated in room finish schedule and in conjunction with one another such as in borders and simple patterns. Colors and patterns to be selected by the Architect.
- B. Adhesives:
 - 1. Adhesive shall be waterproof and stabilized as recommended by the manufacturer of the material being installed, for the condition and substrate being applied to.
 - a. The Contractor shall report the moisture vapor emissions test results to the Architect, Owner, and manufacturer promptly following the execution of testing. If the manufacturer determines a non-waterproof and stabilized adhesive can be used, a credit for the difference in the cost between the non-waterproof adhesive and originally bid waterproof adhesive shall be issued to the Owner.
 - 2. Asphalt emulsions and other non-waterproof adhesives will not be acceptable.
 - 3. In wet areas a two component polyurethane adhesive (ROP-535) shall be used as manufactured by Roppe Corporation or prior approved equal.
- C. Concrete Slab Primer:
 - 1. Provide non-staining type as required as recommended by the manufacturer of the material being installed.

- D. Supply 4" 100% Vulcanized rubber base in areas called for on room finish schedule, anywhere removed on the project or shown on Contract Documents. (Submit to Architect a color selection.) Preformed internal and external corner pieces shall be used with the appropriate adhesive as manufactured by Johnsonite, (Phone: 1-800-476-7301) or Flexco (Phone: 1-800-633-3151). (4" Base shall be supplied in rolls of 100' minimum and shall be installed to minimize joints.) (Apply continuous adhesive in appropriate width to assure a secure installation of rubber base to the wall surface.)
- E. At all areas requiring transition (where tile ends and new flooring begins) strips use Mercer reducer for tile to terminate into. Reducer shall be anchored securely and permanently to floor. (Prior approved equals shall be reviewed.)

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. Surface Conditions
Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.
- B. Contractor shall verify compatibility of materials used to produce a sound installation.
- C. Preparation:
 - 1. Subfloors:
Verify that substrate is smooth, level, at required finish elevation, and without more than 1/8" in 10'-0" variation from level or slopes shown on the drawings. Prior to laying materials, broom clean or vacuum the surfaces to be covered, and inspect the subfloors.
All areas to receive VCT shall be free of all voids, bumps, ridges, debris, dust, etc. All tiles laid over debris that reflects through VCT face shall be removed from the area, cleaned and replaced with a new VCT tile.
 - 2. Priming:
Apply concrete slab primer if recommended by the resilient flooring manufacturer.
Apply in accordance with the manufacturer's recommendations as approved by the Architect.
 - 3. Floor patch shall be Mapei Planipatch or prior approved equal (latex patch shall not be allowed).
 - 4. This subcontractor represents and warrants that his investigation of the site condition was performed in sufficient detail to disclose the conditions and limitations under which the work is to be performed. On new construction and renovations the quantity of primer, floor patch, etc. necessary for a sound, secure, level elevation shall be furnished and installed as part of this work.
- D. Installation:
 - 1. General: All materials shall be stored at a minimum temperature of 75F, for at least 24 hours before installation. A temperature of at least 75F shall be maintained in the spaces where tile is being installed for at least 48 hours before, during and 48 hours after installation. Adequate ventilation shall be provided to take off moisture and volatile fumes.
Install materials only after finishing operations, including painting, have been completed and after permanent heating system is operating.
Verify that moisture content of concrete slabs, building air temperature, and relative humidity are within the limits recommended by the manufacturers of the materials used.
 - a. Testing for moisture content of concrete slabs shall be executed using commercially produced moisture vapor emission test kits utilizing calcium chloride test method.

1. Test kit including calcium chloride shall be commercially packaged and delivered to the site in sealed factory wrapping.
2. Test kits must comply with ASTM Standards of size and weight.
- b. Execution of Testing
 1. The test site shall be maintained at the same temperature and humidity conditions as anticipated during normal occupancy for 48 hours prior to and during testing.
 2. The number of test sites is determined by square footage of the facility. The minimum number is three (3) in the first 1,000 s.f. and one (1) per additional 1,000 s.f. or additional as per test kit manufacturer.
 3. Test sites shall be cleaned of all curing compounds, adhesive residue, paint sealers, floor covering, etc. for 24 hours prior to testing.
 4. Execute test as per manufacturer's recommendations.
 5. Report all test results in chart form listing test dates, start/stop time, start stop weight, weight gain, moisture vapor emission value as "pounds of emission per 1,000 s.f. per 24 hours".
 6. List test locations on chart.

Maintain reference markers, holes, and openings that are in place or plainly marked for future cutting by repeating on the finish surface as marked in the sub-floor. Use chalk or other nonpermanent marking device. Installation of floor covering will indicate acceptance of that surface by the installing subcontractor.

2. Installing resilient tiles:

Place units with adhesive cement in strict compliance with the manufacturer's recommendations as approved by the Architect.

- a. Butt units tightly to vertical surfaces, nosings, edgings, and thresholds.
- b. Scribe as necessary around obstructions and to produce neat joints.
- c. Place tiles tightly laid, even, and in straight parallel lines.

Lay units from center marks established with principal walls, discounting minor offsets, so that units at opposite edges of the room are of equal width.

- a. Adjust as necessary to avoid use of cut widths less than 3" wide at room perimeters.
- b. Lay units square to axis of the room or space. Match units for color and pattern by using materials from cartons in the same sequence as manufactured and packaged.

Lay with grain in all units running the same direction, unless otherwise directed by the Architect.

Place resilient edge strips tightly butted to units and secure with adhesive, providing at all unprotected edges unless otherwise shown.

3. Contractor shall, after the project is complete, furnish the Owner with 2% of the total amount of tiles of each type used on the project. All of these tiles shall be in unbroken packages for the use by the Owner. No broken tiles will be accepted.

3.2 CLEANING AND PROTECTING

- A. Remove excess adhesive and other blemishes from exposed surfaces, using neutral cleaner recommended by the manufacturer of the resilient materials. Two (2) coats of sealer as recommended by manufacturer shall be applied after cleaning with neutral cleaner. Next, the recommended coat(s) of high solids institutional wax as recommended by the manufacturer shall be applied. Finished work shall be in completely clean, neat and shiny condition.

3.3 EXPOSED EDGE

- A. Exposed edge of all flooring where terminated under doors or at locations not provided by base, and all other edges of tile that abut floors of different materials shall be fitted with transition strips of design approved by the Architect. Acceptable manufacturers shall be: Mercer or Johnsonite.

END OF SECTION 09 65 19

SECTION 09 91 00 - PAINTING

PART 1 - GENERAL

1.1 SCOPE

- A. This section covers furnishing of all labor, materials, tools, equipment, and performing all work and services necessary or incidental to furnish and apply, complete, all paints and finishes as shown on drawings and as specified, in accordance with provisions of the contract documents, and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.
- C. For additional related information, refer to sections:
 - 03 30 00 - Cast-In-Place Concrete
 - 05 21 12 - Structural Steel and Steel Joists
 - 05 30 00 - Metal Deck
 - 05 50 00 - Metal Fabrications
 - 06 10 00 - Rough Carpentry
 - 06 20 00 - Finish Carpentry
 - 07 60 00 - Flashing and Sheet Metal
 - 08 11 13 - Hollow Metal Doors and Frames
 - All HVAC Sections
 - All Electrical Sections
- D. The terms "paint" and "painting" refer to all applied coatings except special wall coatings. Paint includes fillers, primers, scalers, emulsions, enamels, thinners, stains, and all other applied coatings whether used as primer intermediate or finish coats.
- E. Work Included
 - 1. Paint and finish all interior surfaces in finished work except as follows:
 - 2. No field prime coat is required on items furnished with shop applied prime coat except that items so furnished shall have all abraded, damaged or marred areas touched-up by field painting before subsequent coats are applied. (Exception: Hollow metal frames shall be back-primed at the jobsite as indicated in Section 08 11 13.)
 - 3. Pre-finished items: Unless otherwise indicated, do not include painting when factory-finishing is specified for such items as (but not limited to) laminate plastic toilet enclosures, acoustic materials, architectural casework, finished mechanical and electrical equipment including light fixtures, switchgear and distribution cabinets, elevator frames, doors, and equipment, etc. However, paint prefinished items as directed by the architect if necessary to match color scheme.
 - 4. Concealed surfaces: Unless otherwise indicated, painting is not required on wall or ceiling surfaces in inaccessible areas, such as furred areas, pipe spaces, and duct shafts.
 - 5. Finished metal surfaces: metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished material will not require finish painting, except as otherwise specified.
 - 6. Operating part and labels: Do not paint any moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, signages, sensing devices, motor and fan shafts, unless otherwise indicated.
 - 7. Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating or name plates, etc.
 - 8. Do not paint new acoustic ceilings, glass, plastic laminate finishes, vinyl wall covering and special wall coatings. Where existing acoustics ceilings are disturbed and portions of ceilings are repaired or replaced, the entire ceiling area shall be painted.

9. Finishes on items of mechanical equipment, pipes, and ducts: located within mechanical equipment rooms shall be as described under painting provision of the Mechanical Specifications.
10. All ducts, pipe, and items of equipment exposed in finished work outside mechanical equipment rooms shall be painted as described herein. Where painting is performed in completed finish areas complete room shall be repainted to match existing so as not to appear as a patch.

1.2 COLORS

- A. Architect will furnish a schedule showing where various colors shall be used. Contractor shall prepare 12" x 12" samples of paint colors on cardboard as requested, and 12" x 12" samples of wood finishes on selected woods or plywood.
- B. Before proceeding with painting, Contractor shall finish one complete room, space, or item of each color scheme required using selected colors, finished texture, materials, and workmanship. After approval, these selected rooms or items shall serve as a standard for similar throughout the project.
- C. For sprayed-on finish, contractor shall finish a 100 s.f. sprayed-on sample using selected color, finished texture, materials, and workmanship. Samples shall be free of streaking, lapping, pile-up of paint, and spray-gun pass marks.

1.3 DELIVER AND STORAGE

- A. Deliver all materials to job site in original, new and unopened containers bearing manufacturer's name and label, and application instruction thereon.
- B. Provide labels on each container with following information:
 - Name or title of material
 - Manufacturer's stock number
 - Manufacturer's name
 - Contents by volume, for major pigment and vehicle constituents
 - Thinning instructions
 - Application instructions

1.4 PROTECTION AND CLEANUP

- A. Protect work of other trades, whether to be painted or not, against damaged by painting and finishing work. Leave all such work undamaged, with any damage corrected by cleaning, repairing, or replacing, and repainting, as directed by the Architect.
- B. Provide "wet paint" signs as required to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.
- C. Upon completion of work, clean all windows, glass, and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

1.5 SITE CONDITIONS

- A. Contractor and his painting subcontractor shall examine all surfaces and parts of structure to which painting is to be applied and Contractor shall correct conditions detrimental to performance of work. Do not proceed with painting until satisfactory conditions have been corrected.
- B. Starting of painting in any area will be construed as acceptance of surfaces within that area.

- C. Painting over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film is not acceptable work.

PART 2 - PRODUCTS

2.1 MATERIALS - GENERAL

- A. Contractor shall submit for approval a complete list of, and complete manufacturer's data for, each type of material he proposed to use.
- B. Provide finish coats which are compatible in all respects with prime paints used. Review other sections of specifications in which prime paints are to be provided to ensure compatibility of total coating system for various substrates. Provide barrier coats over incompatible primers or remove and reprime as required.
- C. Materials shall be of types specified under "Schedule of Painting". Painting materials not specifically described such as thinners, solvents, shellac, turpentine, etc., shall be of highest quality and shall have identifying labels on containers.
- D. Materials which have not been approved for use shall not be used and shall be removed from site.
- E. Paint shall have well ground pigment, shall not readily cake or thicken in container, shall be readily and easily stirred with paddle to smooth, uniform consistency, and shall have easy brushing qualities.
- F. All paint materials and equipment shall be stored in accordance with manufacturer's instructions. Storage space shall be kept clean and shall be left in condition required for equivalent spaces in project.
- G. Contractor shall take all precautions to keep fire hazard to a minimum.
- H. Cleaner for bare metal shall be T.S.P. (TRI Sodium Phosphate) in solution as recommended by the manufacturer.
- I. Colors for tinting shall be as recommended and furnished by manufacturer of paint or finish.
- J. Shellac shall be pure white gum cut in pure denatured alcohol.
Thinners:
 - 1. Turpentine: pure gum spirits of turpentine conforming to ASTM D-13-51
 - 2. Mineral spirits shall conform to ASTM D-236-61

Preparation of Surfaces

General

- a. Surfaces shall be clean, dry and adequately protected from dampness.
- b. Surface shall be free of any foreign material which will adversely affect adhesion or appearance of applied coating.
- c. Mildew shall be removed and surface neutralized.
- d. Efflorescence on any area shall be corrected before painting.
- e. Galvanized Metals
 - 1. Interior (Dry)
 - a. Clean to remove all soluble contaminants.
 - b. Hand/power tool clean to remove insoluble contaminants such as white and/or red dust. Then chemically treat with one of the following:
Great Lakes Clean 'N Etch
Henkel Galvaprep 5
Follow the manufacturer's written instructions for application.
 - 2. Exterior and Interior (Wet)

- a. Clean to remove all soluble contaminants.
- b. Brush-off blast to remove all insoluble surface contaminants and to achieve a uniformly profiled surface.

Wood to be Painted

- a. Sandpaper to smooth and even surface, then dust off.
- b. After priming coat has dried, putty all nail holes, cracks, open joints and other defects. Putty shall be colored to paint.

Plaster, Gypsum Wallboard

- a. Rake small cracks, scratches and abrasions deeply.
- b. Undercut large crack edges, coat cracks with shellac and fill with prepared patching plaster. Spot coat patches with prime coat when dry, prior to applying specified prime coat.
- c. Do not use sandpaper on plaster surfaces to be painted.
- d. Before painting any plaster, surfaces shall be tested with moisture testing device. No paint or scaler shall be applied on plaster when moisture content exceeds 12%, except as may be required by manufacturer of the paint materials used. Test sufficient areas in each space, and as often as necessary to determine proper moisture content for painting.

Drywall

- a. Fill all minor irregularities with approved patching material and sand to smooth level surface. Exercise care to avoid raising nap of paper.

Concrete and Concrete Unit Masonry (Allow new concrete and masonry to cure a minimum of 30 days prior to coating.)

- a. Patch large openings and holes, finish flush with adjacent surface. Before priming, fill any small holes with a patching compound that is compatible with the finish coats. (The Contractor shall verify compatibility of patching compound.)
- b. Remove form oil from poured-in-place concrete by washing concrete with xylol, or as required for complete removal.
- c. Surfaces shall be dry. No painting shall be done until surfaces are tested by moisture meter and shown to be within the acceptable limits of specified manufacturer and safe to paint, or below 12%. Allow new concrete and masonry to cure a minimum of 30 days prior to coating.

Ferrous Metal Surfaces

- a. Remove dirt and grease with T.S.P. and wipe dry clean cloths.
- b. Interior Steel: Hand tool/power tool clean all failed areas in accordance with SSPC-SP2/SP3.
- c. Exterior Steel: Power tool clean all failed areas in accordance with SSPC-SP3.
- d. Feather-edge the remaining intact coatings with the failed areas to create a smooth transition.
- e. All ferrous metals shall have prime coats touched-up or prime coated again if damaged. (V.O.J. with Architect if questionable to touch-up prime coat.)

Wood to Receive Natural Finish

- a. Sandpaper to smooth and even surface, then dust off.
- b. After wood is filled, stained, and has received one coat of varnish, prepare a mixture of putty and colors in oil to exact shade or color, and fill all nail holes, etc. Sand lightly after dry and touch-up puttied spots with varnish.
- c. Sand varnish between coats.
- d. Filled or puttied spots shall not show in finished work.

Mechanical Units

- a. Clean as required to remove all surface contaminants.
- b. Power tool clean all failed areas in accordance with SSPC-SP3.
- c. Feather-edge remaining intact coatings to create a smooth transition between the new and existing coating.
- d. Prime with specified primer.

- e. A test patch is required to verify compatibility of the new coatings with the existing.

PART 3 - EXECUTION

3.1 WORKMANSHIP - General

- A. Only skilled mechanics shall be employed. Equipment shall be kept clean and in proper conditions to provide a job commensurate with intent of specifications.
- B. Do not use same tools for application of paint on smooth surfaces that were originally used to paint concrete block.
- C. All materials shall be mixed, thinned, modified and applied only as specified by manufacturer's directions.
- D. All priming coats and undercoats shall be tinted to approximate shade of final coat, except slightly lighter.
- E. If Architect so directs, succeeding coats shall not be applied until he has inspected previous coat.
- F. Contractor shall protect his work at all times and protect all adjacent work and materials by suitable covering or other method during progress of his work. Upon completion of work, he shall remove all paint and varnish spots from floors, glass and other surfaces. He shall remove from premises all rubbish and accumulated materials of whatever nature not caused by others and shall leave work in clean, orderly and acceptable condition.
- G. Remove and protect hardware accessories, device plates, lighting fixtures, factory finished work, and similar items; or provide ample-in-place protection. Upon completion of each space, carefully replace all removed items.
- H. Remove electrical panel box covers and doors before painting wall. Paint separately and reinstall after all paint is dry.
- I. All materials shall be applied under adequate illumination, evenly spread and smoothly flowed onto avoid runs, sags, holidays, brush marks, air bubbles and excessive roller stipple.
- J. Coverage and hide shall be complete. When color, stain, dirt, or undercoats show through final coat of paint, surface shall be covered by additional coats until paint film is of uniform finish, color, appearance and coverage, at no additional cost to the Owner.
- K. All coats shall be thoroughly dry before applying succeeding coats.
- L. All suction spots or "hot spots" in plaster and/or cement after application of first coat shall be touched up before applying second coat.

3.2 WORKMANSHIP FOR INTERIOR PAINTING

- A. All interior wood trim shall be back-primed before installation with undercoat or penetrating sealer, as required.
- B. Enamel or varnish finish applied to wood or metal shall be sanded with fine sandpaper and then cleaned between coats to produce an even smooth surface.
- C. Interior doors to be painted shall be sealed on tops and bottoms with prime coat only. Side edges of interior doors shall be finished same as faces of doors.

- D. All closets and storage space shall be finished same as adjoining rooms, unless otherwise specified. All other surfaces shall be finished same as nearest adjoining surfaces, unless otherwise specified or directed by Architect.
- E. Paste wood filler applied on open grained wood, after commencing to flatten shall be wiped across grain of the wood, then with a circular motion to secure a smooth, filled, clean surface with filler remaining in open grain only. After overnight drying, sand surface until smooth before applying specified coat.
- F. General Note: Prior to installation, all interior and exterior steel door frames shall be back primed with a rust inhibitive primer equal to and compatible with the primer used on frames from factory.

3.3 SCHEDULE OF PAINTING

A. INTERIOR

1. **High Abuse Gypsum Wallboard (Standard and High Impact)**
 1st Coat: B28W02600 - ProMar® 200 Zero VOC Interior Latex Primer White (1.0 mils DFT)
 2nd Coat: A87W01151 - SuperPaint® Interior Latex Satin Extra White (1.6 mils DFT)
 3rd Coat: A87W01151 - SuperPaint® Interior Latex Satin Extra White (1.6 mils DFT)
2. **High Abuse Gypsum Wallboard (Epoxy)**
 1st Coat: B28W02600 - ProMar® 200 Zero VOC Interior Latex Primer White (1.0 mils DFT)
 2nd Coat: B73W00361 - Pro Industrial Waterbased Epoxy Eg-Shel (Part A) Extra White / Tint Base (2.0-4.0 mils DFT)
 3rd Coat: B73W00361 - Pro Industrial Waterbased Epoxy Eg-Shel (Part A) Extra White / Tint Base (2.0-4.0 mils DFT)
3. **Wood - Clear Finish**
 1st Coat: B26V00043 - Wood Classics® FastDry Sanding Sealer Clear
 2nd Coat: A66F00390 - Wood Classics® FastDry Varnish Hand Rubbed Satin Clear
 3rd Coat: A66F00390 - Wood Classics® FastDry Varnish Hand Rubbed Satin Clear
4. **Wood - Stained**
 1st Coat: A49V00200 - Wood Classics® Interior Oil Stain Natural Natural
 2nd Coat: A66F00390 - Wood Classics® FastDry Varnish Hand Rubbed Satin Clear
 3rd Coat: A66F00390 - Wood Classics® FastDry Varnish Hand Rubbed Satin Clear
5. **Wood - Painted**
 1st Coat: B51W00620 - PrepRite® ProBlock® Interior/Exterior Latex Primer/Sealer White (1.4 mils DFT)
 2nd Coat: B66W01051 - Pro Industrial DTM Acrylic Gloss Extra White (2.5-4.0 mils DFT)
 3rd Coat: B66W01051 - Pro Industrial DTM Acrylic Gloss Extra White (2.5-4.0 mils DFT)
6. **Insulated Pipe and Ductwork**
 1st Coat: B66W00561 - Pro Industrial Multi-Surface Acrylic Eg-Shel Coating Extra White (1.5-2.0 mils DFT)
 2nd Coat: B66W00561 - Pro Industrial Multi-Surface Acrylic Eg-Shel Coating Extra White (1.5-2.0 mils DFT)

7. **Metal Doors, Frames and Exposed Metals**
1st Coat: B50WZ0001 - Kem Kromik® Universal Metal Primer Off White (3.0-4.0 mils DFT)
2nd Coat: B66W01051 - Pro Industrial DTM Acrylic Gloss Extra White (2.5-4.0 mils DFT)
3rd Coat: B66W01051 - Pro Industrial DTM Acrylic Gloss Extra White (2.5-4.0 mils DFT)
8. **Galvanized Metal**
1st Coat: B66N00310 - Pro Industrial Pro-Cryl® Universal Acrylic Primer Red Oxide (2.0-4.0 mils DFT)
2nd Coat: B66W01051 - Pro Industrial DTM Acrylic Gloss Extra White (2.5-4.0 mils DFT)
3rd Coat: B66W01051 - Pro Industrial DTM Acrylic Gloss Extra White (2.5-4.0 mils DFT)
9. **Mechanical Units**
1st Prime: B66N00310 - Pro Industrial Pro-Cryl® Universal Acrylic Primer Red Oxide (2.5-3.0 mils DFT)
2nd Coat: B66W01051 - Pro Industrial DTM Acrylic Gloss Extra White (2.5-4.0 mils DFT)
3rd Coat: B66W01051 - Pro Industrial DTM Acrylic Gloss Extra White (2.5-4.0 DFT)
NOTE: If standup mechanical units are part of the project, they shall come to the jobsite primed with specified primer above or manufacturer's standard primer if primer is verified compatible with field finish coats prior to fabrication. The specified primer shall be used for spot prime and touch-up of damaged areas. One unit shall be top coated as a mock-up to verify adhesion of the topcoat with the shop primer.
10. **Exposed Structural Steel Columns**
Spot Primer: B65G00011 - Corothane® I Galvapak One Pack Zinc Primer Gray Gray (3.0-4.0 mils DFT)
1st Coat: B67W00201 - Pro Industrial High Performance Epoxy (Part A) Pure White/Tint Base (4.0-8.0 mils DFT)
2nd Coat: B67W00201 - Pro Industrial High Performance Epoxy (Part A) Pure White/Tint Base (4.0-8.0 mils DFT)
11. **Metal Deck**
1st Coat: B66W00561 - Pro Industrial Multi-Surface Acrylic Eg-Shel Coating Extra White (3.0-4.0 mils DFT)
Note 1: Color of overhead and steel and metal deck will be different.

B. EXTERIOR

1. **Galvanized Metal**
1st Coat: B66N00310 - Pro Industrial Pro-Cryl® Universal Acrylic Primer Red Oxide (3.0-4.0 mils DFT)
2nd Coat: B66W01051 - Pro Industrial DTM Acrylic Gloss Extra White (2.5-4.0 mils DFT)
3rd Coat: B66W01051 - Pro Industrial DTM Acrylic Gloss Extra White (2.5-4.0 mils DFT)
2. **Ferrous Metals and Miscellaneous Metals**
1st Coat: B50NZ0006 - Kem Kromik® Universal Metal Primer Brown Brown (3.0-4.0 mils DFT)
2nd Coat: B66W01051 - Pro Industrial DTM Acrylic Gloss Extra White (2.5-4.0 mils DFT)

3rd Coat: B66W01051 - Pro Industrial DTM Acrylic Gloss Extra White (2.5-4.0 mils DFT)

3. **Wood**

1st Coat: B51W00620 - PrepRite® ProBlock® Interior/Exterior Latex Primer/Sealer White (2.5-3.0 mils DFT)

2nd Coat: A89W01151 - SuperPaint® Exterior Latex Satin Extra White (1.5 mils DFT)

3rd Coat: A89W01151 - SuperPaint® Exterior Latex Satin Extra White (1.5 mils DFT)

4. **Exposed Concrete and Concrete Block (Excluding Columns)**

1st Coat: B42W00046 - Heavy Duty Block Filler White (60-80 sq. ft./gal)

2nd Coat: A05W00451 - ConFlex XL High Build Coating Extra White (6.0-7.5 mils DFT)

3rd Coat: A05W00451 - ConFlex XL High Build Coating Extra White (6.0-7.5 mils DFT)

Note: Block filler is not required for concrete.

5. **Exposed Masonry (Brick & Split-face Block)**

(See Section 04 01 20.31 - Masonry Sealer)

6. **Metal Deck**

1st Coat: B66N00310 - Pro Industrial Pro-Cryl® Universal Acrylic Primer Red Oxide (3.0-4.0 mils DFT)

2nd Coat: B66W00561 - Pro Industrial Multi-Surface Acrylic Eg-Shel Coating Extra White (2.0-3.0 mils DFT)

IMPORTANT NOTE: IN THE ABOVE SCHEDULE OF PAINTING, THE AMOUNT OF COATS AND DRY FILM THICKNESS MILLAGE IS INDICATED. THE DRY FILM THICKNESS SHALL OVERRIDE THE AMOUNT OF COATS INDICATED. IF IT TAKES MORE COATS THAN INDICATED, TO ACHIEVE THE DRY FILM THICKNESS SHOWN, THEN ADDITIONAL COATS OF PAINT SHALL BE APPLIED IN ORDER TO RECEIVE THE SPECIFIED DRY FILM THICKNESS.

IMPORTANT NOTE: RECOMMENDED MANUFACTURER'S MAXIMUM DRY FILM THICKNESS (DFT) SHALL NOT BE EXCEEDED IN ANY ONE COAT OF PAINT TO ACHIEVE THE SPECIFIED MILLAGE.

NOTE: FOR BRUSH AND ROLL APPLICATION MULTIPLE COATS MAY BE REQUIRED TO ACHIEVE SPECIFIED FILM THICKNESSES. SEE NOTE M. 15.

NOTE: A TEST PATCH SHALL BE PERFORMED TO VERIFY THE FIELD APPLIED COATINGS ARE COMPATIBLE WITH INTUMESCENT FIREPROOFING.

3.4 TINTING AND PRODUCT NUMBERS

- A. All paint coats shall be in the same color family but at different degrees of same color. Contact Architect after each coat for inspection.
- B. Painting contractor shall submit to the Architect prior to purchase of products the product name and numbers of the paints to be used on this project. NOTE! ALL PRODUCTS SHALL BE EQUAL TO THAT WHICH HAS BEEN SPECIFIED HEREIN AND APPROVED BY THE ARCHITECT. ALL PRODUCTS SHALL HAVE IDENTIFYING LABELS ON CONTAINERS AT JOBSITE.

3.5 MANUFACTURERS AND TRADE NAMES

- A. Given herein are intended to establish minimum standards of materials and finishes. Subject to compliance with specifications, products of manufacturers listed below are approved for use:

Sherwin Williams
Fuller O'Brien or Minwax (for stains only)
Tnemec
Pittsburgh Pitglaze
Scuffmaster

- B. Contractor shall submit, if required, necessary information to accurately show that quality of materials and finishes proposed for use are equal to standards specified.
- C. Bidders desiring to use coatings other than those specified shall submit their proposal in writing to the Architect at least ten (10) working days prior to the bid opening. Requests for substitution shall include manufacturer's literature for each product giving the name, generic type, descriptive information, solids by volume, recommended dry film thicknesses and a list of five (5) projects where each product has been used and rendered satisfactory service. No request for substitution shall be considered that would decrease film thickness, the number of coats applied or offer a change in the generic type of coating specified. The coating contractor shall submit manufacturer's certified test reports for the following test methods showing that the substitute product(s) equal or exceed the performance of the specified products outlined in the painting schedule.
1. American Society for Testing and Materials (ASTM)
 - a. ASTM D 4585, Condensing Humidity
 - b. ASTM B 117, Salt Spray
 - c. ASTM D 3359B, Adhesion
 - d. ASTM D 3273 Fungal Resistance
 - e. ASTM D 1653 Moisture Vapor Transmission
 - f. ASTM G 53 QUV Exposure
 - g. ASTM D 4213 Scrubbability
 - h. ASTM D 1308 Stain Resistance
 - i. ASTM D 4060 Abrasion Resistance
 - j. ASTM D 2246 Freeze Thaw
 - k. ASTM D 3363 Hardness
 - l. ASTM D 2794 Impact Resistance
 - m. ASTM D 522 Elongation
 - n. ASTM D 2805 Contrast Ratio
 - o. ASTM D 2486 Scrubbability
 - p. ASTM D 4541 Adhesion
 - q. ASTM D 4141 C EMMAQUA-NTW
 - r. ASTM D 1014 Exterior Exposure 45° South
 - s. ASTM E 308 Light Reflectance
 2. Federal Test Methods:
 - a. Standard #TT-C-555B, Paragraph 4.4.7.3, Wind Driven Rain
 3. Exterior Exposure - Exterior Exposure at 45° facing south
- D. Minimum Performance Requirements. No material will be considered that fails to meet the following performance requirements.
1. Epoxy Wall Coating
 - a. Scrubbability ASTM D 2486
Requirement: Passes 8,000 scrub cycles.
 - b. Adhesion ASTM D 4541
Requirement: Minimum 1000 psi
 2. Acrylic Wall Coating
 - a. Scrubbability ASTM D 2486
Requirement: No less than 2500 scrub cycles
 - b. Adhesion ASTM D 4541
Requirement: Minimum 1500 psi

3.6 COLOR SELECTION

- A. Colors shall be selected by Architect and shall be matched by successful contractor.

3.7 APPLICATION

- A. Apply coatings by brush, roller, spray, squeegee, or other applications in accordance with manufacturer's directions. Use brushes best suited for type of material being applied. Use rollers of carpet, velvet back, or high pile sheep wool as recommended by manufacturer for material being applied. Spray coatings uniformly with suitable and properly maintained equipment.
- B. Wherever spray application is used, apply each coat to provide the equivalent hiding power of brush-applied coats. Do not double-back for the purpose of building up film thickness of 2 coats in one pass, unless recommended in writing by coating manufacturer.
- C. The minimum number of coats and minimum coating film thickness required shall be the same regardless of the application method used. Do not apply succeeding coats until the previous coat has cured as recommended by the coating manufacturer. Sand between coats where required to produce an even, smooth surface.
- D. Apply additional coats when undercoats or other conditions show through the finish coat until the coating film is of uniform finish, color and appearance.
- E. Coat the back sides of access panels, removable or hinged covers to match exposed surfaces.
- F. Coat surfaces behind moveable equipment and furniture the same as similar exposed surfaces.
- G. Apply each material at not less than manufacturer's recommended spreading rate. Provide a total dry film thickness of the entire coating system as specified or, when not specified, as recommended by manufacturer.
- H. Before application of finish coats, apply a prime coat to material which is required to be coated or finished.
- I. Recoat primed and sealed substrates.
- J. Do not apply coatings when temperature of surfaces to be coated or the surrounding air temperature is 50 degrees F., or below, unless specifically permitted by manufacturer's printed instructions.
- K. Do not apply coatings in snow, rain, mist, or fog; or when relative humidity exceeds 85% and do not apply coatings to damp or wet surfaces, unless otherwise permitted by manufacturer's printed instructions. Coatings work may be continued during inclement weather only if the areas and surfaces to be coated are enclosed and heated within temperature limits specified by manufacturer.
- L. Completed work shall match approved samples for color, texture and coverage. Remove, refinish and recoat work not in compliance with specified requirements.
- M. Important: The manufacturer of the paint product used (or his authorized representative) must inspect the surface prior to the initial installation or for mock-up sections applied on the project and give the painting contractor approval to apply the product as approved on the initial mock-up sections. The manufacturer (or his authorized representative) shall also approve the painting contractor's methods of applications of his product according to printed instructions of the manufacturer. Payment of this work will be delayed to the Contractor until these written approvals are received by the Architect.
- N. All paint product names and numbers shall be provided at the end of the job for the Owner's future reference.

- O. Important Note: The specified number of coats for each system are the minimum number required to achieve the specified film thicknesses. If roller or brush applied, additional coats may be required to achieve the specified film thickness.
- P. All coating shall be applied during environmental conditions that meet the requirements of the coating manufacturer.
- Q. Mock-Up
 - 1. A full system mock-up shall be installed for all shop primed metal and for all other systems as required by the Architect to verify adhesion and compatibility with the existing coatings.
- R. Figure a maximum of 35% of surfaces to be painted to receive deep colors. This does not include clear sealers and stains.

END OF SECTION 09 91 00

SECTION 10 11 00 - VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 SCOPE

- A. Furnish all markerboards and materials shown on drawings and specified herein and manufactured by Claridge Products and Equipment, Inc., P.O. Box 910, Harrison, Arkansas 72601, phone (501) 743-2200
- B. Platinum Visual Systems, Inc., 1020 Railroad Street, Corona, CA 92882 (BTS System)
- C. American Visual Display Products, Wetumpka, AL, (334) 514-4524 (Series 2000)
- D. Marsh Industries, Inc., (800) 426-4244 (Markerboard Model #1432)
- E. or prior approved equal.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Markerboard
 - 24 gauge LCS Face, 1-1/4 lb.
 - Core: 7/16" hardboard, 2-3/4 lb.
 - Size: See Drawings
 - Panel Backing: .015 Aluminum Sheet
 - Laminations: Shall be hot type neoprene contact adhesive applied to both surfaces automatically. Each substrate to have a minimum of 80% covering with 1.5 - 2.0 dry mils of adhesive. Panel components shall have a uniform pressure applied mechanically over the entire area. Laminations shall be made by face sheet manufacturer. All units shall have head trim, mullion trim and chalk tray.
 - Required Surface Characteristic: Surface shall be capable of supporting magnetic display accessories.
- B. Accessories for display rail:
 - 1 - flag holder
 - 20 - display hooks
- C. Bulletin Board - Shall be 1/2" fabricork vinyl bulletin board panel consisting of 1/4" cork on 1/4" hardboard and set in aluminum trim.
- D. Aluminum Trim - Shall be "snap-out" trim.
- E. Color: Shall be selected by Owner / Architect from standard colors.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. Install in strict accordance with manufacturers recommendations. Damaged, marred, scratched or otherwise unacceptable boards will be replaced at the contractor's cost.
- B. The contractor shall verify all mounting heights and general conditions on the job site. Modifications required to fit the board on the wall shall be the responsibility of the Contractor.

3.2 WARRANTY

- A. The manufacturer shall warrant the bulletin and markerboard finishes, materials and workmanship under normal atmosphere conditions against fading, crazing, cracking, flaking, or warping for the lifetime of the original installation (based upon the standard usual life of the average installation). Failure of any unit will cause that unit to be replaced and reinstalled free of charge by the manufacturer. Submittal of product for approval shall signify acceptance of this warranty by the manufacturer.

END OF SECTION 10 11 00

SECTION 10 14 13 - INTERIOR ROOM SIGNS

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established within the General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Interior unframed signs.

1.2 QUALITY ASSURANCE

- A. Supplier: Obtain all signage products in this and other signage specifications through a single supplier from a single manufacturer.
- B. Regulatory Requirements: Products shall meet requirements of the Americans With Disabilities Act Accessibility Guidelines (ADAAG) and local amendments and modifications.
- C. Installer: Installation shall be performed by installer specialized and experienced in work similar to that required for this project.
- D. Sign supplier to provide ONLINE REORDER website for use by owner to order additional signs. Reorder website to include sign descriptions, sign drawings & sign cost.

1.3 SUBMITTALS

- A. Submit in accordance with requirements of Division 1.
- B. Product Data: Submit product data for specified products. Include material details for each sign specified.
- C. Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including dimensions, anchorage, and accessories.
- D. Samples: Submit supplier's standard color chart for selection purposes and selected colors for verification purposes.
- E. Installation: Submit supplier's installation instructions.
- F. Closeout Submittals:
 - 1. Submit operation and maintenance data for installed products, including precautions against harmful cleaning materials and methods.
 - 2. Submit warranty documents specified herein.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Division 1.
 - 1. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
 - 2. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
 - 3. Store products protected from weather, temperature, and other harmful conditions as recommended by supplier.
 - 4. Handle products in accordance with manufacturer's instructions.

1.5 WARRANTY

- A. Project Warranty: Comply with requirements of Division 1.
- B. Manufacturer's Warranty: Submit manufacturer's standard warranty document executed by authorized company official.
 - 1. Warranty Period: One year from product ship date.

PART 2 - PRODUCTS

2.1 SIGNAGE SYSTEMS

- A. Acceptable Manufacturers:
- B. The following manufacturer and product is used as a basis of design and are Prior Approved:
 - 1. ASI Signage Innovations, 520 Commerce Point, Harahan, Louisiana 70123; (504) 704 1000 telephone; (504) 704 1006 facsimile. Contact: Emily H. Meyers (337) 517-9451; Cell, Emily.Hebert@asisignage.com; Email.
 - 2. Acceptable Product: ASIntouch III Plaques
 - 3. Additional manufacturers shall submit equal product data 10 days before advertised bid date for architect's review. The architect has sole discretion to accept or deny substitutions.

2.2 SIGN MATERIALS

- A. Sign Face: High impact cast acrylic, 3D printed text and braille.
- B. Tactile Graphics and Text: Provide tactile copy [and grade 2 Braille] raised 1/32 inch minimum from plaque surface using manufacturer's 3D printed process.
 - 1. Provide lettering and graphics precisely formed, uniformly opaque to comply with relevant ADA regulations and requirements indicated for size, style, spacing, content, position, and colors.
 - 2. Colors: Background color is second surface painted. Text Color is Integrally colored and printed first surface with logo. Silkscreened text is not allowed.
 - 3. First surface painted signs and sandblasted sign faces are not allowed.
- C. Sign Type Description
 - 1. Face Depth: 1/8" inch thickness Clear Acrylic with Flat Polished Edges. Subsurface painted.
 - 2. Surface Texture: Smooth Texture with non-glare finish.
 - 3. Letter style[s], and size[s] and layout position: Architect to select from manufactures standard options.
 - 4. Raised text is integrally colored and 3D printed into face background.
 - 5. 1/4" thick Painted Acrylic Backer to be 8 3/4" h x 6 3/4" w. Painted ASI Ruby Red.
 - 6. Sign Size: 8" h x 6" w, all signs.
 - 7. Corner Shape: Square
 - 8. Quantity: One sign at each door opening, one sign at each exit door. All classrooms and offices to have two 1 1/2" h clear windows for paper inserts.
 - a. Gender specific restroom signs shall be 8" x 8". (4 required)
 - b. Unisex restroom signs shall be 8" x 8". (3 required)
 - c. Directional – Qty 8 (Subsurface text w/ 1/4" thick acrylic backer)
 - d. Exit ID – Qty 8
 - e. Room ID – Qty 18
 - f. Exterior Room ID – Qty 10 (Exterior Grade Signage – ASIntac w/ 1/4" thick w/ screw mounted acrylic backer)
 - g. Classroom Identification signs /room number signs – 12

2.3 INSTALLATION METHOD

- A. Screw Mount with counter sunk holes and silicone. Signs on glass to have vinyl backer. All others to be screw mounted. Backer to have countersunk holes with face piece tape mounted over backer to conceal mounting.

2.4 FABRICATION - GENERAL

- A. General: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
- B. Preassemble signs in the shop to the greatest extent possible to minimize field assembly. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in a location not exposed to view after final assembly.
- C. Conceal fasteners if possible; otherwise, locate fasteners to appear inconspicuous.
- D. Form panels to required size and shape. Comply with requirements indicated for design, dimensions, finish, color, and details of construction.
- E. Coordinate dimensions and attachment methods to produce message panels with closely fitting joints. Align edges and surfaces with one another in the relationship indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site Verification of Conditions: Verify installation conditions previously established under other sections are acceptable for product installation in accordance with manufacturer's instructions.
- B. Scheduling of installation by Owner or its representative implies that substrate and conditions are prepared and ready for product installation. Proceeding with installation implies installer's acceptance of substrate and conditions.

3.2 INSTALLATION

- A. Install product in accordance with supplier's instructions.
- B. Install product in locations indicated using mounting methods recommended by sign manufacturer and free from distortion, warp, or defect adversely affecting appearance.
- C. Install product level, plumb, and at heights indicated.
- D. Install product at heights to conform to Americans with Disabilities Act Accessibility Guidelines (ADAAG) and applicable local amendments and regulations.
- E. Install signs within the following tolerances and in accordance with manufacturer's recommendations:
 - 1. Interior Signs: Within 1/4 inch vertically and horizontally of intended location.

3.3 CLEANING, PROTECTION, AND REPAIR

- A. Repair scratches and other damage which might have occurred during installation. Replace components where repairs were made but are still visible to the unaided eye from a distance of 5 feet.

- B. Remove temporary coverings and protection to adjacent work areas. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from project in accordance with provisions in Division 1.

3.4 SIGN SCHEDULE

- A. Schedule: Refer to signage schedule and Drawings for sizes, locations, and layout of signage types, sign text copy, and graphics.

END OF SECTION 10 14 13

SECTION 10 14 14.13 - DIMENSIONAL LOGO

PART 1 – GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established within the General and Supplementary Conditions of the Contract, Division 1 General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Dimensional logo of cut aluminum composition.
 - 2. Cut aluminum dimensional letters

1.2 QUALITY ASSURANCE

- A. Supplier: Obtain all signage products in this and other signage specifications through a single supplier from a single manufacturer.
- B. Regulatory Requirements: Products shall meet requirements of the Americans With Disabilities Act Accessibility Guidelines (ADAAG) and local amendments and modifications.
- C. Installer: Installation shall be performed by installer specialized and experienced in work similar to that required for this project.

1.3 SUBMITTALS

- A. Submit in accordance with requirements of Division 1.
- B. Product Data: Submit product data for specified products. Include material details for each sign specified.
- C. Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including dimensions, anchorage, and accessories.
- D. Samples: Submit supplier's standard color chart for selection purposes and selected colors for verification purposes.
- E. Installation: Submit supplier's installation instructions.
- F. Closeout Submittals:
 - 1. Submit operation and maintenance data for installed products, including precautions against harmful cleaning materials and methods.
 - 2. Submit warranty documents specified herein.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Division 1.
 - 1. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
 - 2. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
 - 3. Store products protected from weather, temperature, and other harmful conditions as recommended by supplier.
 - 4. Handle products in accordance with manufacturer's instructions.
 - 5. Sign vendor to provide reorder website to owner upon completion. Reorder website shall include online order forms, sign drawings, and pricing.

1.5 WARRANTY

- A. Project Warranty: Comply with requirements of Division 1.
- B. Manufacturer's Warranty: Submit manufacturer's standard warranty document executed by authorized company official.
 - 1. Warranty Period: One year from product ship date. Warranty specifically excludes letter mounting substrate.

PART 2 - PRODUCTS

2.1 SIGNAGE SYSTEMS

- A. The following manufacturer and product is used as a basis of design and are Prior Approved:
 - 1. ASI Signage Innovations, 520 Commerce Point, Harahan, Louisiana 70123; (504) 704 1000 telephone; (504) 704 1006 facsimile. Contact: Emily H. Meyers (337) 517-9451; Cell, Emily.Hebert@asisignage.com; Email.
- B. Acceptable Product: ASI Legacy Series Aluminum Cabinet, Routed Aluminum Dimensional Logo. ASI LPS Series Cut Aluminum Letters.
- C. Precision Laser Cut Aluminum GOMS Logo.
 - 1. Finish: Various Standard ASI Colors. See Drawing.
 - 2. Logo Height: 120"h x 36"w
 - 3. Backer Depth: 3" thick cabinet.
 - 4. 1/4" thick aluminum face with .080" aluminum returns. 3" thick fabricated aluminum returns painted to match face.
 - 5. Aluminum Border Segments: 1/4" thick precision routed out aluminum segments painted different ASI standard colors. VHB tape mounted to cabinet face.
 - 6. GOMS: Fabricated aluminum custom shaped logo 3" deep. GOMS painted two colors with grey edge border and return. Mechanically fastened to cabinet face.
 - 7. Mounting Method: Perimeter screw mount to an internal fabricated welded aluminum frame. Frame mounted to metal panel wall with Tapcons. GC to provide 1-1/2" blocking minimum or (2) 3/4" sheet of plywood blocking at sign location.

2.2 FABRICATION - GENERAL

- A. General: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
- B. Design, fabricate, and install sign assemblies to prevent buckling, opening up of joints, and over-stressing of welds and fasteners.
- C. Mill joints to a tight, hairline fit. Form joints exposed to the weather to exclude water penetration.
- D. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.
- E. Create signage to required sizes and layout. Comply with requirements indicated for design, dimensions, finish, color, and details of construction.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site Verification of Conditions: Verify installation conditions previously established under other sections are acceptable for product installation in accordance with manufacturer's instructions.
- B. Scheduling of installation by Owner or it's representative implies that substrate and conditions are prepared and ready for product installation. Proceeding with installation implies installer's acceptance of substrate and conditions.

3.2 INSTALLATION

- A. Install product in accordance with supplier's instructions.
- B. Install product in locations indicated using mounting methods recommended by sign manufacturer and free from distortion, warp, or defect adversely affecting appearance.
- C. Install product level, plumb, and at heights indicated.
- D. Install product at heights to conform to Americans with Disabilities Act Accessibility Guidelines (ADAAG) and applicable local amendments and regulations.
- E. Install signs within the following tolerances and in accordance with manufacturer's recommendations:
 - 1. Interior Signs: Within 1/4 inch vertically and horizontally of intended location.
 - 2. Exterior Signs: Within 1 inch vertically and horizontally of intended location.

3.3 CLEANING, PROTECTION, AND REPAIR

- A. Repair scratches and other damage which might have occurred during installation. Replace components where repairs were made but are still visible to the unaided eye from a distance of 10 feet.
- B. Remove temporary coverings and protection to adjacent work areas. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from project in accordance with provisions in Division 1.

3.4 SIGN SCHEDULE

- A. Schedule: Refer to signage schedule and Drawings for sizes, locations, and layout of signage types, sign text copy, and graphics.

END OF SECTION 10 14 14.13

SECTION 10 14 16 - PLAQUES

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish all labor, materials, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of Cast Plaques as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.
- C. The Contractor shall coordinate with all trades and provide all in wall blocking as necessary for a complete and secure installation as recommended by the manufacturer.

1.2 SUMMARY

- A. Related Documents: Provisions established within the General and Supplementary Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Cast bronze plaque

1.3 QUALITY ASSURANCE

- A. Supplier: Obtain all signage products in this and other signage specifications through a single supplier from a single manufacturer.
- B. Regulatory Requirements: Products shall meet requirements of the Americans With Disabilities Act Accessibility Guidelines (ADAAG) and local amendments and modifications.
- C. Installer: Installation shall be performed by installer specialized and experienced in work similar to that required for this project.

1.4 SUBMITTALS

- A. Submit in accordance with requirements of Division 1.
- B. Product Data: Submit product data for specified products. Include material details for each sign specified.
- C. Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including dimensions, anchorage, and accessories.
- D. Samples for initial selection: Submit supplier's standard color chart for selection purposes and selected colors for verification purposes.
- E. Samples for Verification: For each type of sign, include the following samples to verify color and finish selected:
 - 1. Actual sample of casting in metal specified to show finish, texture & lettering style.
- F. Installation: Submit supplier's installation instructions.

1.5 Closeout Submittals:

- A. Submit operation and maintenance data for installed products, including precautions against harmful cleaning materials and methods.
- B. Submit warranty documents specified herein.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Division 1.
 - 1. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
 - 2. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
 - 3. Store products protected from weather, temperature, and other harmful conditions as recommended by supplier.
 - 4. Handle products in accordance with manufacturer's instructions.

1.7 WARRANTY

- A. Project Warranty: Comply with requirements of Division 1.
- B. Manufacturer's Warranty: Submit manufacturer's standard warranty document executed by authorized company official.
 - 1. Warranty Period: One year from date of substantial completion.

PART 2 - PRODUCTS

2.1 SIGNAGE SYSTEMS

- A. The following manufacturers and products are used as a basis of design and are Prior Approved:
 - 1. A.R.K. Ramos Signage Systems, 1321 South Walker, Oklahoma City, OK 73109; Telephone: 1-800-725-7266; Fax 1-405-232-8516.
Acceptable Product: Cast Aluminum Logo Plaque and Cast Bronze Plaque
 - 2. Or Prior Approved Equals - Manufacturers shall submit an equivalent style signage system for review by the Architect a minimum of 10 days prior to bid.

2.2 FABRICATION

- A. General: Cast free from pits, gas holes, and warped surfaces.
- B. Cast Bronze Plaque:
 - 1. Quantity: 1
 - 2. Material: Bronze
 - 3. Size: 24" W x 30" H with a single border
 - 4. Plaque to be cast in one piece. No visible seams allowed.
 - 5. Plaque Information: Project name, date, all of the names listed in the Ascension Parish School Board box at the front title sheet plus for 25% more names, Architects, Contractor and four (4) Consultants names shall appear on the plaque as furnished by the Architect.
 - 6. Fastening method shall be concealed.
 - 7. Finish: Sealed finish.
 - 8. Location: Verify location with Architect on the jobsite.
 - 9. If more than one rubbing is required for changes, there shall be no extra charge.
- C. Verify location of all Cast Plaques with Architect on the jobsite.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site Verification of Conditions: Verify installation conditions previously established under other sections are acceptable for product installation in accordance with manufacturer's instructions.
- B. Scheduling of installation shall be the responsibility of the General Contractor and the installer. Proceeding with installation implies installer's acceptance of substrate and conditions.
- C. Contractor and installer shall coordinate and verify that all required blocking is installed to properly support Cast Metal Plaques according to manufacturer's recommendations.

3.2 INSTALLATION

- A. Install product in accordance with supplier's instructions.
- B. Install product in locations indicated using mounting methods recommended by sign manufacturer and free from distortion, warp, or defect adversely affecting appearance.
- C. Install product level, plumb, and at heights indicated.
- D. Install product at heights to conform to Americans with Disabilities Act Accessibility Guidelines (ADAAG) and applicable local amendments and regulations.
- E. Install signs within the following tolerances and in accordance with manufacturer's recommendations:
 - 1. Exterior Signs: Within 1/4 inch vertically and horizontally of intended location.

3.3 CLEANING, PROTECTION AND REPAIR

- A. Repair scratches and other damage which might have occurred during installation. Replace components where repairs were made but are still visible to the unaided eye from a distance of 3 feet.
- B. Remove temporary coverings and protection to adjacent work areas. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from project in accordance with provisions in Division 1.

END OF SECTION 10 14 16

SECTION 10 21 13.19 - PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SCOPE

- A. Requirements of the general conditions and special conditions apply to the work in this section.
- B. Provide all labor, materials, etc., necessary for the completion of the work of this section as specified or shown on the drawings.
- C. Work of this section consists of, but is not limited to, the following:
 - 1. Toilet stalls, stall doors, screens and entry partitions, urinal screens
 - 2. Hardware, etc., for stalls
 - 3. Shop drawings
- D. Work not included in this section:
 - 1. Toilet room accessories. (RE: Section 10 28 00 - Toilet, Bath & Laundry Accessories)
- E. Submit six (6) sets of shop drawings, including details and a sample of each item of hardware for Architect's approval.
- F. Provide drawings showing locations for adequate steel reinforcements or wood blocking in walls to be provided by others for proper securement of the finished work.
- G. Furnish color cards for use of the Architect. (With no less than 10 standard colors.)
- H. Furnish Static load testing on door hinges to meet or exceed 800 lbs.
- I. Furnish certificate of compliance that only virgin materials are used for fabrication and no regrind or reprocessed scrap allowed.
- J. Comply with all standards as required by state and local laws and codes. State Statutes RS40-1561, Chapter 7, Part 3 and the American National Standards Institute (ANSI) A 117.1-1986 and ADAAG 2010 apply.
- K. Provide and install all items as described in the Contract Documents as required to constitute a complete project, in full compliance with state and local laws and codes.
- L. Information shown on the plans show the general information as to layout, sizes and dimensions. Examples shown in this section of the specifications gives specific requirements as required by ANSI 117.1-1986 and ADAAG 2010 and shall be used for dimensions and locations of handicapped access specialty items and standard items adapted for use by the handicapped. Sizes and dimensions given are minimum standards. Other examples from the same source are not excluded and shall apply. Copies of ANSI 117.1-1986 and ADAAG 2010 are available at the office of the Architect.
- M. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- N. Deliver, store, and handle compartments as recommended by manufacturer to protect from damage.
- O. Provide manufacturer's written two (3) part warranty: The entire toilet partition shall be warranted for ten (10) years, against breakage, corrosion delamination, to include hardware; replaced without charge, excluding labor. Panels, pilasters and doors shall be

warranted for fifteen (15) years against breakage, corrosion and delamination; replaced without charge, excluding labor.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Columbia Partitions Series 19825, by PSISC, P.O. Box 181, Columbia, S.C. 29202, 803-252-3020, Fax: 866-337-7286.
- B. Sentinel Floor Mounted Overhead Braced Toilet Partitions and Modesty Style Partitions in Bradmar (HDPE) Solid Plastic Series 400, as manufactured by The Mills Company a subsidiary of Bradley Corp., P.O. Box 309, Menomonee Falls, WI 53052-0309 (800) 272-3539. Contact Person: Sean Hebert with Superior Products, (225) 644- 9773.
- C. Solid Plastic Polyethylene Overhead Braced Toilet Partitions, Shower and Dressing Compartments as manufactured by Ampco Products LLC, 11400 N 36th Ave, Miami, FL 33167. Tel: (305)821-5700
- D. Solid Plastic Overhead Braced Toilet Partitions (Hiney Hiders), as manufactured by Scranton Products: 801 E. Corey St. Scranton PA 18507 (800) 445-5148
- E. Or Prior Approved Equal. All submittals for approval shall be presented in accordance with the submittals clause of this document and must be presented at least ten (10) working days prior to the bid date. All submittals shall be reviewed based on the standard of quality established herein.

2.2 MATERIALS

- A. General: Provide material which has been selected for surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are not acceptable. Solid Plastic HDPE shall meet or exceed all requirements for Class "B" Flame Spread Rating calculated according to ASTM E-84 and shall carry a UL Class "B" Fire Rating Certification.
- B. Material shall be Solid HDPE, overhead braced floor supported
 1. Doors - Minimum 1.00" Finished Thickness, 55" high
 2. Divider Panels - Minimum 1.00" Finished Thickness, 55" high
 3. Pilasters - Minimum 1.00" Finished Thickness, 82" high
- C. Pilasters, Doors and Panels shall have edges machined to a .250" radius. Pilasters, Doors and Panels shall be provided with a self-adhesive peel coat to protect the finish during installation.
- D. Colors: To be selected by Project Architect from Manufacturer's Standard Colors.
- E. Pilaster Shoes: ASTM A 167, Type 304 18 gauge Stainless Steel, minimum 3" high, 18 gauge, finished with #4 Polish, attached with Stainless Steel Through Bolts.
- F. Continuous Brackets: Full High (54") Type 304 stainless steel. Inside of opening of bracket shall be 1.00" for panels and pilasters. All holes for mounting to wall and panel/pilaster shall be pre-drilled. Holes are to be spaced at 12" o.c. (Max.) along the full length of the bracket for a total of ten (10) holes for mounting to the wall and five (5) holes for mounting to the panel/pilaster. Each bracket is to have a minimum wall thickness of .125". Brackets shall be pre-drilled for mounting to door using theft proof stainless steel Torx Head with Pin Through Bolts. (Attachment using screws to core material is unacceptable)
- G. Continuous Hinge: Continuous 14 gauge Type 3 stainless steel hinge (54"). Hinge shall be 3" wide and shall have cam knuckles for gravity type self-closing action. Pivot pin shall

be .250" in diameter and shall be made of Type 304 stainless steel. Hinges shall provide emergency access by lifting the door. Hinges shall be pre-drilled for mounting to door using theft proof stainless steel Torx Head with Pin Through Bolts. Mounting holes shall be at 12" o.c. (Max.) for through-bolting with stainless steel fasteners. In-swinging hinges shall be preset to hold doors in the closed position when unlatched. Out-swinging hinges shall be preset to hold doors in the closed position when unlatched.

- H. Strike and Keeper: Heavy duty Type 304 14 gauge stainless steel with a satin finish. The strike and keeper shall have an integral rubber bumper door stop. Furnish one per door.
- I. Slide Latch: Heavy duty cast stainless steel with a satin finish. The slide latch shall be surface mounted. Latch shall have an internal stainless steel buffering spring to prevent damage when door is inadvertently slammed against the latch. Latch knob is to be riveted to the slide bar and then welded to ensure that the knob will not come off. Furnish one per door.
- J. Coat Hook: Heavy duty Type 304 cast stainless steel with a satin finish. Furnish one per door.
- K. Door Stop: Heavy duty cast stainless steel with a satin finish. Furnish one for each disabled accessible door.
- L. Pull Handle: Heavy duty cast Type 304 stainless steel with a satin finish. The pull handle shall have mounting holes drilled and tapped for 10/24 threads at 3.50" o.c. The pull handle shall be .655" wide and shall be mounted back to back with the slide latch. Furnish one for each disabled accessible door.
- M. Overhead Bracing (Headrail): Continuous heavy duty extruded 6063-T5 aluminum headrail with Anti-Grip profile. Headrail shall have integral reinforcing channel and curtain track. Headrail shall have a satin anodized finish. Provide headrail corner brackets, wall brackets, and headrail end caps as required. The headrail and thickness of the headrail and headrail brackets shall be .125". Each headrail bracket is to be packaged in a separate poly bag and is to be labeled by stock number and manufacturer.
- N. Anchorage and Fasteners: All fasteners shall be stainless steel with theft proof heads, through-bolts unless noted otherwise. Chrome plated steel or brass are not acceptable.

2.3 FABRICATION

- A. General: Provide standard doors, panels, screens and pilasters fabricated for partition system, complete with all accessories and hardware listed above and as required for installation of fully functional system, unless otherwise noted. Provide units with cutouts and drilled holes to receive partition-mounted hardware, accessories, and grab bars as indicated.
- B. Overhead-Braced and Floor-Anchored Partitions:
 - 1. Furnish heavy duty cast stainless steel "Z" bars, complete with stainless steel threaded rods, lock washers and leveling-adjusting nuts at pilaster, to permit structural connection at floor.
 - 2. Make provision for setting and securing continuous extruded aluminum anti-grip handrail at top of each pilaster.
 - 3. Furnish stainless steel shoe at each pilaster to conceal supports and leveling mechanism.
- C. Doors: Unless otherwise indicated, provide 24" wide in-swinging doors for standard toilet partitions and 36" wide out-swinging doors with a minimum 32" wide clear opening for partitions indicated to be handicapped accessible.

- D. Floor Anchored Privacy Screens: Furnish privacy screens consisting of a pilaster and a panel of the same construction and finish as the toilet partitions. Furnish in accordance with the drawings.

PART 3 - EXECUTION

3.1 EXECUTION

A. Installation

1. General: Comply with manufacturer's written installation instructions. Install partitions rigid, straight, plumb and level. Provide clearance of not more than .50" between pilasters and panels, and not more than 1.0" between panels and walls. No evidence of drilling, cutting and patching shall be visible in finished work.
2. Attach continuous wall brackets to the wall with the following:
 - a. At solid masonry: #14 x 1.50" long stainless steel phillips pan head screws and plastic #14/16 anchors at 9" o.c. vertical spacing.
 - b. At cavity masonry: .25" diameter x required length stainless steel toggle bolts at 9" o.c. vertical spacing.
3. Overhead-Braced and Floor-Anchored Partitions: Secure pilasters to floor and level, plumb, and tighten. Secure continuous headrail to each pilaster with not less than two (2) through-bolt stainless steel fasteners. Hang doors and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
4. Screens: Attach with anchoring devices according to manufacturer's written instructions and to suit supporting structure. Set units level and plumb and to resist lateral impact.

B. Accessories

1. Mount accessories to partition units in accordance with manufacturer's instructions.

C. Adjusting and Cleaning

1. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation.
2. Provide final protection and maintain conditions that ensure toilet partitions and screens are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 10 21 13.19

SECTION 10 26 13 - CORNER GUARDS

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish all labor, materials, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, surface mount corner guards as shown on drawing and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.
- C. The drawings do not purport to show all locations and requirements for wall protection. The Contractor shall provide wall protection at all 90 degree angle and 135 degree angle outside corners of drywalls in Contract Documents.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Corner Guards: Shall be Stainless Steel (1-1/2" Wing) Corner Guards in 4' lengths (mechanically fastened) as manufactured by Inpro IPC Door and Wall Protection Systems (Phone: 800-222-5556) or prior approved equal.
- B. Color and finishes shall be selected by the Architect.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. Install one 48" high wall guard trim at every outside corner of gypsum board walls throughout the new addition. Corner guards shall be installed with bottom edge set just above rubber base trim.
- B. Inspect all surfaces to receive wall protection systems for proper condition before installation.
- C. Install wall protection systems to walls securely in accordance with manufacturer's written instructions.
- D. Install wall protection systems accurately in location, alignment, and elevation.
- E. Mechanically fasten securely to existing studs at recommended spacing.
- F. Do not install cut lengths of corner guards with surface checking, end checking or other damage.
- G. Corner guards shall be installed at all outside corners or as indicated in the construction drawings.

3.2 ADJUSTING AND CLEANING

- A. Touch up minor damages or blemishes as approved by the Architect.
- B. Clean surfaces in accordance with manufacturer's instructions.

END OF SECTION 10 26 13

SECTION 10 28 00 - TOILET, BATH AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete of toilet accessories as shown on drawings and as specified in accordance with provisions of the contract documents and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, and complete installation shall be furnished and installed as part of this work.
- C. Comply with all standards as required by state and local laws and codes. State Statutes RS40-1561, Chapter 7, part 3 and the American National Standards Institute (ANSI) A 117.1-1986 & ADAAG 2010 Part III apply.
- D. Provide and install all items as described in the contract documents as required to constitute a complete project, in full compliance with state and local laws and codes.
- E. Information shown on the plans shown the general information as to layout, sizes and dimensions. Examples shown in this section of the specifications gives specific requirements as required by ANSI 117.1-1986 & ADAAG 2010 Part III and shall be used for dimensions and locations of handicapped access specialty items and standard items adapted for use by the handicapped. Sizes and dimensions given are minimum standards. Other examples from the same source are not excluded and shall apply. Copies of ANSI 117.1-1986 & ADAAG 2010 Part III are available at the office of the Architect.
- F. **NOTE: Verify all quantities of toilet, bath and laundry accessories by reviewing drawings.**

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Grab Bars - 1-1/2" diameter stainless steel with knurled finish grip. To comply with ANSI 117.1-1986 & ADAAG 2010 Part III handicapped access requirements. Fasteners are to be concealed. Size is as per drawings. Provide bracing in wall or behind mounting surface for all grab bars. (42" grab bars at side and 36" behind toilet fixture) (42" grab bars at both sides of secondary ADA compliant toilet stalls) (18" x 36" continuous grab bars in ADA compliant showers) and as additionally indicated on plans.

BOBRICK: B-6806 Series Grab Bars (18 ga. 304 st. stl.)
BRADLEY: 8120 Model Grab Bars (18 ga. 304 st. stl.)
AMERICAN SPECIALTIES: 3800 Series Grab Bars)18 ga. 304 st. stl.)
Or prior approved equals

- B. Toilet Tissue Fixture - Shall be anchored firmly to the wall or toilet partition using stainless steel vandal resistant through bolt fasteners. (Locate one at each toilet. Discuss location with Architect on the job.) Chrome plated steel, double roll dispenser with vandal resistant controlled delivery

BOBRICK: Series B-265
BRADLEY: Series 5224
AMERICAN SPECIALTIES: 0710 Series

Or prior approved equals

- C. Mirror (Type #1) - 22 gauge stainless steel (type-430 stainless steel) bright polished finish. Mirror has 1/4" return. Backing - 1/4" thick tempered masonite. Size as per drawings (18" wide x 30" high) or (18" wide x 36" high). Mount mirror on surface of wall as per manufacturer's recommendations with mounting screws and finishing washers furnished by manufacturer. Refer to plans for mirror locations and sizes required per toilet/ locker room.

BOBRICK: B-1556 Series Mirror (22 ga. 304 st. stl.)
BRADLEY: 7481 Model Mirror (20 ga. 304 st. stl.)
AMERICAN SPECIALTIES: 8026 Series Mirror (20 ga. 304st. stl.)
Or prior approved equals

- D. Mirror (Type #2) - Frame shall be one-piece, roll-formed stainless steel with bright annealed finish. Channel is 3/4" x 3/4" x 7/16" with 90 mitered corners. Double strength continuous integral stiffener on all sides for added strength. Back shall be galvanized steel. Mirror shall be first quality 1/4" float glass, thermosetting infrared cured paint backing with Poly-Glaze protective finish. Manufactured in accordance with ASTM C 1036 and ASTM C 1503. All edges protected by shock-absorbing, neoprene tubing. The back of the mirror is protected by a sheet of 1/4" extruded polystyrene, which is placed between the mirror and the galvanized steel. Mounting brackets shall be 18 gauge cold rolled steel. See Drawings for Locations and Sizes.

BOBRICK: Series B-165 1836
BRADLEY: Series 781 (Angle Frame Mirror)
AMERICAN SPECIALTIES: Series 0600
Or prior approved equals

- E. Liquid Soap Dispenser – Shall be owner provided and contractor installed.
- F. Sanitary Product Disposal Unit - Shall be a surface mounted napkin/product disposal unit. Receptacle components include body/container and cover. Container shall be 22gauge stainless steel (all welded construction) with exposed surfaces in satin finish. Cover shall be 22 gauge stainless steel with exposed surfaces in satin finish. Cover shall be attached using a heavy duty stainless steel piano hinge.

BRADLEY: Series 4A10-11 - Surface Mounted
BOBRICK: Series B-270 - Surface Mounted
AMERICAN SPECIALTIES: Series 20852 Surface Mounted
Or Prior Approved Equal

- G. Towel Dispenser - Surface-mounted paper towel dispenser shall be type-304 stainless steel with all-welded construction; exposed surfaces shall have satin finish. Door shall be secured to cabinet with a full-length stainless steel piano-hinge and equipped with a tumbler lock keyed like other Bobrick washroom accessories. Paper towel tray shall have hemmed opening to dispense paper towels without tearing. Unit shall be capable of dispensing 400 C-fold or 525 multifold paper towels measuring 3-1/8" to 3-13/16" (79 to 97mm) deep. Narrower paper towels 2-1/2" to 3-1/8" (65 to 79mm) deep may be efficiently dispensed with the use of an optional TowelMate accessory, Bobrick Part No. 262-130. TowelMate accessory allows for paper towels to dispense one at a time without bulging, sagging or falling through the towel tray opening. (2 Towel dispensers to be located at each hand wash lavatory in the cafetorium dining area in path of travel.) (See Plans for exact locations)

BRADLEY: Series 250-15 - Surface Mounted
BOBRICK: Series B-262 - Surface Mounted
AMERICAN SPECIALTIES: Series 0210
Or Prior Approved Equal

- H. Towel Dispenser/Waste Receptacle - Recessed paper towel dispenser and waste receptacle shall be Type-304 stainless steel with all-welded construction; exposed surfaces shall have satin finish. Flange shall be drawn and beveled, one-piece, seamless construction. Door shall be secured to cabinet with a full-length stainless steel piano-hinge and equipped with a knob latch. Paper towel dispenser shall dispense 350 C-fold or 475 multifold paper towels without adjustment or use of adapters. Removable stainless steel waste receptacle shall be retained in cabinet by a retaining hook feature, have top edges hemmed for safe handling, and shall have a minimum capacity of 2-gal

BRADLEY: Series 2291
BOBRICK: Series B-369
AMERICAN SPECIALTIES: Series 0462-AD
Or Prior Approved Equal

- I. Utility Shelves - Utility shelf with mop/broom holders and rag hooks shall be type-304 stainless steel with all-welded construction; exposed surfaces shall have satin finish. Shelf shall be 18 gauge (1.2mm), 8" (205mm) deep with 3/4" (19mm) return edges, and shall have front edge hemmed for safety

BRADLEY: Series 9983
BOBRICK: Series B-239 X 34
AMERICAN SPECIALTIES: Series 1308-3
Or Prior Approved Equal

- J. Hand Driers - (Reference Electrical Drawings and Specifications)

- K. Utility Hooks - Surface-mounted utility hook shall be type-304 stainless steel with satin finish. Flange and support arm shall be 22 gauge (0.8mm) and equipped with a concealed, 16-gauge (1.6mm) mounting bracket that is secured to a concealed, 16-gauge (1.6mm) wall plate with a stainless steel setscrew. Cap shall be 10 gauge (3.6mm), welded to the support arm.

BRADLEY: Series 9114
BOBRICK: Series B-6707
AMERICAN SPECIALTIES: Series 7308
Or Prior Approved Equal

- L. Sharps Disposal - shall be fabricated of stainless steel with exposed surfaces in satin finish. Door secured by piano-hinge. Removable needle disposal with tumbler lock. (Contractor shall provide 5.4Qt. BD Sharps Container compatible with all models below.)

BRADLEY: Series 989
BOBRICK: Series B-35061
AMERICAN SPECIALTIES: Series 0548
Or Prior Approved Equal

- 2.2 ACCESSORY SCHEDULE BY ROOM - "New Sugar Mill Primary School"
(Quantities shown below are intended to help the bidder but do not warrant the numbers indicated on the drawings. All quantities shall be the responsibility of the Contractor. All Toilet Accessories needed for a complete installation shall be furnished and installed as part of this work by the Contractor.

- A. Room # 28:
1. Janitor
a. one (1) Utility Shelf

B. Room # 14, 03, 05, 38, 37:

1. Toilet:
 - a. one (1) Grab bar at toilet (36" at rear and 42" at side)
 - b. one (1) Toilet tissue holders (surface mounted)
 - c. one (1) Towel Dispenser/Waste Receptacle
 - d. one (1) Type #2 mirror
 - e. one (1) Soap dispenser (owner provided contractor installed)
 - f. one (1) Sanitary Product Disposal Unit.

C. Room # 23,26,30,31,32,33,34,35,36:

1. Classrooms
 - a. one (1) Towel Dispenser
 - b. one (1) Soap dispenser (owner provided contractor installed)

D. Room #04:

1. Exam Room
 - a. one (1) Sharps Disposal
 - b. one (1) Soap dispenser (owner provided contractor installed)
 - c. one (1) Towel Dispenser

E. Room #25:

1. Boys Restroom
 - a. one (1) Grab bar at toilet (36" at rear and 42" at side)
 - b. Two (2) Toilet tissue holders (one located at each toilet fixture / stall)
 - c. four (3) Soap dispensers (owner provided contractor installed)
 - d. two (3) ADA compliant hand dryers (refer to electrical)
 - e. four (3) Type #1 mirrors (one above each lavatory bowl) (18" x 36")

F. Room #24:

1. Girls Restroom
 - a. one (1) Grab bar at toilet (36" at rear and 42" at side)
 - b. four (4) Toilet tissue holders (one located at each toilet fixture / stall)
 - c. four (4) Sanitary Product Disposal Unit.
 - c. four (3) Soap dispensers (owner provided contractor installed)
 - d. two (3) ADA compliant hand dryers (refer to electrical)
 - e. four (3) Type #1 mirrors (one above each lavatory bowl) (18" x 36")

G. NOTE: Verify all quantities of toilet, bath and laundry accessories by reviewing drawings.

PART 3 - EXECUTION

- 3.1 Provide and install all blocking and anchoring in the wall. IMPORTANT: Failure to install adequate means for supporting toilet accessories, especially handicapped items, will require the demolition of finished work, installation of support blocking and anchoring, and reconstruction of work at the Contractors expense. All handicapped accessories shall support at 500# minimum loading.
- 3.2 Install all items in strict accordance with manufacturer's recommendations.
- 3.3 All fastener, accessories, etc. shall be stainless steel or other corrosion proof material. Fasteners shall be tamperproof type where exposed.
- 3.4 NOTE! All fixtures and accessories required to meet handicapped accessibility and barrier free conditions, shall adhere strictly to the ADAAG-2010 and ANSI 117.1 the contractor shall maintain clearances, height and reach requirements on all fixtures and accessories.

END OF SECTION 10 28 00

SECTION 10 44 16 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish all labor, materials, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of firefighting devices as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.
- C. Furnish and install semi-recessed fire extinguisher cabinets with 10 lb. minimum capacity fire extinguishers for multi-purpose dry chemical Type "ABC" and 6 liter minimum capacity fire extinguishers for wet chemical Type "WC" as indicated in drawings.
- D. For additional information, see drawings Sheets LS-1 and Blow-up Floor Plans.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Fire extinguishers shall be: "Architectural Series" 2409 R4 as manufactured by: Larsen's Manufacturing Co., Phone: 954-486-3325
 - 1. Box specification: All semi-recessed cabinets shall have heavy gauge steel boxes with vertical duo tempered safety glass door 304 stainless steel with #4 finish. (If in fire wall, use clear wire glass.)
 - 2. Fire rating, **if located in fire wall**: Cabinets shall be constructed to have fire rating required to match wall. The manufacturer shall provide detailed installation instructions and factory supplied anchoring devices to insure proper installation. **(Integrity of the fire rated walls shall be maintained throughout the project.)** Fire resistant materials shall be contained inside double wall cabinet construction.
 - 3. Trims specification: 304 Stainless steel trims and doors shall be in #4 finish, one piece construction in "Rolled-Edge Semi-recessed" style.
 - 4. Projection: Cabinets shall not project more than 3-1/2" into the space. (Depth of cabinet no more than 6".)
 - 5. Door specification: Doors shall have vertical duo tempered safety glass manufactured from 304 stainless steel with a #4 finish. They shall have recessed pulls and red diecut lettering vertically reading "Fire Extinguisher".
 - 6. Fire Extinguisher specification: Multi-purpose dry chemical extinguishers meeting class **A, B, and C** fires requirements. 10 pound minimum capacity.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. Coordinate installation with all other trades. Anchor firmly all components into position. **Provide shop drawings for approval before ordering.** Mount top of extinguisher at 5'-0" A.F.F. in accordance to N.F.P.A. standards. Protrusions into circulation spaces shall be in accordance to A.D.A. standards, 4" maximum.

END OF SECTION 10 44 16

SECTION 10 73 26 - PRE-ENGINEERED ALUMINUM WALKWAY COVERINGS

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete with Pre-Engineered Aluminum Covered Walks and Canopies as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, and complete installation of brick masonry shall be furnished and installed as part of this work.
- C. For additional information refer to Sections:
 - 1. 03 11 00 - Concrete Forming
 - 2. 03 20 00 - Concrete Reinforcing
 - 3. 03 30 00 - Cast-In-Place Concrete
 - 4. 31 23 12 - Excavation, Filling and Grading for Building Foundations
 - 5. 32 16 25 - Architectural Sidewalks

1.2 DESCRIPTION

- A. Work Included: Provide and install all pre-engineered, pre-finished extruded aluminum walkway covers and canopies as shown on the drawings and as specified herein, and as needed for a complete and proper installation. All components shall be 6063 T-6 Extruded Aluminum.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to the General Conditions, and Sections in Division 1 of the specifications.

1.3 REFERENCES

- A. American Architectural Manufacturers Association (AAMA):
 - 1. AAMA 603 - Voluntary Performance Requirements and Test Procedures for Pigmented Organic Coatings on Extruded Aluminum.
 - 2. AAMA 605 - Voluntary Specification for High Performance Organic Coatings on Architectural Extrusions and Panels.
 - 3. AAMA 607.1 - Voluntary Guide Specification and Inspections Methods for Clear Anodic Finishes for Architectural Aluminum.
 - 4. AAMA 608.1 - Voluntary guide Specifications and Inspection Methods for Electrolytically Deposited Color Anodic finishes for Architectural Aluminum.

1.4 QUALITY ASSURANCE

- A. Overall Standard: Project specific structural engineering design documents shall be stamped by a structural engineer registered to practice in the State of Louisiana.
- B. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the methods needed for proper performance of the work of this section, and has a minimum of two (2) years of experience with erection of covers and canopies of the type specified.
- C. Columns, Beams, Deck, and Trim: Aluminum extrusions
- D. Structural Framing: Interlocking deck sections secured by screws.
 - 1. TIG welded, one-piece rigid bents

2. Mechanically fasten vents using internally concealed bolted connections
- E. Canopy: Self-draining from deck through bents to discharge point at subgrade level or as otherwise shown.
 - F. Load Requirements: All Codes and standards adopted by the State of Louisiana shall be adhered to. The system shall be designed to meet and exceed a live load of 20 pounds per sq. foot, Wind load (uplift) as required by the current International Building Code (IBC) to resist 138 M.P.H. (V-ult) wind uplift. The extruded aluminum roof deck and structure shall be able to withstand concentrated and collateral loads such as large hail and walking on top along with additional loads imposed by other materials or systems identified in the Contract Documents. The size of the roof deck, fascia, beam and columns shall be a minimum of those detailed on the plans.
 - G. Structural Design: Prepare complete structural design calculations for all canopy members including footings.
 - H. Engineering Properties: Materials as detailed shall have minimum wall thicknesses and engineering properties as required to meet the 138 mph (V-ult) wind uplift required for this region in the Current State adopted International Building Code (IBC).
 - I. Manufacturer Qualifications: Minimum five (5) years' experience in producing covers/canopies with welded bents and other types specified.
 - J. Installer Qualifications: Installation Company shall be a Louisiana State Licensed General Contractor with a minimum two (2) years' experience in erecting cover/canopies of the type specified.

1.5 SAMPLES AND SHOP DRAWINGS

- A. Submit shop drawings and product data (including manufacturer's catalog data, detail sheets) according to the specifications, Section 01 33 23 - Samples, Shop Drawings and Submittals.
- B. Indicate profiles, dimensions and thicknesses of all components, all connection details and conditions where components abut other materials, fasteners, self-drainage details and accessories.
- C. Shop drawings: Layout and erection drawings shall include roof framing, deck panels, cross sections, and trim details, clearly indicating proper assembly.
- D. Samples: A minimum of ten (10) color selection samples consisting of actual coating material or anodizing process on aluminum extrusions.
- E. As part of the shop drawings, the manufacturer shall submit, for approval, project specific engineering calculations prepared by an engineer registered in the State of Louisiana that their canopy members including footings meets load requirements specified herein and in the drawings.
- F. Quality Assurance / Control Submittals:
 1. Qualifications: Letter certifying manufacturer's required qualifications.
 2. Structural Design Calculations.
 3. Manufacturer's Installation Instructions.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Follow manufacturer's instructions strictly especially as it pertains to product storage and handling requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. EXTRUDED ALUMINUM CANOPY SYSTEM

1. Canopies shall be as dimensioned on drawings. Canopies shall be secured as indicated on plans, using stainless steel fasteners with capacity to resist wind loading of 138 mph, (V-ult) as per the current State adopted International Building Code (IBC).
2. All Columns, Beams, Deck, Gutters and Trim shall be 6063 alloy, T-6 temper Aluminum Extrusions.
3. Roof Deck: Rigid-Roll-Lock aluminum extrusions shall interlock into a structurally rigid connection, which is self-flashing and secured by screws. The connection will be fastened in a manner to develop the full strength of the section. Material over 15'-0" shall be assembled with sufficient camber to neutralize deflection caused by dead load. Exposed pan to cover deck joint are not acceptable. ROLL FORMED DECK IS NOT ACCEPTABLE. Wedge lock or crimped lock deck is not acceptable.
 - a. Size and Profile: as required by structural engineering design to meet the current state adopted International Building Code (IBC). Size not to be less than shown on drawings.
 - b. Provide welded end plate water dams where sections terminate at other than drainage channels. Caulked in place water dams are not acceptable.
4. Bent Construction: Beams and columns shall be TIG welded into one piece rigid bents. When size does not permit shipment in one piece, bolted beam to column joints shall be implemented with concealed fasteners. All structural connections shall meet or exceed wind loads as stated in the current State adopted International Building Code (IBC) for the project location. (138 mph; V-ult)
5. Columns:
 - a. Radius - cornered aluminum tubular extrusion of size as required by structural engineer design to meet the current State adopted International Building Code (IBC). Size not to be less than shown on drawings.
 - b. Grout Key: provide two 1-1/2" (38 mm) diameter holes in column base, one each in opposite sides.
 - c. Provide clear acrylic protection coat on surfaces in contact with grout.
6. Beams: Open top aluminum tubular extrusions
 - a. Size: as required by structural engineer design to meet the current State adopted International Building Code (IBC). Size not to be less than shown on drawings.
7. Struts: Aluminum tubular extrusion of size as required by structural engineer design to meet the current state adopted International Building Code. Size not to be less than shown on drawings.
8. Canopy Drainage: Water shall drain internally from roof deck through bents to discharge point at subgrade level as otherwise shown.
9. Fascia: manufacturer's standard extruded aluminum fascia sections as shown on drawings and as required to complete the installation resulting in a neat finish appearance.
 - a. Include manufacturer's standard extruded aluminum gutters.
10. Flashing: Aluminum sheet, thickness as recommended by manufacturer for specific condition.
11. Rivets: All rivets shall be aluminum conforming to manufacturer's specifications.

12. Grout: 1 part Portland cement, 3 parts masonry sand; 2,000 pounds per square inch.
13. Foam Block-Outs: Rigid foam blocks sized as required for column embedment depth and shape.
14. All flashings and sealants required for a complete weather-tight installation shall be provided and installed by the Contractor.
15. Finish:
 - a. Roof Deck - Clear anodized: AA-M-10C-22A-31, Architectural Class II, comply with AAMA 607.1.
 - b. Beams - Clear anodized: AA-M-10C-22A-31, Architectural Class II, comply with AAMA 607.1.
 - c. Columns - Clear anodized: AA-M-10C-22A-31, Architectural Class II, comply with AAMA 607.1.
 - d. Bents - Clear anodized: AA-M-10C-22A-31, Architectural Class II, comply with AAMA 607.1.
 - e. Flashings - Clear anodized finish
 - f. Fascia - Clear anodized: AA-M-10C-22A-31, Architectural Class II, comply with AAMA 607.1.
 - g. Struts - Clear Anodized: AA-M-10C-22A-31, Architectural Class II, comply with AAMA 6071.
16. Hardware: All bolts, nuts, washers and screws used in the joining of the canopy members to each other shall be stainless steel.
 - a. Deck Screws shall be No. 14 by 1 inch (25mm) self-tapping type 18-8 stainless steel with neoprene washers.
 - b. Trim Screws shall be No. 10 by ½ inch (13mm) self-tapping type 18-8 stainless steel screws.
 - c. Trim Rivets shall be aluminum, size recommended by manufacturer for specific condition.
 - d. Other Fasteners shall be type 18-8 stainless steel, type recommended by manufacturer for specific condition.

2.2. FABRICATION

- A. Roof deck pans and beams shall have welded end closures on all cantilevered end conditions. CAULKED SHEET METAL CLOSURES ARE NOT ACCEPTABLE. Materials shall be fabricated from approved shop drawings, approved by the Architect. The manufacturer shall field verify all elevations, dimensions and conditions prior to releasing for fabrication.
- B. Walkway Cover Shop Assembly: Fabricate cross beams and columns into one-piece rigid bents with corners mitered and TIG welded to the extent that completed bents can be shipped on local, state and federal highways without special permit. Provide concealed bolted connections for bents required to be shipped unassembled.
- C. Suspended Canopy Shop Assembly: Fabricate with corners mitered and heli-arc welded to the extent that completed pieces can be shipped on local, state, and federal highways without special permit. Provide concealed bolted connections for elements required to be shipped unassembled.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine footings in which bents will be set. Verify footing locations and elevations comply with shop drawings.
- B. Examine building surfaces to which canopy might connect.
- C. Coordinate with responsible trade to perform corrective work on unsatisfactory footings or surfaces.

- D. Commencement of work by installer is acceptance of existing conditions.

3.2 PREPARATION

- A. Provide column sleeves or blockouts to be installed by the concrete contractor as part of the concrete work.

3.3 INSTALLATION

- A. Install canopy in accordance with manufacturer's approved shop drawings and instructions.
- B. Carefully align columns and beams plumb, straight, and true to line prior to grouting or anchoring. Adequately brace to maintain position until grout has cured.
- C. Grout downspout columns to lower edge of "weep hole". Install downspout deflectors after grouting. If base plate anchorage is indicated, no interior grout nor deflectors are required.
- D. Attach roof deck to structural supports and abutting construction. Insure that fastening points are sealed or gasketed.
- E. Take strict care to prevent scratching or damage. Replace damaged components which cannot be repaired to satisfaction of Owner or Owner's representative. Canopy shall be installed plumb and level in a manner that benefits an ornamental structure.
- F. Keep aluminum surfaces from direct contact with ferrous metal or other incompatible materials by applying one coat of zinc chromate primer; follow with two coats of aluminum paint.
 - 1. In lieu of aluminum paint, one coat of clear acrylic paint may be used.
- G. Erect protective covers in accordance with manufacturer's installation instructions.

3.4 CLEANING

- A. Clean surfaces soiled by work as recommended by manufacturer.
- B. Remove surplus material and debris from site.

3.5 PROTECTION

- A. Protect finished aluminum surfaces from damage due to subsequent construction operations.

3.6 SYSTEM MANUFACTURERS

- A. SPECIFIED SYSTEM
 - 1. Brand name specifications used herein are for the purpose of denoting the quality standard of product desired. It is not intended to restrict Bidders to the specific brand, make, manufacturer listed, rather, specifications are used to convey the style, type, character, detail and quality of product desired. The canopy components are based upon the products of: Glendale Enterprises, Inc., Kenner, LA.

3.7 PRE-APPROVED MANUFACTURERS

- A. The following manufacturers are pre-approved in name:

Pelican Protective covers.
Hahnville, LA
504-229-6298

Allstate Canopies and Rooms, LLC
Hammond, LA
985-542-1416
985-542-2120 (FAX)

Peachtree Protective Coverings
Kennesaw, GA
770-424-6600
770-424-6684 (FAX)

The pre-approved manufacturers listed above are generally approved provided that their product supplied for this project meets the specification herein and on the drawings.

END OF SECTION 10 73 26

SECTION 11400
FOOD SERVICE EQUIPMENT

PART I - GENERAL

1.1. GENERAL REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. STANDARDS

- A. Equipment and installation thereof shall meet all requirements of applicable portions of latest editions of Standards listed below.
 - 1. American Society for Testing Materials (ASTM)
 - 2. National Electrical Code (NEC)
 - 3. American Gas Association (AGA)
 - 4. Louisiana State Board of Health
 - 5. National Sanitation Foundation (NSF)
 - 6. Factory Mutual (FM)
 - 7. Underwriters Laboratory (UL)
 - 8. Occupational Safety and Health Administration (OSHA)
 - 9. National Fire Protection Association (NFPA)
 - 10. International Building Code (IBC)
 - 11. American Disabilities Act (ADA)

1.3. DESCRIPTION OF WORK

- A. Work in This Section Includes the Following:
 - 1. Furnishing, delivery, uncrating, setting in place at locations indicated on drawings. Installation to include mounting, leveling, adjusting, and cleaning all equipment specified herein.
 - 2. Apply permanent foot/caster placement markings to building floor at all cooking equipment requiring coverage of fire suppression system in accordance with NFPA-96 codes.
 - 3. All components required for a complete assembly to serve intended function when connected to mechanical and electrical services.
 - 4. Coordination of all work required for a complete installation with other trades and subcontractors.

5. Field verification of plumbing and electrical rough-ins by Food Service Equipment Contractor to ensure requirements and locations are correct. Said verification shall include all electrical characteristics (amperage, voltage, and phase) for all Existing, Contractor-Furnished, and Owner-Furnished Equipment. Field verification shall commence prior to release of equipment order and pouring of concrete slab by General Contractor.
6. Sink faucets, strainers, vacuum breakers, duo drains, lever handle drains and tailpieces specified under heading entitled Fabrication Standards.
7. Furnishing and mounting of all electrical starting switches, controls, light fixtures, and receptacles included in Itemized Equipment Specifications or as required for operation of equipment specified herein.
8. Furnish and install all refrigeration lines and components for remote condensers in accordance with manufacturers' requirements.
9. Cutting of all holes in equipment tops, shelves and bodies required for piping (gas, water and drains) and wiring.
10. Threaded hanger rods with brackets and turn buckles required to support Exhaust Hoods.
11. Threaded hanger rods with brackets and turn buckles required to support walk-in cooler and/or freezer ceiling panels (where applicable).

B. Related Work Specified Elsewhere:

1. Water/gas piping, line shut-off valves and final connections to equipment.
2. Drain piping, floor drains, floor sinks, "P" traps, grease traps and final connections to equipment.
3. Electrical wiring, overload protection devices, line-disconnect switches, and final connections to equipment.
4. Install cord/plug assemblies provided by Food Service Equipment Contractor.
5. Concrete and/or masonry curbs with coved bases as indicated on drawings.

6. Conduit for remote beverage systems.
7. Concrete pad for remote walk-in cooler/freezer condensing unit package located outside building.
8. Roof curb for remote walk-in cooler/freezer condensing unit package located on building roof (verify location).
9. Exhaust/supply fans (including magnetic starters/ductwork/roof curb) and welding exhaust ducts to exhaust duct collars of exhaust hoods to meet applicable fire codes.
10. Air balancing of exhaust/supply fans of Exhaust Hoods to meet project requirements.
11. Structural framing where required at hanger rod locations to support Exhaust Hoods and/or Walk-In Coolers and/or Freezers.
12. Wall blocking for support of wall-mounted equipment (where applicable).

1.4. DRAWINGS AND SPECIFICATIONS

- A. Specifications and drawings shall be considered as a part of the Contract to be executed. Intent of said Drawings and Specifications is for all components required for a complete installation of food service equipment specified.
- B. Should any error, omission or conflict occur in Drawings and Specifications, Contractor shall not avail himself of such error, omission or conflict but shall have same explained and adjusted prior to signing the Contract.
- C. All addenda shall be considered as a part of original Contract Documents.

1.5. QUALITY AND WORKMANSHIP

- A. All equipment shall be constructed in strict compliance with standards of National Sanitation Foundation and shall bear the NSF label. All equipment shall meet all standards set by state and local regulations.
- B. All electrical equipment shall be approved by Underwriter's Laboratories and shall bear its seal of approval.
- C. All electrical components of equipment shall meet requirements of National Electric Code.

- D. All material shall be new (latest model at time of delivery) and of first quality. All equipment shall be installed in an undamaged condition. Where brands, materials, apparatus, or equipment are specifically designated, no substitution shall be made without prior approval in writing.
- E. Provide all Work in best manner in conformity with best standard practices. Employ qualified, efficient, and skillful workers for installation in a first-class manner.
- F. It is required that custom fabricated equipment be fabricated by a Food Service Equipment Fabricator who has plant, personnel and engineering facilities to design, detail and manufacture high quality equipment.

1.6. FOOD SERVICE EQUIPMENT CONTRACTOR QUALIFICATIONS

- A. Contractor shall possess experience and ability to perform the necessary services for a complete and workmanlike installation of food service equipment.
- B. Contractor experience shall include a minimum of five (5) years' experience as a successful Food Service Equipment Contractor and shall have successfully completed installation of at least five (5) comparable projects of similar size and nature.
- C. Contractor's in-house capabilities shall include preparation of dimensioned mechanical/electrical rough-in Drawings, experienced personnel to coordinate with other trades the proper equipment installation, warranty services, and proper demonstration of equipment on operation, service, and maintenance.

1.7. SUBMITTALS

- A. Submittals shall include product data (manufacturer's specification sheets) of standard-manufactured equipment, shop drawings of custom-fabricated equipment and equipment modified to meet project requirements, and dimensioned mechanical and electrical rough-in drawings of equipment utility requirements. Partial submittals will be given no consideration.
 - 1. Product data shall be submitted in electronic pdf format unless stated otherwise in Contract Documents and shall be in numerical order (by equipment item numbers). Each manufacturer's specification sheet shall be preceded with a type-written sheet that includes equipment description, quantity, brand/model number, accessories, and modifications to meet project requirements.
 - 2. Shop drawings are not to be based upon reproduction of Contract Document drawings. Shop drawings shall be submitted in electronic

pdf format unless stated otherwise in Contract Documents. Shop drawings for custom-fabricated equipment shall be drawn at a minimum scale of $\frac{3}{4}$ " to the foot with cross-sections drawn at 1-1/2" to the foot. Sheet sizes shall be same size as sheet sizes of Contract Document drawings, not to exceed 30" x 42".

3. Equipment floor plan, mechanical, and electrical rough-in drawings are not to be based upon reproduction of Contract Document drawings. Drawings shall be submitted in electronic pdf format. Rough-in drawings shall show utility requirements of equipment specified, existing equipment to be re-used, future equipment (including vendor-furnished equipment), area clean-up floor drains, and electrical convenience outlets shown on Contract Document drawings. Rough-in requirements shall be accurately drawn to scale with dimensions from centerline of columns or finished walls. Contractor shall be responsible for determining exact locations on building walls and floors and not connection points on equipment. Contractor shall visit project site to verify correct locations of utility stub-outs and floor recesses/block-outs prior to pouring of concrete slab and report discrepancies found to Architect and/or Consultant. Refer to certification requirements of Description of Work of this section.
4. Contractor shall be responsible for taking all field dimensions which affect equipment and installation thereof. At the time of taking field measurements and observation of existing conditions, Contractor shall report in writing to Architect all work performed by other trades which will prevent him from execution of his work required by Contract Documents and shall obtain Architect's instructions before proceeding with his work.

1.8. PROTECTION OF WORK AND MATERIALS

- A. Contractor shall always cover and protect his Work, material, and equipment to save same from damage. Contractor shall always exercise due care to protect the work of others. Cost of any repair or replacement of damaged Work, material and equipment shall be borne by Contractor.

1.9. BRANDS AND TRADE NAMES

- A. Contractors are cautioned that only food service equipment and related items manufactured in accordance with Specifications will be acceptable. Where brand names and model numbers are specified, it is not intended that competition be limited, but to set standards of performance, design, capacity, durability, and appearance. Bidders desiring to quote and/or supply brands of equipment other than those specified shall submit a written request to Architect with a copy to Consultant seven (7) days prior

to bid date in order that such substitutions can be considered for approval and if approved, an addendum issued to all plan holders. It is understood that approval of substitutions does not relieve Contractor from furnishing equipment to meet intent and requirements of Specifications. Approval of substitutions does not relieve Contractor from additional costs of mechanical and electric utilities and other requirements not included in Contract Documents.

1.10. WARRANTIES

- A. Contractor shall provide a one (1) Year Warranty from date of Substantial Completion or occupancy on all Work provided under these Specifications. Warranty shall cover replacement of defective material, transportation, and labor, but does not include costs of replacement parts and labor caused by Owner's carelessness or misuse of equipment. An additional four (4) year warranty (labor included) shall be provided on all refrigeration compressors. Contractor shall provide a reputable and qualified service agency, located within fifty (50) miles of Project site, to provide immediate service for all refrigeration equipment.

PART 2 - PRODUCTS

2.1 CUSTOM FABRICATED EQUIPMENT MANUFACTURERS

- A. Equipment manufacturers shall be Low Temp Industries, Inc.; Atlanta Custom Fabricators; and Stainless & Aluminum Fabrication, or a prior approved equivalent.
- B. All fabricated equipment shall be manufactured by one (1) manufacturer to ensure uniformity in design and finish.

2.2 ELECTRICAL REQUIREMENTS

- A. Refer to Drawings for specific requirements.
- B. Fixtures wired for three-phase shall have loads balanced as equally as possible.

2.3 SWITCHES AND CONTROLS

- A. A suitable control switch or starter of proper type in accordance with Underwriter's Code shall be supplied for each motorized appliance or electrically-heated unit.
- B. Said switches and controls shall be mounted in recessed die-stamped stainless-steel cups or otherwise indented to prevent damage.

2.4 METAL FABRICATION STANDARDS

A. Materials:

1. All stainless steel shall be type 302 or 304 with 18% chromium, 8% nickel, and a maximum of 0.12% carbon. All sheets shall have a No. 4 finish with colors and finish uniform throughout.
2. Where galvanized steel is specified, a tight coat galvanized copper bearing finish shall be furnished. Galvanized steel shall be furnished in largest sheets possible with as few joints as necessary.

B. Welding:

1. All welded parts shall be non-porous and free from imperfections, pits, cracks, or discolorations.
2. Stainless steel joints and seams shall be heli-arc welded ground smooth and polished to a No. 4 finish. Welds of galvanized steel shall be ground smooth, sand-blasted and sprayed with molten zinc at 1200 degrees Fahrenheit to a thickness of .004". Tinning of welds is not acceptable. All welds shall be ground smooth and polished to original finish of metal.

C. Field Joints:

1. Field joints shall be located for practical construction with sizes convenient for shipping and entry into building spaces.
2. All field joints shall be fully (continuous) welded with same type metal, ground smooth and polished to original finish of metal.

D. Table and Counter Tops:

1. All tops, unless otherwise specified, shall be constructed of 14-gauge stainless steel. Exterior edges not adjacent to walls or other equipment shall be turned down on a 90-degree angle or rolled down 1-3/4" with corners bullnosed. Tops adjacent to walls shall be turned up 6" and back 1" (minimum) on a 90-degree angle to form a backsplash. Tops adjacent to other equipment shall be flanged straight down 1-3/4". Sound deadening material shall be provided between frame members and stainless-steel tops.
2. Edges of dishtable tops not adjacent to walls shall be turned up 3" and rolled down 1-1/2" with corners bullnosed. Dishtable tops adjacent to walls shall be turned up 10", back 2-1/2" on a 45-

degree angle and down 2" to form a pipe chase. All horizontal edges and internal corners of dishtable tops shall be coved on a 5/8" minimum radius. Ends of backsplashes shall be closed, welded, ground smooth and polished.

3. Edges of preparation counter tops (with sinks) not adjacent to walls shall be turned up 7/8" on a 45-degree angle and turned down on a 90-degree angle or rolled down 2-5/8" to form a marine roll unless specified otherwise. Preparation counter tops (with sinks and cantilevered overshef uprights) adjacent to walls shall be turned up 10", back 2-1/4" on a 45-degree angle and turned down 1" on 90-degree angle to form a backsplash with pipe chase. All horizontal edges and internal corners of preparation counter tops shall be coved on a 5/8" minimum radius. Ends of backsplashes shall be closed, welded, ground smooth and polished. Backsplashes of counter tops with sinks shall be pierced on 8" centers over sinks.
4. All tops shall be reinforced on the underside with 12-gauge (minimum) stainless steel hat channels running from front to back with center bracing where required to hold tops flat. Channels shall be stud welded and bolted to underside of tops with legs, bodies and drawer housings secured to channels so that bolts or rivets will not extend through work tops. Holes required for counter equipment shall be neatly die-punched with raised edges.

E. Backsplashes:

1. Backsplashes of table and countertop with 90-degree turnbacks adjacent to walls shall be turned down 1" at 90-degrees and secured to building walls with 4" long 14-gauge stainless steel "zee" clips on 36" centers. Cracks between backsplashes and building walls shall be sealed with clear silicone sealant.
2. Backsplashes of preparation counters and dishtables with 45-degree turnbacks adjacent to walls shall be turned down 1" at 135-degrees and secured to walls with 4" long 14-gauge stainless steel "zee" clips on 36" centers. Cracks between backsplashes and building walls shall be sealed with clear silicone sealant.

F. Open Bases:

1. Open bases shall be constructed of 1-5/8" OD 16-gauge stainless steel tubular uprights and crossbraces fully welded together, ground smooth and polished. Top of cross braces shall be 12" above floor. Refer to Drawings for arrangement of crossbraces. Uprights shall be fitted at floor with adjustable, sanitary stainless steel bullet feet inserted into uprights with inside threads to

eliminate any possibility of threading collecting dirt and other matter. Tops of legs shall be fitted into die-stamped fully enclosed stainless steel gussets equivalent to Component Hardware No. A20-0206-C welded to reinforcing channels on underside of stainless-steel tops.

2. Tables 6'-0" long and under shall have four (4) legs, and tables 7'-0" long shall have six (6) legs. Legs shall be spaced not more than 5' 0" apart unless specified otherwise.

G. Cabinet Bodies and Bases:

1. All cabinet bodies and bases shall be enclosed with 18-gauge stainless steel. Exterior vertical corners shall be square.
2. Bodies and bases shall be mounted on 6" high sanitary adjustable counter legs equivalent to component Hardware No. A48-5048.

H. Undershelves and Interior Shelves:

1. All undershelves and interior shelves shall be constructed of 18-gauge stainless steel.
2. Undershelves on open base tables shall be sectional, removable, and rolled down over crossbraces, unless otherwise specified in Itemized Equipment Specifications. Shelves adjacent to walls and other equipment shall turn up 2". Shelves shall be notched around table uprights and crossbraces, so that undershelves are easily removable. All edges of sections adjacent to each other shall be turned down 1" (minimum) for rigidity.
3. All interior shelves of cabinet bodies and bases shall be stationary unless specified otherwise. Sides and rear edges of shelves shall be turned up 1-1/2", down 1-1/2" and in 2" on front. Shelves shall be welded to cabinet bodies and braced on underside. Welding marks or spots shall not be visible on exterior of counter base panels. Where removable interior shelves are specified, edges of shelves shall be turned down 1-1/2" on all sides with sections supported by angle framework. Where plumbing and other appurtenances pass through counter bases, 5" wide open chases, concealed by 6" wide rear vertical pilaster trim, shall be provided to accommodate piping.

I. Elevated Shelves:

1. Elevated shelves shall be constructed of 16-gauge stainless steel and shall be turned down 1-1/2" on front and ends with sanitary

semi-rolled edges with bullnosed corners. Rear sides of shelves shall be turned up 1-1/2".

2. Free-standing shelves, unless specified otherwise, shall be mounted on 1" OD stainless steel tubular uprights mounted to counter tops in a sanitary manner (tube inserts when accessible from bottom of counter). Wall mounted shelves shall be equipped with stainless steel angle wall brackets anchored to building wall.
3. Shelves, where specified to be mounted on cantilever brackets, shall be mounted on 1-5/8" diameter stainless steel tubular uprights welded to framing of table and counter tops.

J. Drawers:

1. All drawers shall be 20" x 20" x 5" deep unless specified otherwise. Removable pans shall be formed of one-piece die-stamped 18-gauge stainless steel with top edges flanged out 2". Faces of drawers shall be equivalent to Component Hardware No. J85-2000. Drawers shall operate on ball-bearing roller stainless steel extension slides to allow full opening and shall be fitted with adjustable stops to prevent drawers from being pulled out too far so they will drop down.
2. Drawers shall be completely enclosed in 18-gauge stainless steel housing attached to undersides of tops on open base tables and shall be attached to framework of cabinet base tables.

K. Casters:

1. Casters specified for open base tables shall be equivalent to Component Hardware Nos. C23-1250 (5" diameter non-braking) and C23-1251 (5" diameter braking).
2. Casters specified for cabinet base tables shall be equivalent to Component Hardware Nos. C21-3050 and C21-3051.

L. Sinks:

1. Sinks shall be constructed of 14-gauge stainless steel having back, bottom and front formed of one (1) continuous sheet of metal with ends and partitions welded in place. All vertical and horizontal corners of sink compartments shall be coved with metal on a 5/8" (minimum) radius. No solder filleting will be acceptable. All edges of sink counter tops not adjacent to walls shall be turned up 7/8" on a 45-degree angle and rolled down 2-5/8" to form a marine roll unless specified otherwise. Edges of sink counter tops adjacent to wall

shall be turned up 10", back 2-1/4" on a 45-degree angle and down 2" to form a backsplash with pipe chase. All ends of backsplashes shall be closed, ground smooth and polished. Backsplashes shall be pierced on 8" centers over compartment dividers of two, three and four compartment sinks and over center of one compartment sinks unless specified otherwise. Bottom of each sink compartment shall be fitted with Component Hardware No. D50-7200 lever handle drain. Overflow drain assemblies when specified shall be Component Hardware No. D50-7215. Drains shall set into embossed openings in sink bottoms, gasketed and locked in place without use of rivets or bolts. Sinks shall be mounted on 1-5/8" OD 16-gauge stainless steel legs with adjustable stainless-steel feet (same as specified for open base tables). All sink partitions shall be 7/8" thick double wall construction. A model No. B-0231 T & S mixing faucet (12" spout) shall be mounted at center of each single compartment sink and over each partition of each multiple compartment sink. Preparation and utensil wash sinks shall be 12" and 14" deep respectively unless specified otherwise.

2. Sink inserts shall be constructed same as specified for sinks above with coved corners and 2" lever drains. Sink inserts shall be welded integral with stainless steel tops. Inserts unless otherwise specified, shall have a T & S model no. B-0222-059X faucet deck-mounted behind each compartment.

2.5 ITEMIZED EQUIPMENT SPECIFICATIONS

- A. Space and utilities shown on Drawings are based on primary specification (first brand and model number specified). Secondary and alternate brands shall meet specific equipment requirements of primary brand and model number specified. Substitutions of equipment do not relieve Contractor from additional costs for mechanical and electrical utilities in excess of requirements shown in Contract Documents.
- B. Item No. 1 Clothes Washer (One Required):
 1. Whirlpool No. WTW5010LW or approved equal with 36" long NEMA 5-20P cord/plug assembly
- C. Item No. 2 Clothes Dryer (One Required):
 1. Whirlpool No. WED5010LW or approved equal with 36" long NEMA 14-30P cord/plug assembly
- D. Item No. 3 Wall-Mounted Storage Shelving (One Required):

1. Single-tier, 12" wide Metro Super Erecta Metroseal-3 or approved equal, located in accordance with drawings 60" above finished floor. General Contractor to provide blocking for wall-mount application.

E. Item No. 4 Mobile Shelving Unit (One Required):

1. Cambro Camshelving series or approved equal with components/features/ accessories as follows:
 - a. Four (4) 21" wide x 48" long shelves with vented shelf mats
 - b. Four (4) 64" long uprights
 - c. Four (4) 5" diameter urethane swivel casters, two (2) with brakes

F. Item No. 5 Stainless Steel Floor Mop Sink (One Required):

1. Advance Tabco No. 9-OP-28 or approved equal with components/features/accessories as follows:
 - a. No. K-240 faucet
 - b. No. K-242 mop hanger
 - c. No. K-244 hose and bracket

G. Item No. 6 Air Door (One Required):

1. Mars No. N272-2UA-SS or approved equal with components/features/accessories as follows:
 - a. Two (2) micro-switches for automatic on/off operation
 - b. No. HSF-304SS-STD stainless steel housing

H. Item No. 7 Walk-In Cooler/Freezer (One Required):

1. General: Walk-in shall be pre-fabricated modular construction, designed and constructed to allow for fast and easy field assembly, relocation, and modification by addition of modular panels. Walk-in and components thereof shall meet 2009 Energy Code Standards. Walk-in shall be installed and/or commissioned by a certified factory technician.
2. Project Requirements: Walk-in shall be floor type installed within 7" deep concrete floor recess (below finished kitchen floor) with thick-set quarry tile wearing floor surface, same level as adjacent floor surface.
3. Size: Walk-in shall be 26'-11" wide x 15'-5" deep x 8'-6" high with arrangement indicated on drawings.

4. Finishes: Exposed exterior wall and ceiling panels (including exposed floor and ceiling caps) shall be 20-gauge type 304 No. 3 finish stainless steel. Interior wall and ceiling panels shall be 26-gauge galvanized steel with mill-applied white enamel. Interior/exterior door/door panels shall be 20-gauge type 304 No. 3 finish stainless steel with 36" high kick plates. Unexposed wall and ceiling panels shall be 26-gauge galvanized steel. Floor panels shall be 14-gauge galvanized steel (unexposed).
5. Panel Construction: Panels shall consist of metal pans, formed to precise dimensions, with "foamed-in-place" urethane to permanently bond to inner metal surfaces to form strong rigid units. Standard wall, ceiling, and floor panels shall 11½", 23", 34½", 46", and 69" wide. Standard corner panels shall be 12" x 12" on 90-degree angle. Special fabricated panels shall be provided to meet project requirements. Panels shall be equipped with NSF-approved double-bead interior and exterior vinyl gaskets which are resistant to stains, grease, oil, mildew, and sunlight. Panels shall be equipped with cam-action locking mechanisms (hook and arm assemblies) securely mounted in matching panel locations to form air-tight and vapor-proof joints. Locking mechanism parts shall be equipped with urethane plugs and snap-in caps to match interior finish of panels.
6. Insulation: Insulation shall be 4" thick rigid, low ozone depleting HCPC 22 blown Class 1 urethane foam classified according to UL723 (ASTM-E-84) as tested by Underwriter's Laboratories, Inc. Four (4) inch core material shall have a flame spread of 25 or less and a smoke density of 250. Insulation shall have a thermal conductivity (K Factor) of not more than 0.125 BTU/hr/sf per degree Fahrenheit/inch, on overall coefficient of heat transfer (U factor) of not more than .031, and R factor of 32. Pre-fabricated urethane foam panels shall be supplied with a Class 1 fire hazard classification according to UL723 (ASTM-E-84) as tested by Underwriter's Laboratories, Inc. Panels shall have a flame spread rating of 25 or less with a certifying UL labels.
7. Entrance Doors and Door Panels: Refer to drawings for door locations and directions of door swings. Doors shall be 48" wide x 76" high, infitting flush-mounted type with one-piece perimeter PVC accordion-type removable gasket with magnetic core at top and side perimeters at doors. Adjustable wiper gaskets shall be mounted on bottom edge of doors. Door latches shall be high pressure zinc die cast with polished chrome finish with break-away inside safety release handles so that doors can be opened from inside, even if locked, and cylinder locks. Doors shall be equipped with Kason No. 1346 Performer adjustable hinge. Doors shall be equipped with positive-action hydraulic door closers to ensure positive closing of doors. Hinges of 42" and 48" wide doors shall include 21-inch straps. Rubber door stopper shall be installed on

exterior front panel to prevent damage of panel by handle when door is opened to a full 180 degrees. Aluminum diamond treadplates (1/8" thick) shall be mounted on the lower 36" of interior and exterior door surfaces. Door panels shall be equipped with heavy reinforced steel "U" channel frame on entire door perimeter. Anti-sweat heater cables shall be run in breaker strips located behind removable heavy-gauge stainless steel trim for easy access to heater cables. Heater cables shall be run within heavy-gauge "U" channels of 12-gauge stainless steel (minimum) thresholds. Each door panel shall include a pre-wired Kason No. 1806LED000 LED-light fixture with globe and 11.5-watt lamp, 2½" diameter chrome face, and flush-mount dual-reading adjustable dial thermometer on exterior surface to provide temperature readings of minus 40-degrees F to plus 60-degrees F and minus 40-degrees C to 15-degrees C.

8. Pressure Relief Ports: Walk-in cooler and freezer rooms shall include 2-way heated pressure relief ports (vents) to equalize pressure between interior and exterior pressures caused by sudden temperature changes due to opening doors, loading of products, and/or defrosting of coils. Pressure relief port(s) quantities, sizing, and locations to be determined by walk-in manufacturer.
9. Ceiling Light Fixtures: Eight (8) Kason No. 1810L21248LB 48" long LED-light fixtures, each with two lamps (36-watt total) shall be furnished and installed by this Contractor. Junction box assemblies shall include threaded electrical conduit (urethane-filled), junction boxes (installed on top of ceiling panels), and 120-volt wiring to junction box.
10. Warranty: Walk-in panels shall include a ten (10) year factory warranty (including labor) for defects in materials and workmanship from date of Substantial Completion of project.
11. Trim Strips and Closure Panels: Trim strips to match finish of exposed exterior walk-in panels shall be furnished and installed in a workmanlike manner to conceal cracks between walk-in and building walls. Closure panels, constructed in accordance with drawings and project requirements, shall be mounted on top of walk-in to match exposed exterior walk-in panels. Where required for access to top of walk-in, removable closure panels are required.
12. Temperature Alarm System: Each cooler/freezer room shall include one (1) flush-mounted Modularm No. 75LC multi-monitor, 3-button user interface, digital temperature indicator, built-in audible alarm, built-in dry contacts for remote notification capability of an audio and/or visual alarm condition, built-in transformer, built-in rechargeable battery with recharging circuitry, and built-in data/comm port for system expansion. System shall provide Energy Independence and Security Act compliant timing lighting control, Hi-Lo temperature alarm, panic alarm, and door ajar alarm. System shall include magnetic contacts for each door and low

voltage IP-1 illuminated push button (to provide light switch and panic alarm functions) inside each cooler/freezer room by the door. The IP-1 will remain lit at all times, even during a power failure. Multiple IP-1's shall be provided by each door in multi-door compartments to integrate with timed lighting function and to replace conventional 3-way light switching. Walk-in manufacturer shall furnish and install rigid conduit and wiring from each flush-mounted monitor mounted in door panels to top of ceiling panels (for field wiring to ceiling lights and specified components, by electrical contractor). Wiring to sensors within cooler/freezer rooms shall be furnished and installed by Food Service Equipment Contractor. System shall include low voltage MD-1 motion detectors inside walk-in cooler and freezer above the door for occupancy detection and automatic light control. Temperature sensors shall be located behind the evaporator coils to typify the average ambient temperature of the room. Sensor wiring shall be run above top of walk-in ceiling panels with penetrations (thoroughly sealed with silicone and foam urethane to prevent condensation) at sensor locations. Sensor wiring shall be secured to top of walk-in ceiling panels with continuous duct tape to prevent wiring damage.

13. Plastic Door Curtains: Exterior cooler/freezer entrance doors shall be equipped with Clear Vu stripless swinging door curtains manufactured by CCI Industries, Inc. (350-A Fischer Ave., Costa Mesa, CA 92626) Phone: (800) 854-5719.
14. Quality Standards: Walk-in shall be manufactured by Thermo-Kool, American Panel, Norlake, Kolpak, Bally or approved equal.

I. Item No. 8 Remote Refrigeration System (One Required):

1. System shall be pre-engineered, factory-assembled, air-cooled, multi-compressor type mounted within a common type 304 stainless steel housing with one-piece louvers and hail guards. Unit shall be furnished with 24" high galvanized steel stand and anchored to concrete pad (furnished by General Contractor) outside building where indicated on drawings.
2. System shall include pre-assembled components to include compressors (EPA-approved refrigerant), condensers, ball-bearing fan motors, adjustable head pressure controls, crankcase heaters, suction filters, sight glass driers, liquid line inlet/outlet valves, high-pressure superhose connection, suction/discharge absorbers, and accessories for a complete assembly to meet project requirements.
3. Condensing unit package shall include factory pre-wired electrical components to include control panel with circuit breakers, contactors, Eco-Smart on-demand electric defrost systems for cooler and freezer coils, **two pre-mounted and pre-wired leak**

- sensors**, and fused line disconnect for a single electrical connection.
4. System shall include evaporator coils with factory-assembled thermostats, solenoid valves, expansion valves, on/off disconnect switch, and accessories for a complete and workmanlike installation to meet project requirements.
 5. System shall be Refrigerated Design Technologies (RDT) or approved equal to include one (1) rack no. ZS1-02Z-CT3-EST (32270) with one (1) no. YB14KSE and one (1) no. YF15KAE compressors for cooler and freezer rooms respectively; and one (1) no. KLP215MA and one (1) no. KLP316LE evaporator coils for cooler and freezer rooms respectively.
 6. Shop drawing required for approval.
 7. Contractor shall furnish and install **liquid line shut-off valves and suction line check valves (furnished by manufacturer)**, all necessary valves, controls, oil separators, refrigerant tubing, refrigerant **R454A**, condensate drain lines, and accessories for a complete and neat workmanlike job in accordance with the best refrigeration practices. Refrigerant piping shall be pressure tested with nitrogen at 300 psi after condensing units and evaporator coils have been connected prior to charging with refrigerant and testing. All refrigerant lines subject to sweating shall be insulated with AP/Armaflex insulation ($\frac{3}{4}$ " minimum thickness for coolers and 1" thickness for freezers) with all joints sealed with glue as recommended by the manufacturer of the insulation. Duct tape at joints is not acceptable. Thickness of insulation shall be increased to 1-1/2" and 2" for cooler and freezer rooms respectively in poorly-ventilated confined areas to reduce probability of condensation of refrigerant lines. Refrigerant lines shall be rigid, type L copper with all joints soldered to meet the best refrigeration practices. Refrigerant lines shall be anchored to building structure with clamps and galvanized steel saddles as required. Condensate drain lines shall be rigid, type L copper securely fastened to walk-in panels with non-corrosive clamps (straps are not acceptable). Condensate drain lines installed in freezer rooms shall be wrapped with spiral-installed heater tape. Condensate drain lines shall be generously sloped (1/2" per lineal foot minimum) to the bottom of walk-in rooms, extended through walk-in panel, through building walls (where applicable), and trapped outside walk-ins. All refrigeration systems shall be checked out to the Owner's satisfaction. This contractor shall provide an acceptable, local refrigeration service agency which shall provide 24-hour, 7-day warranty service.
 8. Contractor shall furnish and install 20-gauge stainless steel refrigerant line enclosure on exterior of building where indicated on drawings. All refrigerant piping shall be enclosed stainless steel enclosure. Refer to drawing detail on Sheet FS2.1. Shop drawing required for approval.

- J. Item No. 9 Mobile Storage Shelving Units (Ten Required):
1. Cambro Camshelving series or approved equal, each with components/features/accessories as follows:
 - a. Four (4) 21" wide x 48" long shelves with vented shelf mats
 - b. Four (4) 64" long uprights
 - c. Four (4) 5" diameter urethane swivel casters, two (2) with brakes
- K. Item No. 10 Dunnage Racks (Twenty-Eight Required):
1. Cambro Nos. DRS480 (48" long) and DRS600 (60" long) or approved equal, lengths and quantities as indicated as drawings
- L. Item No. 11 Storage Shelving Units (Nineteen Required):
1. Cambro Camshelving series or approved equal, each with components/features/accessories as follows:
 - a. Five (5) 21" wide x 48" long shelves with vented shelf mats
 - b. Four (4) 72" long uprights
- M. Item No. 12 Can Racks (Three Required):
1. New Age 97294 or approved equal, First-in-First-out series with 156 can storage capacity
- N. Item No. 13 Ice Machine (Cuber) w/Storage Bin (One Required):
1. Manitowoc No. IDT-0620A (air-cooled) or approved equal with components/features/accessories as follows:
 - a. Water filter sized to ice production capacity
 - b. No. D570 ice storage bin
- O. Item No. 14 Stainless Steel Hand Sinks (Four Required):
1. Advance Tabco No. 7-PS-50 or approved equal, each with components/features/accessories as follows:
 - a. Splash-mounted faucet with wrist handles
 - b. Lever drain with overflow
 - c. Chrome-plated "P" trap
 - d. Wall bracket

- P. Item No. 14A Stainless Steel Hand Sink – Future Equipment
- Q. Item No. 15 Preparation Counter w/Sinks & Overshelf (One Required):
1. 30" wide x 10'-0" long x 36" high, arrangement indicated on drawings, custom fabricated stainless steel open base type with components/features/accessories as follows:
 - a. Marine roll top edges on front and right end
 - b. Two (2) 20" x 24" x 12" deep sinks
 - c. Two (2) lever drains
 - d. One (1) splash-mount faucet
 - e. Undershelves, except at sinks
 - f. Two (2) drawers (on opposite ends)
 - g. Footworks No. 9401-B-L-1/2 pedal valve with stainless braided hose kit
 - h. 12" wide x 10'-0" long stainless steel overshelf mounted on tubular uprights and cantilevered brackets 24" above countertop
- R. Item No. 16 Food Cutter (One Required):
1. Hobart No. 84186 or approved equal with #12 attachment hub and standard accessories
- S. Item No. 17 Slicer (One Required):
1. Hobart No. HS7-1 or approved equal
- T. Item No. 18 Preparation Counter w/Overshelf (One Required):
1. 60" wide x 12'-0" long x 36" high, custom fabricated stainless steel open base type with components/features/accessories as follows:
 - a. 6" high x 6" wide x full-length enclosed backsplash
 - b. 11'-6" long x 54" high 2-bar pot rack mounted on tubular uprights and cantilevered brackets
 - c. 15" wide x 24" high overshelf
 - d. Undershelf
 - e. Four (4) drawers
 - f. Flanged feet
 - g. Four (4) NEMA 5-20R receptacles pre-mounted in backsplash (including receptacles for Nos. 16 & 17)
- U. Item No. 19 Pot/Pan Sink w/Overshelf (One Required):

1. 30" wide x 13'-0" long x 36" high, arrangement indicated on drawings, custom fabricated stainless steel open base type with components/features/accessories as follows:
 - a. Marine roll top edges on front and ends
 - b. Three (3) 24" x 30" (left-to-right) x 14" deep sink compartments
 - c. One (1) T&S Brass No. B-0133-ADF12-B splash-mounted pre-rinse spray unit with wall bracket and add-on faucet with 12" long swing nozzle, mounted above sink compartment divider on left end of Pot/Pan Sink
 - d. One (1) splash-mount faucet, mounted above sink compartment divider on right end of Pot/Pan Sink
 - e. 15" wide x 13'-0" long 14-gauge stainless steel overself mounted on tubular uprights and cantilevered brackets 24" above sink top with provision for pre-rinse unit
 - f. Two (2) Footworks No. 9401-B-L-1/2 pedal valves with stainless braided hose kits

V. Item No. 20 Reach-In Refrigerator (One Required):

1. Traulsen No. RHT232NUT-HHS or approved equal with components/ features/accessories as follows:
 - a. Half-height doors
 - b. Standard wire shelves

W. Item No. 21 Baker's Table w/Spice Shelf (One Required):

1. 30" wide x 96" long x 36" high, custom fabricated stainless steel open base type with components/ features/accessories as follows:
 - a. 6" high x 1" thick rear splash
 - b. Tier of three (3) drawers within base enclosure on right end
 - c. Open base for mobile ingredient bins on left end
 - d. 12" wide x 96" long x 15" high stainless steel overself

X. Item No. 22 Mobile Ingredient Bins (Three Required):

1. Rubbermaid No. FG360288WHT or approved equal

Y. Item No. 23 Mobile Utensil Storage Shelving Units (Three Required):

1. Cambro Camshelving series or approved equal, each with components/features/ accessories as follows:
 - a. Four (4) 24" wide x 48" long shelves with slotted shelf mats

- b. Four (4) 64" long uprights
- c. Four (4) 5" diameter urethane swivel casters, two (2) with brakes

Z. Item No. 24 Mixing Faucets w/Hose Threads (Two Required):

- 1. T&S Brass No. B-0665-BSTP or approved equal, each with components/features/accessories as follows:
 - a. T&S No. 002970-45 stainless steel hose rack (mounted underneath faucet)

AA. Item No. 24A Mixing Faucet W/Hose Threads – Future Equipment

BB. Item No. 25 60-Quart Mixer (One Required):

- 1. Hobart No. HL600 or approved equal with components/features/accessories as follows:
 - a. Standard accessories including 60-quart stainless steel bowl, "B" beater, "D" wire whip, and "ED" dough hook
 - b. Bowl truck
 - c. 60-quart Lexan splash cover
 - d. 40-quart accessories including stainless steel bowl, "B" beater, "D" wire whip, "ED" dough hook, and Lexan splash cover
 - e. 48" long NEMA L15-20P cord/plug assembly

CC. Item No. 26 Mobile Pan Racks (Seven Required):

- 1. CresCor No. 207-1820 or approved equal, each with components/features/accessories as follows:
 - a. Vinyl corner bumpers
 - b. 5" diameter swivel casters, two (2) with brakes

DD. Item No. 27 Mobile Proofer Warming Cabinets (Two Required):

- 1. CresCor No. 121-PH-UA-11D, Metro equivalent, or approved equal, each with components/features/accessories as follows:
 - a. Vinyl corner bumpers
 - b. 5" diameter swivel casters, two (2) with brakes

EE. Item No. 28 Double-Stacked Convection Ovens (Two Required):

1. Blodgett No. DFG-100 DBL (double-stacked) or approved equal, each with components/features/ accessories as follows:
 - a. Stainless steel front, sides, top, rear enclosure panel, and 6" high adjustable legs
 - b. Gas manifold for single connection

FF. Item No. 29 40-Gallon Tilting Braising Pans (Two Required):

1. Groen No. BPM-40GC, Cleveland equivalent, or approved equal, each with components/features/accessories as follows:
 - a. Classic controls
 - b. Double pantry faucet with 48" spray hose assembly
 - c. No. 150247 pan carrier

GG. Item No. 30 Double-Stacked Convection Steamers (Three Required):

1. Groen No. (2)GSSP-BL-5GS (double-stacked), Cleveland equivalent, or approved equal, each with components/features/accessories as follows:
 - a. SmartSteam water treatment kit

HH. Item No. 31 Fryer/Filter Unit (One Required):

1. Frymaster No. SCFHD260G (tube-type) or approved equal with components/features/accessories as follows:
 - a. Two (2) 80-lb capacity fryers with standard controls
 - b. Built-in filtration system
 - c. Stainless steel frypot, front, door, and cabinet
 - d. Stainless steel spreader cabinet on left end
 - e. Two (2) stainless steel full pot covers
 - f. One (1) box of filter powder (80-count)
 - g. One (1) box of filter paper (100-count)
 - h. Clean-out rod
 - i. Common gas manifold for single gas connection
 - j. Casters with brakes

II. Item No. 32 Utility Distribution System (One Required):

1. System shall be a U.L. Listed, modular, island-type energy distribution and control system manufactured in accordance with the latest edition of the National Electrical Code (NEC), National Manufacturer's Association (NEMA), National Fire Protection Association (NFPA) Pamphlet Nos. 96 and 54, Uniform Plumbing

Code, ASME, and Occupational Safety and Health Administration (OSHA) using only U.L. Listed Bureau of Mines, and AGA and CGA certified components.

2. System shall be 16'-0" long x 12" wide and shall be completely pre-wired and pre-plumbed to final connection points for electric/hot water/cold water/gas for the equipment shown on the drawings. HORIZONTAL CHASE OF ISLAND-TYPE SYSTEM SHALL NOT EXCEED AN OVERALL HEIGHT (INCLUDING PEAKED TOP) OF 50" ABOVE FINISHED FLOOR.
3. Fixed riser, pedestal, end caps, and raceway exterior panels shall be constructed of 16-gauge type 304 stainless steel with a No. 4 finish. Removable panels shall be constructed of 18- and 20-gauge stainless steel. A watertight barrier shall be provided between electrical and plumbing compartments. Control tower pedestals shall be secured to the building floor with stainless steel, interior flanges. Housing of the raceway shall be equipped with neoprene bumper strips.
4. Electrical compartment shall be a completely enclosed, stainless steel housing accessible by removal of stainless steel screws.
5. Internal electrical main feeder(s) shall be cable bus type having balanced load and phases with branch circuit locations directly behind connection plates. Cable bus shall be manufactured from 100% copper and mounted on non-conductive insulators spaced at 48" (maximum) centers and equipped with connection lugs for main service. Field joints shall be connected by attaching cables to insulated terminals. Branch circuit wiring for each electrical connection shall be phase-identified and sized in accordance with circuit breaker's rated ampacity. A 12" long, 16-gauge, stainless steel connection plate shall be provided for each electrical connection and equipped with a point-of-use circuit breaker and grounding type receptacle having a specific NEMA, polarized configuration or pre-wired, flexible, seal-tite conduit. Connection plates shall be equipped with metallic labels with permanently lettered electrical characteristics. Plates shall be spaced on 12" centers and readily interchangeable by maintenance personnel to facilitate changes, additions, and deletions of equipment. Blank plates shall be provided for future equipment. A main electrical circuit breaker and disconnect shall be mounted in the control tower.
6. Plumbing compartment shall be isolated from the electrical compartment and all piping and disconnects shall be color-coded. Provide an additional capped nipple in each section for each plumbing service for future use. Field joints shall be securely by tightening unions.
7. Hot and cold water piping, including individual branch pipe connections, shall be hard temper type "L" copper tubing with copper sweat type solder fittings. All water lines shall be covered

with 3/8" thermal closed cell pipe insulation per ASTM-E90-C. Each branch connection shall be provided with a brass, double shut-off, quick-disconnect, and flexible hose connector consisting of brass bellows type, corrugated hose with braided stainless steel restrainer. Hoses shall be coated with Avtec Polytec material to provide a smooth surface for cleaning.

8. Gas piping shall be black iron pipe with welded threadlets to branch connections and drip-tee in the service riser. Each branch connection shall be equipped with a quarter-turn, ball-type shut-off valve; brass quick-disconnect; 2-wall, stainless steel, flexible hose connector; and steel restraining cable. Hoses shall be coated with Avtec Polytec material to provide a smooth surface for cleaning.
9. System shall be equipped with quarter-turn shut-off valves for all main incoming services for gas and water.
10. System shall be equipped with components/features/accessories as follows:
 - a. Two (2) end risers
 - b. Two (2) floor pedestals
 - c. Power shut-off device (shunt trip breaker)
 - d. Convenience outlet on each end tower
 - e. Exhaust Hood light switch, mounted on end riser panel adjacent to Manager's Office
 - f. Exhaust/Supply fan control panel with fire system interface mounted in end riser adjacent to Manager's Office
 - g. Water quick-disconnect hose assemblies for cooking equipment
 - h. Gas quick-disconnect hose assemblies with shut-off valves for cooking equipment
 - i. Electric cord/plug assemblies for cooking equipment
11. System shall be Avtec MIDG series, **Accurex** equivalent, or approved equal to meet above requirements. Shop drawings are required for approval. Refer to Contract Document drawings for utility requirements and locations thereof.

JJ. Item No. 33 Exhaust Hood (One Required):

1. Size: 10'-0" wide (including framing section between hood sections, plus make-up air plenums) x 16'-0" long x 30" high
2. Construction Features: UL 710 Listed (without fire dampers in exhaust collars), constructed of all-welded 18-gauge type 304 no. 4 finish stainless steel on all surfaces with all exterior joints and seams continuously welded liquid tight, ground smooth and polished to a no. 4 finish to conform to the latest edition of NFPA 96. Exterior front and end panels shall include integral "v" bracing to strengthen flat surfaces. UL Listed stainless steel baffle filters

extending the entire length of the hood. Grease trough shall be concealed type (fully-enclosed) sloped to one (1) end and equipped with a removable stainless steel grease cup.

3. Components/Features/Accessories:

- a. 14" wide framing section between hood sections for risers of Utility Distribution System.
- b. Two (2) 14" wide x full-length x 8" high, stainless steel air curtain type double wall insulated make-up air plenums with air balancing dampers, baffles and duct collars to ensure even air distribution along entire length of plenums
- c. Heat sensors for activation of exhaust fan whenever cooking operations occur in accordance with paragraph 507.2.1.1 of 2006 International Mechanical Code
- d. Twelve (12) UL-listed Component Hardware No. LED-L80-20DN recessed-type LED light fixtures with bulbs pre-wired in rigid conduit on top of hood to a junction box on each section of hood
- e. Exhaust/supply fan control panel with fire system interface and light switch mounted in end riser panel of Utility Distribution System adjacent to Manager's Office
- f. Light switch shall be mounted in end riser panel of Utility Distribution System adjacent to Manager's Office
- g. Stainless steel enclosure panels

4. Refer to Contract Document drawings for CFM requirements and duct sizes
5. Exhaust Hood shall be Avtec AFWO-PBB series, **Accurex** equivalent, or approved equal to meet above requirements
6. Shop drawings required for approval

KK. Item No. 34 Fire Suppression System (One Required):

1. System shall be designed to automatically suppress fire by spraying the exhaust hood plenum area, filters, exhaust ducts, and cooking surfaces with a predetermined flow rate of low pH liquid fire suppressant in compliance with the latest editions of NFPA 17A, NFPA 96, and Authority having Jurisdiction. System shall be Ansul R-102 pre-engineered wet chemical type or approved equivalent in compliance with UL Standard 300. System shall include components/features/accessories installed by a manufacturer certified installer as follows:
 - a. Stainless steel nozzles and piping within Exhaust Hood
 - b. Regulated release assembly which contains a release mechanism and agent tank within a stainless steel enclosed cabinet mounted on building wall where indicated on

- drawings
 - c. Remote manual release station located on egress of cooking area
 - d. Mechanical (cable-operated) gas shut-off valve (verify size) for installation on incoming gas line at Utility Distribution System
 - e. Submittal data and review fee by Fire Marshal's Office or Authority having Jurisdiction
2. This Contractor shall furnish and install a Class K portable fire extinguisher with wall bracket in kitchen in accordance with NFPA 10 and State Fire Marshal requirements.

LL. Item No. 35 Stainless Steel Floor Drain Troughs w/Grates (Two Required):

1. 19-1/2" wide x 36" long, custom-fabricated all-welded 14-gauge type 302/304 stainless steel in accordance with drawings. Trough shall be equipped with 5-1/2" diameter x 3-1/4" deep sump bowl with 3" long pipe sleeve sized to accommodate drain pipe (installed within sleeve) by plumbing contractor. Sump bowls shall be equipped with removable perforated stainless steel strainer baskets with perforated covers. Submit shop drawing for approval.
2. Each trough shall be equipped with 15-1/4" wide x 31-3/4" long x 1" thick McNichols No. MS S-100 SM-G dark gray color fire retardant removable molded fiberglass grates (1/4" wide bars with 1-1/2" x 1-1/2" spacings) with grit surface (one side only). Each grate shall be cut with a bar on all outside edges for a banded finished edge appearance. Grates shall be furnished by trough fabricator for fitting coordination purposes. Submit shop drawing for approval.

MM. Item No. 36 Stainless Steel Floor Drain Trough w/Grate (One Required):

1. 19-1/2" wide x 78" long, custom-fabricated all-welded 14-gauge type 302/304 stainless steel in accordance with drawings. Trough shall be equipped with 5-1/2" diameter x 3-1/4" deep sump bowl with 3" long pipe sleeve sized to accommodate drain pipe (installed within sleeve) by plumbing contractor. Sump bowls shall be equipped with removable perforated stainless steel strainer baskets with perforated covers. Submit shop drawing for approval.
2. Trough shall be equipped with 15-1/4" wide x 72" long x 1" thick McNichols No. MS S-100 SM-G dark gray color fire retardant removable molded fiberglass grates (1/4" wide bars with 1-1/2" x 1-1/2" spacings) with grit surface (one side only). Each grate shall be cut with a bar on all outside edges for a banded finished edge appearance. Grates shall be furnished by trough fabricator for fitting coordination purposes. Submit shop drawing for approval.

NN. Item No. 37 Work Table (One Required):

1. 30" wide x 84" long x 36" high, custom fabricated stainless steel open base type, with components/features/accessories as follows:
 - a. One (1) drawer
 - b. Undershelf

OO. Item No. 38 Work Table w/Overhead Pot Rack (One Required):

1. 30" wide x 84" long x 36" high custom fabricated stainless steel open base type with components/features/accessories as follows:
 - a. One (1) drawer
 - b. Undershelf
 - c. 78" long 2-bar table-mount pot rack with stainless steel removable pot hooks

PP. Item No. 39 Pass-Thru Refrigerators (Three Required):

1. Traulsen No. RHT232WPUT-HHS or approved equal, each with components/features/accessories as follows:
 - a. Half-height doors on both sides
 - b. Twenty (20) sets of stainless steel universal pan slides
 - c. 6" diameter locking casters

QQ. Item No. 40 Pass-Thru Warmers (Three Required):

1. Traulsen No. RHF232WP-HHS or approved equal, each with components/features/accessories as follows:
 - a. Half-height doors on both sides
 - b. Twenty (20) sets of stainless steel universal pan slides
 - c. 6" diameter locking casters
 - d. 48" long NEMA 14-20P cord/plug assembly

RR. Item No. 41 Mobile Utility Carts (Seven Required):

1. Lakeside No. 943 or approved equal, each with standard vinyl bumpers

SS. Item No. 42 Mobile Milk Coolers (Three Required):

1. Beverage-Air No. SMF49HC-1-S, Traulsen equivalent, or approved equal, each with components/features/accessories as follows:

- a. Stainless steel interior and exterior
- b. Corner bumpers
- c. 10'-0" long cord/plug assembly

TT. Item No. 43 Mobile Tray/Silverware Counters (Three Required):

- 1. 32" wide x 28" long x 34" high, LTI No. SPC-RTS-SS-28 (stainless steel series), Atlanta Custom Fabrication equivalent, or approved equal, each with components/ features/accessories as follows:
 - a. 16" wide x 34" high upper top section with removable 12" x 20" x 6" deep 20-gauge stainless steel counter pan for packets of napkins, serving pieces, and straws
 - b. 12" wide lower top section for compartment trays
 - c. Stainless steel base panels
 - d. 5" diameter swivel casters with brakes
 - e. Shop drawings required for approval

UU. Item No. 44 Mobile Hot Food Counters (Three Required):

- 1. 32" wide x 60" long x 34" high, LTI No. SPC-TW-DW-SS-20-04-60 (stainless steel series), Atlanta Custom Fabrication equivalent, or approved equal, each with components/ features/accessories as follows:
 - a. Four (4) hot food wells with drains, drain manifold, and drain pipe extension with shut-off valve and threaded coupling (located above bottom shelf) for 10'-0" long ¾" garden hose (hose provided by FSEC)
 - b. 8" wide flat top surface on workers side
 - c. Full-length bottom shelf (where unobstructed)
 - d. Line-up locks for adjacent counters
 - e. Stainless steel base panels
 - f. Full-length x 18" high BSI ZG9930 series, modified in accordance with drawings to include 16-gauge stainless steel top shelf, ¼" thick tempered glass fully adjustable front panels, ¼" thick laminated glass end panels. Shop drawing of food guard required for approval.
 - g. Full-length solid-type fold-down tray slide, arrangement indicated on drawings
 - h. 5" diameter swivel casters with brakes with 6" minimum clearance for floor mounted outlet box
 - i. 60" long NEMA 6-15P cord/plug assembly
 - j. Stainless steel outlet box with one (1) NEMA 6-15R receptacle for this item. NOTE: One of three stainless steel outlet boxes to also include an additional NEMA 5-15R receptacle for Item 42 (located at center of serving line).

- k. Shop drawings required for approval

VV. Item No. 45 Mobile Frost-Top Counters (Three Required):

1. 32" wide x 88" long x 34" high, LTI No. SPC-FT-SS-25-32-88 (stainless steel series, modified), Atlanta Custom Fabrication equivalent, or approved equal, each with components/features/accessories as follows:
 - a. 38" long frost top, located on end adjacent to Item No. 46 with 8" wide flat top surface on workers side to match Item No. 44
 - b. Drain pipe extension with shut-off valve and threaded coupling for $\frac{3}{4}$ " garden hose connection (located above bottom shelf)
 - c. Flat top section adjacent to Item No. 44 for countertop equipment (Item No. 45A)
 - d. 2" diameter hole with grommet in top for electric cord/plug assembly of countertop equipment (Item No. 45A)
 - e. Full-length bottom shelf (where unobstructed) with provisions for electric cord/plug assembly of countertop equipment (Item No. 45A)
 - f. Line-up locks for adjacent counters
 - g. Stainless steel base panels
 - h. 45" long x 18" high BSI ZG9930 Series, modified in accordance with drawings to include 16-gauge stainless steel top shelf, $\frac{1}{4}$ " thick tempered glass fully adjustable front panels, $\frac{1}{4}$ " thick laminated glass end panels. Shop drawing of food guard required for approval.
 - i. Full-length solid-type fold-down tray slide, arrangement indicated on drawings
 - j. 5" diameter swivel casters with brakes with 6" minimum clearance for floor mounted outlet box
 - k. One (1) 60" long NEMA 5-15P cord/plug assembly for refrigerated cold pan
 - l. Stainless steel outlet box with one (1) NEMA 5-20R and one (1) NEMA L14-20R receptacles for this item No. 45 and Item No. 45A
 - m. Shop drawings required for approval

WW. Item No. 46 Heated Sandwich Merchandisers (Three Required):

1. Hatco No. HXMS-30D or approved equal, each with components/features/accessories as follows:
 - a. Dual slanted shelves
 - b. Standard designer black exterior finish

XX. Item No. 47 Mobile Cashier Counters (Three Required):

1. 32" wide x 36" long x 34" high, LTI No. SPC-CSE-SS-36 (stainless steel series), Atlanta Custom Fabrication equivalent, or approved equal, each with components/features/accessories as follows:
 - a. 2" diameter hole with grommet in top for electric cord/plug assembly of countertop P.O.S. unit
 - b. Line-up locks for adjacent counters
 - c. Stainless steel base panels
 - d. Cash drawer with cylinder lock located in accordance with drawings
 - e. Open base with tubular foot rest
 - f. Full-length solid-type fold-down tray slide, arrangement indicated on drawings
 - g. 5" diameter swivel casters with brakes with 6" minimum clearance for floor mounted outlet box
 - h. Base-mounted NEMA 5-20R receptacle with 60" long NEMA 5-20P cord/plug assembly
 - i. Stainless steel outlet box with one (1) NEMA 5-20R receptacle for this item No. 46 and one (1) CAT-6 data outlet for Item No. 47
 - j. Shop drawings required for approval

YY. Item No. 48 P.O.S. Units (3) – Not in Contract

ZZ. Item No. 49 Roll-Down Counter Door w/Integral Window Frame – Future Equipment:

1. Space and utilities for Cookson No. CDF series (less sill) with components/features/accessories as follows:
 - a. Stainless steel integral frame to fit 60" wide x 45" high (verify) wall opening
 - b. Stainless steel hood and door curtain
 - c. Shop drawing required for approval

AAA. Item No. 50 Soiled Dishtable w/Pass-Thru Window Sill – Future Equipment:

1. Space and utilities for 30" wide x 34" high x length and arrangement indicated on drawings, custom-fabricated stainless steel open base type with components/features/accessories as follows:
 - a. 14-gauge stainless steel sill to fit wall opening
 - b. One (1) 20" x 20" x 6" deep pre-rinse sink with removable

- perforated scrap basket with rack guides
- c. One (1) T & S No. B-0133/B-0109 pre-rinse spray unit
- d. Open base at pass-thru window to accommodate mobile sinks, receptacles, etc.
- e. Stainless legs and finished rolled edge on end, adjacent to future dishwasher

BBB. Item No. 51 Dishwasher – Future Equipment

- 1. Space and utilities for Hobart No. CLPS66-BAS with integral booster heater

CCC. Item No. 52 Condensate Exhaust Stainless Steel Pant Leg Duct – Future Equipment

- 1. Duct opening for future pant leg exhaust duct for future dishwasher (Item No. 51)

DDD. Item No. 53 Clean Dishtable – Future Equipment

EEE. Item No. 54 Student Hand Wash Sinks (Two Required):

- 1. 18" wide x 6'-0" long, custom-fabricated stainless-steel wall-mounted type in accordance with drawings, each with components/features/accessories as follows:
 - a. 1" perforated stainless steel spray pipe
 - b. T&S Brass No. ORK2 shut-off valve, mounted on opposite end of direction of flow
 - c. 6" deep drain pan with tailpiece and "P" trap
 - d. 15" high front and end apron panels
 - e. 11" wide x 6'-0" long overself 15" above top of drain pan
 - f. Water tempering valve by Plumbing Contractor
- 2. Shop drawing required for approval

PART 3 - EXECUTION

3.01 ERECTION

- A. Equipment specified herein shall be erected and set in place at location as indicated on Drawings. Equipment shall be fabricated so that it can be handled through finished openings or arrangements otherwise made with General Contractor. Equipment specified shall be located on floors as indicated on Drawings. A competent foreman shall be provided as supervisor of erections and installations.

3.02 ADJUSTMENT OF EQUIPMENT

- A. Contractor shall adjust all equipment after erection and installation to satisfaction of Owner.
- B. Contractor shall confirm in writing that all equipment is operational and in working condition prior to demonstration.

3.03 CLEANING OF EQUIPMENT

- A. Clean up all debris caused by workmen immediately upon completion of Work in the area, and clean equipment after all others have completed their Work in the area.

3.04 DEMONSTRATION OF EQUIPMENT

- A. Upon acceptance by Owner, provide full instructions to Owner's designated representative on proper methods of care, operation, and maintenance of equipment.
- B. Three (3) operating instructions, warranty cards/certificates and parts manuals on equipment in loose leaf hard cover binders shall be presented to Architect at this time. Operation and maintenance manuals shall be organized for easy reference by maintenance personnel, including index tabs of equipment item numbers.

END OF THIS SECTION

SECTION 11 52 13 - PROJECTION SCREENS

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishings and installation, complete, of manually operated projection screen as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.
- C. Summary
 - 1. Section Includes:
 - a. Electrically operated, front-projection screens and controls.
 - 2. Related Requirements:
 - a. Section 05 50 00 - Metal Fabrications
 - b. Section 06 10 00 - Rough Carpentry
- D. Submittals:
 - 1. Provide in accordance with Section 0120 - Samples, Shop Drawings and Submittals:
 - a. Product data for project screens and accessories.
 - b. Shop drawings: Indicate dimensions, fabrication, and installation details.
 - c. Manufacturer's installation, maintenance, and cleaning instructions.
 - 2. Closeout submittals
 - a. Maintenance Data: For front-projection screens to include in maintenance manuals.
- E. Coordination
 - 1. Coordinate layout and installation of front-projection screens with adjacent construction, including ceiling suspension systems, light fixtures, HVAC equipment, fire-suppression system, and partitions.

1.2 DEFINITIONS

- A. Gain: Ratio of light reflected from screen material to that reflected perpendicularly from a magnesium carbonate surface as determined per SMPTE RP 94.
- B. Half-Gain Angle: The angle, measured from the axis of the screen surface to the most central position on a perpendicular plane through the horizontal centerline of the screen where the gain is half of the peak gain.

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. Manufacturers:

1. Source Limitations for Projection Screens: Obtain front-projection screens from single manufacturer. Obtain accessories, including necessary mounting hardware, from screen manufacturer.
2. Acceptable manufacturers:
 - a. Da-Lite Screen Company, Inc.
3100 North Detroit Street
P.O. Box 137
Warsaw, Indiana 46581-0137
Phone: 800-622-3737
Fax: 877-325-4832
 - b. Draper, Inc.
411 South Pearl St.
PO Box 425
Spiceland, IN 47385
Phone: 765-987-7999
Toll Free: 1-800-238-7999
Fax: 1-765-987-7142
 - c. or prior approved equals

B. ELECTRICALLY OPERATED, FRONT-PROJECTION SCREENS

1. General: Manufacturer's standard units consisting of case, screen, motor, controls, mounting accessories, and other components necessary for a complete installation. Provide units that are listed and labeled as an assembly by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 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. Controls: Remote, three (3)-position control switch installed in recessed device box with flush cover plate matching other electrical device cover plates in room where switch is installed.
 1. Provide one (1) control switches for each screen.
 2. Provide number of control switches indicated for each screen.
 - c. Motor in Roller: Instant-reversing motor of size and capacity recommended by screen manufacturer; with permanently lubricated ball bearings, automatic thermal-overload protection, preset limit switches to automatically stop screen in up and down positions, and positive-stop action to prevent coasting. Mount motor inside roller with vibration isolators to reduce noise transmission.
 - d. Screen Mounting: Top edge securely anchored to rigid metal roller and bottom edge formed into a pocket holding a 3/8 inch (9.5 mm) diameter metal rod with ends of rod protected by plastic caps.
 1. Roller for motor in roller is supported by vibration- and noise-absorbing supports.
2. Surface-Mounted, Metal-Encased, Electrically Operated Screens without Tab Tensioning: Motor-in-roller units designed and fabricated for surface mounting on wall or ceiling, fabricated from formed-steel sheet not less than 0.027 inch (0.7 mm) thick or from aluminum extrusions; with flat back design and vinyl covering or baked-enamel finish. Provide with matching end caps and concealed mounting.
 - a. Products: Subject to compliance with requirements, provide the following:
 1. Da-Lite Screen Company; Contour Electrol.

- b. Subject to compliance to the provisions of the Contract Documents, equal products may be submitted for approval prior to bidding in accordance with the provisions of the Information for Bidders.

C. FRONT-PROJECTION SCREEN MATERIAL

1. High Contrast Matte White Viewing Surface: Peak gain of not less than 1.0, and half-gain angle of not less than 50 degrees from the axis of the screen surface.
 - a. Products: Subject to compliance with requirements, provide the following:
 1. Da-Lite Screen Company; High Contrast Matte White.
 - b. Subject to compliance to the provisions of the Contract Documents, equal products may be submitted for approval prior to bidding in accordance with the provisions of the Information for Bidders and Section 016000 – Product Requirements.
2. Material: Vinyl-coated, glass-fiber fabric or vinyl sheet.
3. Mildew-Resistance Rating: Zero (0) or one (1) when tested according to ASTM G 21.
4. Flame Resistance: Passes NFPA 701.
5. Flame-Spread Index: Not greater than seventy-five (75) when tested according to ASTM E 84.
6. Seamless Construction: Provide screens, in sizes indicated, without seams.
7. Edge Treatment: Black masking borders.
8. Size of Viewing Surface: As indicated in Schedule below:

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide attachment hardware, fasteners, and other components of type, size and spacing recommended by the manufacturer for complete, functional, secure installation of manual screens.
- B. Coordinate provision of manual screens with locations of other wall and ceiling mounted components such as visual display boards, casework, structural framing, light fixtures, air diffusers, ducts, and fire sprinklers to eliminate potential conflicts.
- C. Coordinate requirements for blocking and auxiliary structural supports to ensure adequate means for installation of screens.
- D. Install screens in accordance with approved shop drawings and manufacturer's installation instructions.
- E. Install projection screens at locations and heights indicated on Drawings. Verify locations in field with Architect.
- F. Install screens securely to supporting substrate so that screens are level and back of case is plumb.
- G. Operate each screen three times minimum. Ensure screens properly extend and retract and that screen is level and viewing surface plumb when extended. Adjust to correct deficiencies.

- H. Protect project screens from damage resulting from subsequent construction activities. Remove and replace damaged screens.

3.2 FRONT-PROJECTION SCREEN SCHEDULE

- A. Electrically Operated, Front-Projection Screen Type PS-1: Surface mounted to proscenium wall at Platform, metal encased.
 - 1. Motor Configuration: Motor in roller.
 - 2. Screen Surface: High Contrast Matte White.
 - 3. Size of Viewing Surface: 100 inches by 160 inches (2540mm by 4064mm)
 - 4. Total Drop Length: 24 inches (610mm)
 - 5. Projections screen shall face the dining/seating area.

END OF SECTION 11 52 13

SECTION 11 61 43 - STAGE CURTAINS

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete of Stage Equipment as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, and complete installation shall be furnished and installed as part of this work.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 SUMMARY

- A. Section includes stage curtains, draw-curtain tracks, and rigging accessories.
- B. Related Sections:
 - 1. Section 05 50 00 - Metal Fabrications for steel framing and supports for stage-curtain systems.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design rigging, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Rigging shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Design Loads: Weight of curtains and clips.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for stage curtains. Include plans, elevations, sections, details, attachments to other work, and the following:
 - 1. Operating clearances.
 - 2. Requirements for supporting curtains, track, and equipment. Verify capacity of each track and rigging component to support loads.

- C. Samples for Initial Selection: For each type of stage curtain indicated. Include color charts showing the full range of colors, textures, and patterns available, together with a 12-inch-square Sample (any color) of each type of fabric.
- D. Curtain Fabric Samples for Verification: Full width by 36-inch-long section of fabric from dye lot to be used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of fabric.

1.6 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For stage curtains and rigging to include in operation and maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of stage curtains.
- B. Fire-Test-Response Characteristics: Provide stage curtains with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Flame-Resistance Ratings: Passes NFPA 701.
 - a. Permanently attach label to each fabric of curtain assembly indicating whether fabric is inherently and permanently flame resistant or treated with flame-retardant chemicals, and whether it requires retreatment after designated time period or cleaning.

1.9 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings and construction contiguous with stage curtains and rigging by field measurements before fabrication and indicate measurements on Shop Drawings.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of rigging equipment that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, faulty operation of rigging equipment.
 - 2. Warranty Period: Two (2) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CURTAIN FABRICS

- A. General: Provide fabrics inherently and permanently flame resistant or chemically flame resistant by immersion treatment to comply with requirements indicated. Provide fabrics of each type and color from same dye lot.

- B. Main Front Curtain and Valance Curtain, Charisma IFR (Inherently Flame Resistant) Velour: Napped fabric of 100 percent IFR polyester weighing not less than 25 oz./linear yd., with pile height approximately 75 mils; inherently and permanently flame resistant; 54-inch minimum width. Valance curtain shall come with school's initials (24" High) sewn on in colors chosen by the architect.
1. Acceptable Manufacturers
 - a. ROSE BRAND / 4 Emerson Lane, Secaucus, NJ 07094 / Phone 1-800-223-1624
 - b. Or prior approved equal
 2. Color: As selected by Architect from manufacturer's full range.

2.2 CURTAIN FABRICATION

- A. General: Affix permanent label, stating compliance with requirements of authorities having jurisdiction, in accessible location on curtain not visible to audience. Provide vertical seams unless otherwise indicated. Arrange vertical seams so they do not fall on faces of pleats. Do not use fabric cuts less than one-half width.
1. Vertical Hems: Provide vertical hems not less than 2 inches wide, and not less than 4 inches wide at borders, valance, teasers, and tormentors, with not less than a 1-inch tuck, and machine sew with no selvage material visible from front of curtain. Sew open ends of hems closed.
 2. Leading Edge Turnbacks: Provide turnbacks formed by folding back not less than 12 inches of face fabric, with not less than a 1-inch tuck, and secure by sewing turnbacks vertically.
 3. Top Hems: Reinforce top hems by double-stitching 3-1/2-inch-wide, heavy jute webbing to top edge on back side of curtain with not less than 2 inches of face fabric turned under.
 4. Pleats: Provide 50 percent fullness in curtains, exclusive of turnbacks and hems, by sewing additional material into 3-inch double-stitched box pleats sewn flat and spaced at 12 inches o.c. along top hem reinforcement.
 5. Grommets: Brass, No. 3 or No. 4.
 - a. Black Curtains: Provide brass or aluminum grommets with black finish.
 - b. Pleated Curtains: Centered on each box pleat and 1 inch from corner of curtain; for snap hooks or S-hooks.
 6. Bottom Hems: For curtains with fullness.
 - a. For curtains that do not hang to the floor, provide hems not less than 3 inches deep with 3/4-inch weight tape. Sew open ends of hems closed.
 - b. For floor-length curtains, provide hems not less than 6 inches deep with 1-inch weight tape sewn to the top seam of the bottom hem clear of the finished bottom edge. Sew open ends of hems closed.
 - c. For floor-length curtains, provide hems not less than 6 inches deep with manufacturer's standard series of individual weights in individual closed pockets sewn above the finished bottom edge of curtain. Sew open ends of hems closed.
 - d. For floor-length curtains, provide hems not less than 6 inches deep with separate, interior, 100 percent cotton, heavy canvas chain pockets equipped with proof coil chain. Stitch chain pockets so chain rides 2 inches above finished bottom edge of curtain. Sew open ends of hems closed.

- e. Proof Coil Chain: Grade 30, No. 8, zinc plated, 3/16 inch, ASTM A 413/A 413M.
- 7. Velour Curtains: Fabricate with the fabric nap down.
- B. Snap Hooks: Track manufacturer's standard heavy-duty hooks, sewn to top edge of curtain.

2.3 MOUNTING ACCESSORIES

- A. Ceiling Hung Pipe (per drawings):
 - 1. Steel pipe: ASTM A 53, Grade A, black, standard weight (Schedule 40), 1-1/2" nominal diameter, unless otherwise indicated.
 - 2. Support Chain: ASTM A 413, 1/4" size, not less than .276-inch diameter.
 - 3. Support, Clamps, Anchors, Bolts, Fasteners: Manufacturer's standard units.
- B. Black Steel Track: Fabricate of roll-formed, 14 gauge, galvanized, commercial-quality, steel; complying with ASTM A 653/A 653M; G60 coating designation with continuous bottom slot and with each half of track in one continuous piece
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Automatic Devices Company; Silent Steel 280 series.
 - b. H & H Specialties Inc.; 401S series.
 - c. Or prior approved equal.
 - 2. Thickness: 0.064 inch.
- C. Suspended Track: NPS 1-1/2 steel pipe stiffener for supporting both sections of suspended tracks.
- D. Clamp and Bracket Hangers: Manufacturer's steel clamps and brackets of sufficient strength required to support loads for attaching track to overhead support.
- E. Track Lap Clamp: Metal to match track channel for attaching double-sectioned track at center overlap.
- F. Fold Guide: Equip carriers with rear-fold or backpack guide and rubber spacers to permit offstage curtain folding; sized for use with operating line if any.
- G. Medium-Duty Track System: Provide end stops for track.
 - 1. Curtain Carriers: Standard carriers of plated steel with a pair of wheels riveted parallel to body. Equip carriers with plated-steel swivel eye for attaching curtain snap or S-hook. Provide quantity of curtain carriers sufficient for track length, to suit curtain fabrication.
 - a. Master Curtain Carriers: One master carrier, for each leading curtain edge, of plated steel with two pairs of wheels and with two line clamps per carrier.
 - 2. End Pulleys and Floor Block: One dead-end, single-wheel pulley; one live-end, double-wheel pulley; and one adjustable, floor block containing guarded ball-bearing sheaves enclosed in steel housings. Provide pulleys with steel housing finished to match track and with bracket for securing off stage curtain end. Provide an adjustable floor block to

maintain proper tension on operating line with steel housing painted black.

2.4 CURTAIN RIGGING

- A. Supports, Clamps, and Anchors: Sheet steel in manufacturer's standard thicknesses, galvanized after fabrication according to ASTM A 153/A 153M, Class B.
- B. Trim and Support Cable: 1/4-inch-diameter, 7x19 galvanized-steel cable with a breaking strength of 7000 lb. Provide fittings complying with cable manufacturer's written recommendations for size, number, and method of installation, including a drop-forged galvanized turnbuckle to allow for leveling.
- C. Trim and Support Chain: Grade 80 hardened alloy steel chain rated for overhead lifting, ASTM A 391/A 391M.
- D. Inserts, Bolts, Rivets, and Fasteners: Manufacturer's standard corrosion-resistant units.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for supporting members, blocking, installation tolerances, clearances, and other conditions affecting performance of stage-curtain work. Examine inserts, clips, blocking, or other supports required to be installed by others to support tracks and battens.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install stage-curtain system according to track manufacturer's and curtain fabricator's written instructions.

3.3 TRACK INSTALLATION

- A. Beam-Mounted Tracks: Install tracks by suspending from manufacturer's special beam clamps securely mounted to I-beam structure at spacing, according to manufacturer's written instructions.
- B. Spacing: Do not exceed the following dimensions between supports:
 - 1. Heavy-Duty Track: 12 inches.
- C. Install track for center-parting curtains with not less than 12-inch overlap of track sections at center, supported by special lap clamps.

3.4 CURTAIN INSTALLATION

- A. Track Hung: Secure curtains to track carriers with snap hooks.

END OF SECTION 11 61 43

SECTION 12 30 00 - CASEWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and provisions of the contract including General Conditions, Supplementary Conditions, and Division 1, apply to this section.

1.2 WORK INCLUDED:

- A. Furnish and install high-pressure laminate casework and accessories as shown and listed on drawings and specified herein. Include all countertops, sink cutouts, splashes, supports, shelving, and filler panels necessary for a complete casework installation.
- B. The Casework Contractor shall verify all critical building dimensions prior to fabrication of casework. The Casework Manufacturer shall re-engineer the casework arrangements to dimensions requiring 2-1/2" or less of filler at each end of wall-to-wall elevations, and to ensure a complete and satisfactory installation.
- C. Provide all labor for unloading, distribution, and installation of casework and related items as specified.

1.3 WORK RELATED, NOT INCLUDED:

- A. Division 6: Rough Carpentry-blocking within walls to adequately support casework. Finish Carpentry/Millwork. Architectural Woodwork.
- B. Division 7: Joint Sealants-caulking of casework and/or countertops to abutting walls.
- C. Division 8: Finish Hardware-cabinet locks keyed or master keyed to building locks.
- D. Division 9: Resilient Tile Flooring.
- E. Mechanical - furnishing, installation, and hook-up of sinks, fixtures, outlets, strainers, tailpieces, traps, vacuum breakers, stops, etc., shall be performed by the Mechanical Contractor to state and local codes. In all cases, sink cutouts shall be by the Casework Contractor. Furnishings, installation, and final connection of all ductwork to range hoods and spray booths shall be by the Mechanical Contractor.
- F. Electrical - furnishing, installation, and final connections of wiring, conduit, and/or electrical items within casework shall be performed by the Electrical Contractor to state and local codes.
- G. All in-wall blocking for base, wall and tall units shall be provided and installed by the General Contractor.

1.4 STANDARD OF QUALITY:

- A. Catalog numbers and specifications are those of Case Systems, Inc., Midland, Michigan. Casework of other nationally recognized Casework Manufacturers may be considered for prior approval providing it is equal in construction and design according to drawings and specified herein. 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 Casework Manufacturer's product. Case Systems is used for the purpose of establishing quality of material, construction, and workmanship.
- B. Casework Contractors requesting approval to bid shall do so in writing, listing any and all deviations to the approval not less than ten days prior to bid date. As a means for evaluation, Casework Contractor shall submit to the Architect a full scale base cabinet

not less than ten days prior to bid date. The sample shall be typical for construction the Casework Contractor proposes to meet the quality standards set forth by this specification. The sample may be impounded by the Owner and retained until completion of the casework installation. Casework Contractors seeking approval to bid shall submit evidence that the Casework Manufacturer has adequate plant, equipment, and work force to produce the quality of casework specified and be able to deliver as scheduled.

- C. The Owner, or its designated representative, reserves the right to reject any proposal that is in his opinion fails to meet the criteria established by this specification. Such a decision shall be final.
- D. The Casework Manufacturer and Contractor shall offer a limited lifetime warranty to the original owner against defective material and workmanship for as long as they own the product. In addition, all buy-out items not manufactured at Case Systems, such as sinks, fixtures, apparatus, fume hoods, keyboard tray, spray booths, lights, power outlet strips, shall be covered under the original manufacturer's warranty. The warranty specifically does not cover any product or hardware; which has been incorrectly installed, exposed to excessive loads or abused.
- E. All case work installed is subject to 3rd party testing to determine if materials meet the requirements of this specification. If materials do not meet or exceed the requirements of this specification the work will be rejected and will be replaced with material that does meet the specification at no cost to the owner.
- F. Prior Approved Modular Laminate Casework Manufacturers:
Case Systems, Inc., Midland, Michigan
TMI Systems Design Corporation, Dickinson, ND
Other manufacturers seeking to bid this project shall submit the necessary information for approval as an equal to the manufacturers listed above. (See Section 01 33 24 – Substitutions)

1.5 SUBMITTALS:

- A. Comply with Division 1.
- B. Product Data: Submit Casework Manufacturer's catalog showing casework construction details, and materials and hardware used.
- C. Submit colors as noted in 2.02.2, for exterior high-pressure decorative laminate color selections.
- D. Submit interior samples in three colors: (Frosty White: Wilsonart 1573, Natural Almond: Wilsonart D30, Fog: Formica 961)
- E. Submit three sets of laser quality, 11" x 17" shop drawings consisting of:
 - 1. Color and Hardware options selection sheet
 - 2. Small scale floor plan showing casework in relation to the building.
 - 3. Large scale elevations and plan views.
 - 4. Cross-sections; service runs; blocking locations; and sink centerlines.
- F. Shop drawings to be submitted within 45 days of casework contract award.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Decorative laminate casework shall be Case Systems as specified or approved equal with the following minimum features:
 - 1. M-3 engineered board for all cabinet components. Material to be:

- a. Made with formaldehyde-free resins
 - b. Made of 100% annually renewable fibers or particles
 - c. In excess of ANSI 208.1 M3 PB physical and mechanical performance specifications
 - d. Moisture resistant per ANSI 208.2-2002 Grade 130-MR50 MDF
 - e. Free of detectable TVOC emissions after 48 hours of manufacture per ASTM D 5116-97
2. PVC edges applied with hot melt
 3. Epoxy coated, self-closing, minimum 100# static rated drawer slides with lifetime warranty
 4. Non-racking, non-deflecting platform drawer box with 1/2" thick bottoms
 5. 1/2" thick cabinet back
 6. "Balanced" high pressure laminates applied with rigid PVA glue
 7. Thermally fused melamine interior that exceeds NEMA LD3-1995 for GP-28 performance
 8. Each cabinet to have a factory applied, separate and full support toe base construction.
 9. Colors and finishes to be available as specified in 2.1.B and 2.2.A.2
 10. Casework shall be independently tested to meet the following minimum performance values:

Base Unit Racking	1460 lbf
Base Front Joint Loading	725 lbf
Wall Unit Racking	1600 lbf
Wall Unit Static Load	2500 lbf
Drawer Unit Static Load	1050 lbf
Drawer Front Joint Load	805 lbf
Drawer Side Joint Load	450 lbf
 11. Rail mounted casework shall be vertically and horizontally adjustable.
 12. Rail mounted casework shall have integral lower leveling bar, adjustable from inside of cabinet.
- B. Color and finish selections shall be as follows:
1. Up to five (5) color schemes may be chosen for this project at no additional cost. Construction, hardware and finish options will be as specified. Where applicable, the colors of the finishes may change between the color schemes.

2.2 MATERIALS

- A. Exterior Vertical Surfaces:
1. All door and drawer fronts, finished end panels, separate, attachable back panel shall be surfaced with .028" thick high-pressure decorative laminate conforming to NEMA LD3-1995, GP-28.
 2. Laminate patterns, wood grains, and solid colors will be selected from Wilsonart, Formica, Nevamar or Pionite current non-specialty, non-premium grade offerings in laminate manufacturer's standard suede, textured or matte finish. All laminate patterns, wood grains and solid colors will be available for both cabinet and countertop selections.
 3. Wood grain direction shall be vertical on doors, end panels, and exposed backs; horizontal on drawer fronts and aprons.
 4. All exterior vertical high-pressure laminate panels shall be balanced with textured .020" thick high-pressure cabinet liner conforming to NEMA Standard LD3-1995, CL-20. Color shall match interior, (Frosty White: Wilsonart 1573, Natural Almond: Wilsonart D30, Fog: Formica 961). Surface texture shall be similar to exterior finish.
 5. All high-pressure laminate must be laminated using a PVA adhesive, set under pressure, resulting in a rigid glue line. Contact adhesives shall not be used.
- B. Thermally fused interiors at semi-exposed surfaces including open interiors and wall bottoms:

1. Interior surfaces in closed cabinets, behind doors, drawer boxes, concealed backs, underside of wall bottoms, concealed interior shelves and unfinished ends shall be laminated with a (Frosty White: Wilsonart 1573, Natural Almond: Wilsonart D30, Fog: Formica 961) thermally fused melamine that meets or exceeds the performance standards for NEMA LD3-1995 for GP-28. All panels shall be of "BALANCED" construction. Fast cycle thermally fused, melamine foil or polyester surfaced panels or other surface types that do not meet these requirements are not acceptable. One interior color may be utilized within the five color schemes.
- C. 3mm and nominal 1mm (.020") PVC Edges:
1. Door and drawer edging shall be 3mm PVC. The PVC shall be applied utilizing hot melt adhesive and radiused by automatic trimmers. Hand tool applying and trimming of PVC shall not be allowed. Edging shall be available in coordinated color options. One selection from standard options per project. Up to five total choices may be utilized within the five color schemes. Shelves in open or glazed door cabinets shall match the cabinet box front edge color. Edge color for adjustable shelves behind solid doors shall match the cabinet interior color.
- D. Core Material:
1. Shall be engineered board meeting ANSI-A208. 1-latest, M-3 Industrial Grade
 2. Shall use 100% annually renewable fibers or particles
 3. Shall use 100% formaldehyde-free resins
 4. Shall meet ANSI 208.2-2002 Grade 130-MR50 MDF moisture resistance standards
 5. Has TVOC emission factors that are non-detectable after 48 hours per ASTM D 5116-97
 6. Acceptable material: 47# density fibercore; other products acceptable only upon approval by architect, at least 10 days before bid date, and after showing specifications are met.
 7. **SINK CABINETS AND TOPS AT WET AREAS SHALL USE PLYWOOD CORE.**
- E. Hardware:
1. Pulls:
 - a. One pull shall be located at the centerline of the drawer, regardless of width, to ensure ease of operation and maximum drawer slide life. A minimum of twenty-four (24) standard options shall be available. One selection from standard options per color scheme. Up to five total color choices may be utilized within the five color schemes.
 2. 5 Knuckle hinges / full overlay: (See 2.4.B.1 for test criteria)
 - a. Hinges shall be .95" steel five-knuckle hospital-tip institutional grade quality with .187" diameter tight pin. Hinge knuckle must be inset flush with the outside of door edge for a full overlay door style. Hinges not inset "SHALL NOT BE ACCEPTABLE". Hinges Residential, kitchen type pivot, plain butt, or hinges with removable pins "SHALL NOT BE ACCEPTABLE". Each hinge shall be secured with a minimum of nine No. 7 screws. Hinge shall permit door to swing 270 degrees without binding. Doors less than 48" in height shall have two hinges. Doors over 48" in height shall have three hinges. A minimum of three finishes shall be available. One finished selection for all five color schemes.
 3. Drawer Slides:
 - a. Standard Drawer: Self-closing, bottom mount epoxy coated with captive roller and positive in stop. Slide shall have 100 lb. load rating, and must be self-closing and must prevent drawer fronts from contacting the cabinet body.
 - b. File Drawers: Full extension, bottom mount epoxy coated with captive roller and positive in-stop. Slide shall have 100 lb. load rating, must be full extension, and prevent drawer fronts from contacting the cabinet body.

- c. File drawer box shall have full height sides supporting a heavy-duty support rail for hanging file folders. Painted steel supports or metal file frames set into the drawer are not acceptable.
- 4. Door Catches: (not used with self-closing hinges)
 - a. Base and Wall Cabinets: magnetic catch.
 - b. Tall Cabinets: Heavy-duty spring loaded roller, with molded plastic bumper mounted at door bottom.
- 5. Adjustable Shelf Supports:
 - a. Shelf supports shall be injected molded clear plastic, with a double pin engagement 32mm on center and shall have 3/4" and 1" anti-tip locking tabs.
- 6. Wardrobe Hanger Rod:
 - a. 1" diameter plated steel with captive sockets.
- 7. Garment Hooks:
 - a. Single prong and double prong-clear anodized aluminum.
- 8. Locks: (Where shown or noted only)
 - a. National Lock or equivalent five disc tumbler cam locks in chrome finish
 - b. Keying: All locks in each room shall be keyed alike; each room shall be keyed differently by room and master keyed.
 - c. Each lock shall have two keys provided. Contractor shall provide two (2) master keys and two (2) control keys. Contractor shall permanently label keys to match the room number where installed and associated core number.
 - d. Lock core is removable with a control key, permitting Owner to easily change lock arrangements without tools.
 - e. Inactive door of base and wall cabinets shall be secured by using an elbow catch or a chain bolt for tall cabinets.
- 9. Adjustable shelving supports (wall hung).
 - a. Standards shall be # KV870 heavy duty standard.
 - b. Bracket shall be # KV880 heavy duty bracket.

2.3 CONSTRUCTION (PARTS SHALL BE FIELD REPLACEABLE)

- A. All cabinet body components shall be secured utilizing concealed interlocking mechanical fasteners as approved by the Architectural Woodwork Institute Quality Standards 8th Edition - 2003 Sections 400A-T-12, 400B-T10 and 1600-T-11. Also as approved by the Woodwork Institute of California's "Manual of Millwork" Section 15-6.2.195. They shall be specifically designed for use in joining particleboard panels.
- B. All joints are tight fitting and will not rupture or loosen due to the following:
 - 1. Dimensional changes in the particleboard.
 - 2. Racking of casework during shipment and installation
 - 3. Normal use.
 - 4. Seismic shock as tested and approved by the Woodwork Institute of California for casework used in schools and hospitals.
 - 5. All fastening devices and screws shall be treated to deter or resist corrosion.
- C. Construction Features – All Cabinets:
 - 1. All structural components shall be 3/4" thick with balanced surfaces.
 - 2. All back panels shall be:
 - a. 1/2" thick surfaced both sides for balanced construction.
 - b. Fully captured on both sides and bottom; face-mounted, stapled backs are not acceptable.
 - 3. All drawer components shall be 1/2" thick M-3 engineered board core surfaced both sides for balanced construction.
 - 4. Mounting stretchers are 3/4" thick structural components fastened to end panels by mechanical fasteners, and are concealed by the cabinet back.
 - 5. When the rear of a cabinet is exposed a separate finished 3/4" thick decorative laminate back panel may be applied.

6. Exterior grade plywood core individual bases, factory applied to base and tall cabinets shall support and carry the load of the end panels, and the cabinet bottom, directly to the floor. The base shall be let in from the sides and back of the cabinet to allow cabinets to be installed tightly together and tight against a wall. Also, to conceal the top edge of applied vinyl base molding. There shall be a front to back center support for all bases over 30" wide.
7. Horizontal parting rails between drawers shall be 3/4" engineered board with balanced surfaces, secured to and further reinforcing cabinet ends. When drawers are keyed individually within a cabinet, or when drawers are fitted with lock hasps, the parting rail shall run full depth of cabinet to prevent pilfer.
8. A 5mm diameter row hole pattern 32mm (1-1/4") on center shall be bored in cabinet ends for adjustable shelves. This row hole pattern shall also serve for hardware mounting and replacement and/or relocation of cabinet components.
9. All door and drawer fronts and finished ends shall be balanced construction with "high-pressure" laminate bonded to both sides of M-3 engineered board core.
10. Adjustable shelves shall be M-3 engineered board core with balanced surfaces and have a nominal 1mm (.020") thick PVC front edge.
 - a. Adjustable shelves shall be 1" thick (min.).
 - b. All adjustable shelves in open cabinets shall be 1" thick, except for special use cabinets as mail, cubical or locker type units.
11. Fixed interior components such as fixed shelves, dividers, and cubicle compartments shall be full 3/4" thick M-3 engineered board core attached with concealed interlocking mechanical fasteners.
12. All doors shall be a maximum of 24" wide.

D. Wall Cabinets:

1. Each end panel to be secured with mechanical fasteners for a total tensile strength of 2,450 pounds.
2. All wall cabinet bottoms shall be of 1" thick M-3 engineered board core mechanically fastened to end panels and secured to the bottom back stretcher.
3. An upper 3/4" thick stretcher shall be located behind the back panel and attached to the end panels with mechanical fasteners. Also, the stretcher is secured to the cabinet top with #8 x 2" plated flat head screws.
4. A lower 3/4" thick stretcher shall be located behind the back panel and attached to the end panels with interlocking mechanical fasteners. The stretcher is also secured to the cabinet bottom.

E. Base Cabinets:

1. Each end panel to be secured with mechanical fasteners for a total tensile strength of 2,450 pounds.
2. All base cabinets, except sink cabinets, shall have a solid 3/4" thick sub-top of M-3 engineered board core fastened to the ends with interlocking mechanical fasteners.
3. All sink cabinets shall have a vertically mounted front stretcher panel supporting the countertop, a split removable back panel, and four steel corner gussets used to secure the counter-top.
4. An upper 3/4" thick stretcher shall be located behind the back panel and attached to the end panels with mechanical fasteners. This stretcher is also fastened to the full sub-stop thus capturing the back panel.
5. **EXTERIOR PLYWOOD BASES TO BE USED THROUGHOUT. PLYWOOD CORE AT WET AREAS.**

F. Tall Cabinets:

1. Each end panel to be secured with mechanical fasteners for a total tensile strength of 3,850 pounds.
2. An intermediate fixed shelf shall be provided on all general storage cabinets to maintain internal dimensional stability under heavy loading conditions.
3. A 3/4" thick stretcher shall be located behind the back panels and attached to the end panels with mechanical fasteners. This stretcher is also fastened to the full sub-stop thus capturing the back panel.

4. An intermediate 3/4" thick stretcher shall be located behind the back panel and be secured to the cabinet ends with mechanical fasteners. Where an intermediate shelf is present, the stretcher shall also be secured to the shelf with #8 x 2 plated flat head screws.
 5. Drawers with 1/4" bottoms requiring hot melt glue or intermediate supports will not be permitted. No exceptions will be permitted.
- G. Drawers:
1. Drawer box shall be constructed with a full 1/2" thick, non-racking, non-deflecting platform bottom that is carried directly by "L" shaped, bottom mount drawer glides. Sides are secured with 1-1/2" long screws directly into platform and into the sides.
 2. Sides, back, sub-front and bottom shall be 1/2" thick M-3 engineered board core surfaced both faces with (Frosty White: Wilsonart 1573, Natural Almond: Wilsonart D30, Fog: Formica 961) thermally fused melamine per 2.2.B.1. The top edge shall be nominal 1mm (.020") PVC matching the drawer color.
 3. Corners shall be joined with fluted hardwood dowels and glue, minimum 32mm o/c.
 4. Drawer fronts shall be removable and attached drawer box sub-front with screws from inside of drawer.
- H. Adjustable shelving (wall hung)
1. Shelving to be # R2060 heavy duty shelving.
- I. Grommets for countertops shall be located by the Architect/Owner. Contractor shall supply and install.

2.4 PERFORMANCE:

- A. Laminates:
1. "High Pressure Laminates" shall meet the definition and performance requirements of NEMA LD3-1995. Vertical grade laminate shall be GP-28 balanced with a minimum grade of CL-20. Countertops shall be GP-50 or PF-42 as specified.
 2. Thermally fused melamine shall meet the performance requirements of NEMA LD3-1995 for GP-28. Cabinet manufacturer shall submit panel manufacturer's current published specification stating ANSI core properties and NEMA finish properties.
- B. Hinges:
1. ANSI 156.9.4.1,2,3,4: Two hinges mounted 23" on center on a 23-7/16" wide x 19-11/16" high cabinet door shall be capable of supporting a 100 pound test load located 1" from the outside edge of the door.
 - a. Cycle, open and close, from 5 degrees open through 95 degrees open with no failure to hinges, door, or cabinet end panel.
 - b. The maximum horizontal permanent hinge set shall not exceed .030".
- C. Drawers:
1. ANSI A156.4.11: a production drawer box 21-5/16" wide x 20-3/4" deep x 3-7/8" high with an applied finished front 6-7/16" high x 23-1/8" wide with a 20" drawer slides shall be tested as follows:
 - a. When uniformly loaded with 100 pounds and tested through 100,000 opening and closing cycles, the drawer shall operate freely.
 - b. When the drawer is fully extended, a 100 pound load shall be supplied to the drawer front at a point on the centerline of the drawer for one minute. No permanent damage or distortion shall occur.
- D. Adjustable Cabinet Shelving:
1. Shelving shall not deflect in excess of 1/4" when loaded as follows:
 - a. Standard Shelving - 25 pounds / s.f.

b. Library Shelving - 40 pounds / s.f.

E. Wall Hung Cabinet Load Test:

1. Earthquake test procedure developed by the "Woodwork Institute of California" for casework used in California schools and hospitals.
 - a. A 48" h x 12" d x 48" w wall hung cabinet using interlocking mechanical fastening devices shall support a 2,000 pound dead load concurrently with a 982 pound lateral pull out load. Test complies with loads specified in Title 17 with a safety factor of two.

2.5 COUNTERTOPS:

A. High-pressure decorative laminate; nominal thickness of 1-1/8" or 1":

1. General Purpose, GP-50 high-pressure decorative laminate on horizontal surface, conforming to NEMA Standard LD3, 1995.
2. Laminate patterns, wood grains, and solid colors will be selected from Wilsonart, Formica, Nevamar or Pionite current non-specialty, non-premium grade offerings in laminate manufacturer's standard suede, textured or matte finish.
3. Core material M-3 engineered board for all cabinet components, **except at wet areas, which shall be plywood core.** Material to be:
 - a. Made with formaldehyde-free resins
 - b. Made of 100% annually renewable fibers or particles
 - c. In excess of ANSI 208.1 M3 PB physical and mechanical performance specifications
 - d. Moisture resistant per ANSI 208.2-2002 Grade 130-MR50 MDF
 - e. Free of detectable TVOC emissions after 48 hours of manufacture per ASTM D 5116-97
4. Laminate bonded to either 1-1/8" or 1" thick M-3 engineered board core with PVA rigid adhesives. Contact method shall NOT be allowed. Core shall be balanced with HPL backer.
5. All joints shall be secured with adhesive and tight joint fasteners.
6. Provide 4" high back splashes where shown and at all ends abutting walls and adjacent cabinets.
7. Countertops shall conform to ANSI A161.2-1979 PERFORMANCE STANDARDS FOR FABRICATED HIGH-PRESSURE DECORATIVE LAMINATE COUNTERTOPS.
8. **Edges shall be NOT LESS THAN 3mm radiuses PVC, machine applied with hot-melt adhesives.**
9. **ALL WET AREA SHALL USE EXTERIOR PLYWOOD FOR WET AND ADJACENT TOPS.**
10. **WHERE TWO TOPS MEET AND/OR JOINED IN THE CENTER AND X0500 BRACKETS ARE REQUIRED TO SUPPORT THE COUNTERTOP, THERE SHALL BE A BRACKET ON EACH SIDE OF THE SEAM FOR EACH TOP. ONE BRACKET SHALL NOT BE ACCEPTABLE AT THESE LOCATIONS.**

B. Solid Surface:

1. Wilson Art surfaces (or prior approved equal).
 - a. Acrylic resins, fire-retardant mineral fillers, and proprietary coloring agents. Through-the-body color for full thickness of sheet material.
 - b. Superficial damage to a depth of 0.010 inch (.25 mm) shall be repairable by sanding and/or polishing.
 - c. Material Thickness: 1/4 inch, nominal.
 - d. Edge Treatment: as shown in drawings.
 - e. Color to be chosen by architect during submittal process.
 - f. Physical Characteristics:
 1. Thermal Expansion Coefficient: 1.5 x 10⁻⁵ in./in.o F; ASTM D 696.
 2. Hardness (Barcol Impressor): 62; ASTM D 2583.
 3. Impact Resistance: 78 in. drop with no fracture; NEMA LD-3, Method 3.8.
 4. Izod Impact: 0.24 (ft-lb.)/in.; ASTM D 256, Method A.

5. Light Resistance - Xenon: No effect; NEMA LD-3, Method 3.3.
6. Stain Resistance: Pass; ANSI Z 124.3, modified.
7. Wear and Cleanability: Pass; ANSI Z 124.3.
8. Fungi Resistance: Pass; ASTM G 21.
9. Bacterial Resistance: Pass; ASTM G 22.
10. Boiling Water Resistance: No effect; NEMA LD-3, Method 3.5.
11. High Temperature Resistance: No effect; NEMA LD-3, Method 3.6.
12. Weatherability: Delta E less than 5; ASTM G 155.
13. Moisture Absorption: Less than 0.25 percent; ASTM D 570, long term.
14. Specific Gravity: 1.78 gram/cm³ ; ASTM D 792.
15. Approximate Weight: 2.2 lb./ft² .
16. Surface Burning Characteristics: Class II and Class B; ASTM E 84.

PART 3 - EXECUTION

3.1 SHIPPING:

- A. All casework shall be blanket wrapped and delivered to the jobsite in air-ride furniture vans.

3.2 CASEWORK INSTALLATION:

- A. Casework shall not be delivered or stored at the jobsite until building has become adequately dry and secure. The ambient relative humidity must be maintained between 25% and 55% prior to delivery and through the life of the installation.
- B. Installation shall be by Casework Manufacturer's authorized representative.
- C. Casework is to be installed plumb and true, and is to be securely anchored in place. Scribe casework fillers as necessary for a tight fit.
- D. Wall cabinets shall be securely fastened to horizontal blocking, not to plaster, lath, or wallboard. Appropriate trade shall provide reinforcement of stud walls during erection of walls. Casework Manufacturer shall accurately locate blocking requirements on shop drawings. **(Wall blocking for all upper cabinets shall be 2" x 6". Other blocking to be coordinated with casework manufacturer.)**
- E. Install countertops on base cabinets using screws.

3.3 CLEANING AND PROTECTION BY CASEWORK CONTRACTOR:

- A. Empty drawers of dirt and dust. Wipe out cabinets interiors to remove dirt and dust. Remove pencil or other marks, excess adhesive, etc. from cabinets and countertops. Remove all packaging, scraps, and debris resulting from casework installation activities.
- B. Make final adjustments to doors and drawers. Doors shall swing freely, catches shall hold securely, and all other doors shall be aligned both vertically and horizontally. Drawers shall open and close smoothly, without binding and without excessive slide play.
- C. Keys shall be appropriately labeled and turned over to the Owner. (Re: 2.2 E.8. above)

The following are not acceptable:

- A. Concealed hinges (only five knuckle hinges)
- B. Low pressure laminate modular cabinets
- C. The use of self-edged doors and drawers (only machine applied PVC edges acceptable)

- D. 3/4" shelves (only 1" thick is acceptable)
- E. The use of particleboard where sinks are located (only treated plywood is acceptable)
- F. Injection molded plastic adjustable shelf supports (only metal shelf clips are acceptable)

END OF SECTION 12 30 00

SECTION 12 49 20 - MANUAL ROLLER SHADES

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishings and installation, complete, of manual roller shades as shown on drawings and as specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.
- C. **Manual roller shades shall be installed at all exterior wall fixed lites / windows, with the exception of the Main Lobby.**

1.2 SUMMARY

- A. Section Includes:
 - 1. Manual roller shades with single rollers.
- B. Related Requirements:
 - 1. Section 05 50 00 - Metal Fabrications
 - 2. Section 06 10 00 - Rough Carpentry
 - 3. Section 08 41 00 - Entrances and Storefront

1.3 REFERENCES:

- A. Flame-Resistant Materials Shall Pass or Exceed One or More of the Following Test:
 - 1. National Fire Protection Association (NFPA) 701
 - 2. Department of Transportation Motor Vehicle Safety Standard 302 Flammability of Interior Materials
 - 3. California Administrative Code Title 19
 - 4. Federal Standard 191 Method 5903 (used by Port Authority of New York and New Jersey for drapery, curtain, and upholstery material)
 - 5. Boston Fire Department Test BFD IX-1
 - 6. New York State Uniform Fire Prevention and Building Code

1.4 SUBMITTALS:

- A. Provide in accordance with Section 01 33 23 - Shop Drawings, Product Data, and Samples.
 - 1. Product data for roller shades and accessories. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.
 - 2. Shop drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.
 - 3. Samples for Initial Selection: For each type and color of shadeband material. Include Samples of accessories involving color selection.
 - 4. Samples for Verification: For each type of roller shade.
 - a. Shadeband Material: Not less than 10 inches (250mm) square. Mark inside face of material if applicable.
 - b. Installation Accessories: Full-size unit, not less than 10 inches (250mm) long.
- B. Closeout submittals

1. Maintenance Data: For roller shades to include in maintenance manuals.

1.5 COORDINATION:

- A. Coordinate layout and installation of the roller shades with adjacent construction, including ceiling suspension systems, light fixtures, HVAC equipment, fire-suppression system, and partitions.

1.6 QUALITY ASSURANCE

- A. SUPPLIER: Manufacturer, subsidiary or licensed agent shall be approved to supply the products specified, and to honor any claims against product presented in accordance with warranty.
- B. INSTALLER: Installer or agent shall be qualified to install specified products by prior experience, demonstrated performance and acceptance of requirements of manufacturer, subsidiary, or licensed agent. Installer shall be responsible for an acceptable installation.
- C. UNIFORMITY: Provide Manual Roller Shades of only one manufacturer for entire project.
- D. MOCKUPS: Build mockups to verify selections made under sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless the Architect specifically approves such deviations in writing.
 2. Subject to compliance with requirements, approved mockups may become part of the completed work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.9 WARRANTY

- A. Lifetime Limited Warranty. Fabrics warranted for a period of 5 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Source Limitations for Roller Window Shades: Obtain roller window shades from single manufacturer. Obtain accessories, including necessary mounting hardware, from roller window shade manufacturer.
- B. Acceptable Manufacturers:

1. Hunter Douglas Contract / 12250 Parkway Centre Dr. / Poway, CA 92064/
Phone: 800-727-8953 Fax: 800-205-9819
2. MechoShade Systems, Inc. / 42-03 35th Street / Long Island City, NY 11101/
Phone: 718-729-2020 Fax: 718-729-2941
3. or prior approved equals

2.2 MATERIALS:

A. PRODUCT: Manual Roller Shades

1. **FABRICS:** Inherently anti-static, flame retardant, fade and stain resistant, light filtering, and room darkening fabrics providing 1% openness factor. Fabric shall be PVC-coated fiberglass E Screen 7501. (Fabrics shall not be rail loaded. Rollers to be coupled where windows have a clear opening over 10 feet.) Finish selected by Architect from manufacturer's available colors.
2. **CONTROL SYSTEM:** Adjustment-free continuous qualified #10 stainless steel ball chain ((90-lb. test)) and pulley clutch operating system allows precise control and ensures a uniform look. Clutch will develop no more than ½ pound drag for ease of lifting. Glass reinforced polyester thermopolymer (PBT) plastic components conform to military specification MIL M-24519 and designed for smooth, trouble-free operation.
3. **ROLLER:** Circular-shaped painted extruded aluminum tubes with thicker wall & ribs provide additional strength while locking into place the clutch & end plug. 3" outside diameter extruded tube to have a .090 wall thickness. 2" outside diameter extruded tube to have a .072" wall thickness (1 ½" & 1 1/8" tubes have .055" wall thickness) providing strength & durability.
4. **END PLUG:** Heat stabilized fiber reinforced plastic outside sleeve and center shaft provide bearing surfaces on which the roller rides ensuring smooth, wear resistant operation.
5. **BOTTOM ROD:** Extruded aluminum weight in a Sealed Pocket Hem Bar, or Flat Bottom Bar for fabrics that are not seamable. Bottom rod is for tracking adjustments and provides uniform look.
6. **MOUNTING HARDWARE:** Manufacturer's standard .07" nickel-plated, C1008/1010 cold rolled steel universal brackets including end plug bracket with lock down retainer device.
7. **ADDITIONAL AVAILABLE OPTIONS:** Fascia, Top & Bottom Covers

B. ROLLER-SHADE FABRICATION

1. **Product Safety Standard:** Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
2. **Unit Sizes:** Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):
 - a. Shade measurements shall be accurate to within + 1/8" or as recommended in writing by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of

connections to building electrical system, and other conditions affecting performance of the Work.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER-SHADE INSTALLATION

- A. INSTALLATION shall comply with manufacturer's specifications, standards and procedures as detailed on contract drawings.
- B. ADEQUATE CLEARANCE shall be provided to permit unencumbered operation of shade and hardware.
- C. CLEAN finish installation of dirt and finger marks. Leave work area clean and free of debris.

3.3 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

END OF SECTION 12 49 20

SECTION 20 0100 - GENERAL PROVISIONS

PART 1 GENERAL

1.01 GENERAL

- A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements apply to the work specified in this section.
- B. The division of the specification into divisions 20, 21, 22 and 23 is for contractor convenience only and is not intended to establish limits of work. This contractor is responsible for any and all references to their work that may be located within a different section of the specifications.
- C. The architectural features shown on these drawings upon which the contract documents are based may be inaccurate or incomplete. The contractor shall coordinate all installation requirements with the most current to date sealed architectural contract documents and modify as required.
- D. The contractor is responsible for including in bid a complete and working system in accordance with the most current to date sealed architectural contract documents.
- E. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 DESCRIPTION

- A. Perform all work under this heading, including the furnishing of labor, materials, equipment, and service necessary for and reasonably incidental to the proper completion of all mechanical work as shown on the drawings and herein specified.
- B. Visit and examine the job and confer with all authorities concerned in order to become familiar with all existing conditions pertinent to the work to be performed. No additional compensation will be allowed for failure to be so informed.
- C. Materials and equipment shall be new, except where otherwise indicated, of the best quality, with same brand or manufacturer for all similar material.
- D. Perform all work in a neat and workmanship manner.
- E. In general, provide the installation of plumbing systems, and heating, air conditioning and ventilating systems complete with piping, fittings, fixtures, equipment, etc.
- F. Regardless of titles and subdivisions herein employed, consider these specifications as an complete document with General Sections applying to all other sections. All bidders are cautioned to read entire specifications and to thoroughly familiarize themselves with all requirements thereto.
- G. Check all specifications and all drawings and bring to attention any conflicts or variations as soon as noted.
- H. Specifications and accompanying drawings apply to all contracts or sub-contracts entered into for supplying material or labor for construction of work specified herein and shown on the drawings.
- I. The drawings and specifications are complementary and what is shown and/or called for on one shall be furnished and installed the same as if shown and/or called for in the other.
- J. In case of discrepancies and/or ambiguities in the drawings and/or in the specifications, consult Architect prior to submission of a proposal. Failure to do so on the part of the successful bidder shall be construed as explicit agreement on his part to abide by the Architect's decision in such matters.
- K. The word "Provide" as used in these specifications and on the drawings shall be termed to mean "furnish and install".

1.03 QUALITY ASSURANCE

- A. The Contractor bidding on this portion of the work must be fully experienced in the installation of equal size, complexity, and quality, and must be licensed to perform such work as required by the Rules and Regulations Promulgated by the State Licensing Board for Contractors.

- B. In bidding he acknowledges that he fully understands the scope of the work and design, and has the ability for the contract price to assemble and install the equipment, piping, ductwork, etc., as shown and specified, so as to mold same into a satisfactory workable system and arrangement.
- C. Contractor shall recognize that a fault or error in his work remains his responsibility regardless of whether such difficulty was discovered after the work had progressed, and shall make corrections at no cost to Owner.
- D. Provide adequate and competent constant supervision to assure that work is done in accordance with good standard practice and workmanship and with intent of drawings and specifications.
- E. Install all work in strict accordance, with all local and state codes and ordinances, with National Board of Fire Underwriters, and in accordance with all O.S.H.A. Standards.
- F. Secure all permits and inspections and pay all legal fees and taxes and provide Owner with a certificate of approval from agencies having jurisdiction over various phases of the work.

1.04 SUBMITTALS

- A. Shop Drawings and Submittal Data Required
 - 1. Submit to the Architect for review, immediately after award of contract, six (6) copies of complete descriptive information and dimensional data on all items of equipment, materials and accessories. Submit all shop drawings at one time. Piece meal submission shall not be acceptable.
 - 2. Shop drawings and submittal data shall be considered to be instruments to service only and submitted for the sole purpose of convenience to the Contractor to assist him in the performance of the contract. The Architect's review of the shop drawings and submittal data shall not supersede these specifications, the accompanying drawings or the contract terms, unless specifically covered by a properly executed change order, and then only to the extent specifically and explicitly stipulated therein.
 - 3. Coordination with electrical: Contractor to submit copy of any & all shop drawings that indicate electrical requirements to the project electrical engineer for electrical service & electrical load verification. Applicable to all mechanical items.
 - 4. Any and all changes within to the contract documents in submittals shall be highlighted in yellow on the submittals (dimension, size, electrical requirements, material, color, etc.).
 - 5. The contractor shall provide a copy of the respective Mechanical Equipment Schedule of the equipment that is being submitted with the information/data of the submitted equipment within the schedule. This is required to be able to compare the specified equipment with the submitted equipment on an exact format basis. Failure to submit custom mechanical equipment schedule with submittal may result in a rejected submittal.
 - 6. The contractor shall submit to the mechanical engineer, as soon as feasible after award of the contract, equipment room layouts at a scale not less than 1/4" = 1'-0" showing the layout of the actual equipment to be used and all necessary clearances. This drawing is to be comprehensive of all trades as to eliminate conflicts. The contractor will be responsible to verify all access for maintenance as required by the manufacturer.
 - 7. Well in advance of preparing the project shop drawings and well in advance of ordering any project equipment, and as part of the requirements and work of this project division:
 - 1. Employ, coordinate directly with, and pay (if such payment is required) the respective suppliers/vendors of all project equipment and/or the respective project subcontractors who are providing all project equipment, as respectively applicable:
 - a. To review all respective equipment performance, electrical characteristics and requirements which are indicated and/or given on any of the project drawings and/or in any of the project specifications; and

- b. To determine whether or not each bit of the information that is relevant to such indicated equipment performance, electrical characteristics and requirements is accurate for the exact respective equipment which is being furnished for the project;
- 2. Have such suppliers/vendors and/or subcontractors, as respectively applicable:
 - a. Verify, in no uncertain terms, with proper documentation, which bits of the information that is relevant to such indicated equipment performance, electrical characteristics and requirements are indeed so accurate; and
 - b. Furnish the respective, properly-corrected, equipment performance, electrical characteristics and requirements for all indicated equipment electrical characteristics and requirements which are not so accurate;
- 3. Submit all such verifying and/or correcting documentation to the architect, in a timely manner, in the same formats in which the respective equipment performance, electrical characteristics and requirements were originally indicated and/or given. For example:
 - a. For all equipment performance, electrical characteristics and requirements which were originally indicated and/or given in the form of equipment schedules, submit the respective, properly-corrected, equipment performance, electrical characteristics and requirements in the form of corrected, similar, equipment schedules;
 - b. For all equipment performance, electrical characteristics and requirements which were originally indicated and/or given in the form of equipment notes (plan keynotes), submit the respective, properly-corrected, equipment performance electrical characteristics and requirements in the form of corrected, similar, equipment notes;
 - c. For all equipment performance, electrical characteristics and requirements which were originally indicated and/or given in the form of specification verbiage, submit the respective, properly-corrected, equipment performance, electrical characteristics and requirements in the form of corrected, similar, specification verbiage; and so on."

B. Record Drawings

- 1. The contractor shall be furnished with one (1) set of blue line prints, on which Contractor shall show any changes in the work caused by unforeseen circumstances and these drawings shall be turned over to the Architect in good order prior to final acceptance of the building. Architect in turn shall prepare record drawings from information furnished by contractor.

C. Parts Catalogs and Operating Instructions

- 1. Furnish to the Architect for the Owner, three (3) complete sets of parts catalogs and operating instructions bound in large binders for his use. Each set shall contain:
 - a. Complete wiring and control diagrams
 - b. Routine maintenance operations
 - c. Detailed operating instructions and instructions for making minor adjustments
 - d. Manufacturer's catalog data, pump curves, service instructions, and part list of each piece of operating equipment

2. One additional copy of the first item above shall be framed under glass and installed in each equipment room where applicable.
3. Instruct Owner's operator in the proper care, operation, lubrication, and maintenance of mechanical equipment installed.

D. Substitution

1. All material, equipment, methods and accessories entering into the work under this section of contract are subject to approval or disapproval of the Architect. Approval of any manufacture or vender, any material, or product, shall not constitute a waiver of Architect's right to demand full compliance with contract requirements, including shape, size, quality and performance.
2. Equality of materials is that established by opinion of Architect. Decision of Architect is final.
3. Whenever a material or article of equipment is specified by use of a proprietary name, or by naming the manufacturer or vendor, any material or article which will perform adequately the duties imposed by the design will be considered for substitution, providing it is of equal substance, and function, meets specifications, and is aesthetically acceptable to the Architect, and that requests for approval along with all literature and technical data on proposed substitution is submitted in writing so as to be received in Office of Architect not less than seven (7) calendar days prior to opening of bids.
4. Literature, technical data, etc., includes complete data (including catalog names and model numbers) and samples if necessary, with submissions for substitutions. Burden of proof that material offered for substitution is equal, or superior, in construction and efficiency to that named, rests on Contractor, and unless proof is satisfactory to Architect, substitutions will not be approved.

1.05 PRODUCT, DELIVERY, STORAGE AND HANDLING

- A. Take necessary precautions to protect all material, equipment, apparatus and work from damage. Failure to do so to the satisfaction of the Architect will be sufficient cause for the rejection of the material, equipment or work in question. Contractor is responsible for the safety and the good condition of the materials installed until final acceptance by the Owner.

1.06 JOB CONDITIONS

- A. Accompanying drawings, including plans, details, diagrams, notes, etc., are shown to limit and explain structural conditions, construction requirements, sizes, capacities, and method of installation and erection. Structural and other conditions may require certain modifications and adjustments from conditions shown. Such deviations are permissible; however specific sizes, capacities, and requirements affecting the satisfactory performance and operation of the installation shall remain unchanged. Make allowances for normal job conditions and interferences.
- B. Whenever it becomes necessary to shift ducts or pipes or to change shape of ducts, such changes shall be referred to the Architect for approval.
- C. Ask for details whenever uncertain about method of installation. Lack of details not requested shall not excuse improper installation and correction shall be responsibility of Contractor.
- D. Furnish detailed ductwork shop drawings and large scale equipment room layouts base on field measurements, actual job conditions, and actual equipment to be installed on project.
- E. Schedule and perform all mechanical work to avoid delays.
- F. All piping, cleanouts and covers, and other mechanical items in way of construction or remodeling, shall be rerouted, relocated or otherwise adjusted to work out with such construction or changes shown or specified in any or all of various sections of specifications.
- G. Refer unknown site or job conditions that are encountered immediately to Architect for method of disposition before continuation of work.

1.07 GUARANTEE AND SERVICE

- A. Guarantee all equipment, materials and workmanship for a period of one (1) year following date of acceptance.
- B. During the period of guarantee and defects in equipment, materials or workmanship shall be promptly corrected without cost to Owner.
- C. Guarantee includes equipment capacity and performance ratings specified with excessive noise levels. Any deficiencies in equipment capacity specified shall be promptly corrected.
- D. Guarantee does not include normal maintenance items.
- E. Warranty period begins at date of substantial completion, not when contractor starts equipment. Figure in bid extending warranty to accomplish this.

1.08 COORDINATION DRAWINGS

- A. The contractor shall coordinate work of all various sections having interdependent responsibilities for installing, connection to, and placing such equipment. At the contractor's expense, all (including but not limited to, mechanical, plumbing, electrical system) necessary offsets, bends, duct size/configurations, crossing/cross-overs shall be provided and installed as necessary to integrate within the structural system and the architectural features (ceilings and walls, etc.).
- B. Coordination Drawings: the purpose of the coordination drawings is to assure proper forethought and coordination of integrating all systems of the building within the structural framework, architectural ceilings, floors, and walls of the building. The contractor shall provide coordination drawings prior to the submittal of all system shop drawings. The coordination drawings shall include ductwork and all mechanical HVAC piping and associated items, plumbing verticals and sprinkler piping, chases, electrical conduit, and shall indicate sizes of these items and the structural members.
- C. The contractor shall submit the coordination drawings (four (4) complete sets) to the architect for the architect's approval no later than one month after the work has commenced on the project site. The contractor shall revise and re-submit the drawings as the architect may require. Provide a DVD/CD with each hard copy with PDF's of coordination drawings.
- D. The coordination drawings shall include, but is not limited to, the following:
 - 1. Plan drawings for each floor indicating structural member sizes, HVAC components/sizes/routes/locations, major electrical conduit grouping/routes, vertical chases/openings, and all other items as necessary to comply with the requirements of 1.08.A and 1.08.B of this section.
 - 2. Section drawings through major pathways for systems (such as corridors, if appropriate), and exemplary rooms.
 - 3. Prior to the commencement of preparing the drawings, the contractor shall confirm the proposed listing of drawings to be submitted.
 - 4. Any and all other drawings, schedules, and information necessary to illustrate the contractor's understanding of the architectural design intent of the critical ceiling heights, wall locations, and all other design parameters and how they are accommodated upon the contractor's proposed integration of the systems noted in the contract documents.
- E. During the course of construction, the contractor shall update the coordination drawings in a clean, clear, and legible manner and have the drawings readily available on-site for the architect's access. Upon substantial completion, the contractor shall submit the updated coordination drawings to the architect for the owner's future use and shall be the property of the owner.
- F. The General Contractor is to coordinate with all sub-contractors as to provide the coordination drawings. All contractors are to be responsible for coordinating their applicable work. The General Contractor and all sub-contractors shall work cohesively in a timely manner as to provide the coordination drawings.

1.09 ELECTRICAL COORDINATION WITH BUILDING AND AUTOMATIC TEMPERATURE CONTROLS PRIOR TO BID COORDINATION DRAWINGS

- A. The contractor shall coordinate/provide the following: Given the nature of the evolving technology in the field of Building & Automatic Temperature Controls (and the differences between various manufacturers), various Temperature Control Devices have been specified at various voltages (120-1-60, 24V, etc., Refer to Specification 230900). It is the responsibility of the General Contractor, Electrical Contractor, Mechanical Contractor, & Temperature Controls contractor to coordinate prior to bid as to ensure all electrical provisions for all Temperature Control Devices are accounted for (material, equipment, conduit, breakers, wiring, devices, installation, labor, etc.) as to provide a complete and working Temperature Controls System. Should the Contractor (and subcontractors) fail to coordinate all electrical provisions prior to bid, then the cost to provide such electrical provisions shall be solely borne by the Contractor (and subcontractors). No additional cost to be provided by the owner to the Contractor for failure to coordinate prior to bid. Refer to specification 230900 for Building and Automatic Temperature Controls sequences of operation, EMS point list, product data, etc.

1.10 FEES AND DEPOSITS

- A. Arrange for and pay regulatory inspection and service connection fees (sewer, drainage, water and gas) including the cost of any main extensions. Pay meter deposits for utility services. After substantial completion of the project, the meter registration shall be transferred to the User/Owner.

1.11 VISITING SITE

- A. The Bidder shall visit the site of proposed work so that he may understand the facilities, difficulties and restrictions attending the execution of the contract. No additional compensation will be allowed for failure to be so informed.

1.12 UTILITY CONNECTIONS

- A. Coordination of utilities which are work of this contract to utilities installed as work of other divisions prior to starting any work. Verify connection points, inverts, valving, etc., prior to commencing any work. No additional compensation will be allowed for conflicts that occur due to lack of coordination.

1.13 NEW EQUIPMENT INSTALLATION

- A. New equipment installed under this project specified by other sections of these specifications which requires discipline specific connections shall be coordinated & installed by the contractor. These connection points are based on the manufacturer specified and laid out by the contractor. Should the contractor utilize another manufacturer, it is the contractor's responsibility to verify all new connections (mechanical, plumbing, electrical, etc.) and modify required services as necessary to place new piece of equipment into operation.

1.14 SPECIAL CONDITIONS

- A. No piping, ducts or other mechanical equipment foreign to the electrical equipment shall pass through or above the spaces dedicated to electrical panel boards, electrical distribution panels, electrical switchboards and motor control centers. Work shall conform with NFPA 70. Working clearances and dedicated spaces at electrical equipment shall be maintained per NFPA 70. Coordinate with each trade.

1.15 WORK IN OTHER DIVISIONS

- A. Prior to bidding, the Contractor shall coordinate items of work referred to as "work of other Divisions" to insure items are not omitted or duplicated.

1. Utility Connections - sewer, natural gas, storm drainage and water unless otherwise noted on the drawings.
2. Electrical work (wiring, raceways and disconnect switches), fire alarm work (wiring, raceways, equipment and devices) associated with work of this division and not specified as work of Division 26 - Electrical, shall be work of this division.
3. Supports for work of this Division, except supports specifically indicated to be provided under other Divisions, shall be provided as work of this Division. Supports provided under other Divisions shall be checked and coordinated under this Division to ensure that they suit the work to be installed.
4. Painting, including painting of exposed insulation, exposed piping and exposed ductwork not specified as work of DIVISION 9 - FINISHES, shall be work of this Division. Damaged surfaces of factory finished items shall be repaired to the satisfaction of the Architect/Engineer as the work of this Division. Nameplates shall be protected until painting has been accomplished. Protection shall be removed and nameplates cleaned prior to acceptance of equipment.

1.16 MANUFACTURER'S RECOMMENDATIONS

- A. Equipment and materials provided under this Division of the specifications shall be installed according to manufacturer's recommendations. Each manufacturer's application and installation instructions shall be reviewed prior to ordering equipment or commencing with the work. If the drawings or specifications show or describe any deviations from the manufacturer's recommendations the Contractor shall request clarification, from the Architect/Engineer and provide as directed at no additional cost to the User Agency. Where the respective manufacturer's recommended installation required equipment/material not shown within the contract documents, the contractor shall provide & figure the cost of these additional equipment/material in their bid. The contractor shall provide a complete and working system.

PART 2 PRODUCTS

2.01 TOOLS AND SCAFFOLDING

- A. Furnish all tools, equipment, scaffolding and other facilities required to properly and expeditiously perform the work.

2.02 BUCKS, GROUNDS AND CHASES

- A. All bucks, grounds, lintels, blockouts, chases and grouting for work under this Division shall be done by the General Contractor.
- B. This Division shall be responsible for proper location and sizes or for any errors of omission in placing same.

2.03 FOUNDATIONS AND SUPPORTS

- A. Provide foundation and supports of concrete or steel shapes for equipment requiring same.
- B. Mount all floor mounted mechanical equipment on nominal four (4) inch high concrete housekeeping pads.

2.04 ACCESS PANELS

- A. Factory made access doors and frames, prime coat finish, screwdriver latch(s) of suitable size as required.
- B. Access panels in rated ceiling to have same rating as ceiling. Where access panels are required in fire rated ceiling then the access panel shall be fire rated.
- C. Access panels in lined ductwork to be double wall type with insulation sandwiched in between, same insulation value as adjacent ductwork.

- D. Where valves (domestic water valves, etc.), dampers, controls, fire dampers, smoke dampers and detectors, VAV Boxes, etc., are concealed in walls or non-accessible ceilings, install factory made access doors and frames. Contractor shall refer to drawings for locations of items in need of access panels. Panels to be sized as to properly access equipment. Minimum access panel size to be 24x24.
- E. Paint all exposed access panels to match finish of respective wall and/or ceiling.

2.05 FLOOR AND CEILING PLATES (ESCUTCHEONS)

- A. Where any pipe or risers pass exposed through walls, partitions, floors or ceiling, use chrome-plated floor and ceiling plates.
- B. Plates shall be large enough to completely close the hole around the pipes and shall be round with the least dimension not less than 1-1/2" larger than the diameter of the pipe. Plates shall be secured in an approved manner.

2.06 SIPHON PREVENTORS

- A. Furnish and install approved type siphon preventers on all equipment and fixtures in such a manner as to prevent water being siphoned back into the water supply in the event the water supply is shut off.

2.07 FLAME SPREAD PROPERTIES OF MATERIALS

- A. All materials and adhesives used for acoustical linings, jackets and insulation shall comply with requirements of NFPA 90A and 90B and UL guide no. 40 V.8.15. Products exceeding a flame spread rating of 25, or a smoke developed rating of 50, as determined by ASTM Test Method E-84 are prohibited. Adhesives and sealers shall be fire retardant and fire resistant when dry. Flame proofing treatments which are subject to decomposition, deterioration, or the effects of moisture are prohibited.

2.08 SCAFFOLDING, RIGGING AND HOISTING

- A. Each contractor shall furnish all scaffolding as required for the installation of his work. He shall either arrange with the General Contractor for servicing in connection with any rigging and hoisting required or provide his own equipment to hoist apparatus to be installed by him into place. Each contractor shall see that any equipment too large to permit passage through normal doorways and access ways is brought to the job and set in place before the mechanical spaces are enclosed. All apparatus not delivered in this manner shall be disassembled and reassembled in the proper location. Equipment specified to be factory assembled and tested prior to shipment shall not be disassembled for shipment to an installation into the building.

2.09 VIBRATION ISOLATION

- A. Transmission of vibration or structural borne noise to occupied areas by equipment installed under this contractor will not be permitted. Contractor shall furnish for approval, data showing disturbing frequency, supported weight, static deflection, efficiency and calculations supporting same for each isolator he proposes to use.
- B. All isolators shall be selected and certified, using published data, to limit vibration transmission to 10% for equipment located on floors in direct contact with grade and 5% for equipment located other than the above. Should any noise or vibrations be objectionable to the Architect and/or Owner, field instrumentation tests and measurements shall be made by the isolator manufacturer or his representative to determine the source and cause of such disturbance. Any non-compliance with these specifications shall be corrected by the contractor in a manner satisfactory to the Architect at no additional cost to the Owner.

2.10 UNDERGROUND PIPING WARNING TAPE

- A. All underground piping shall have warning tape installed directly above underground piping (beyond building slab). Tape shall be installed 12 to 18 inches below finished grade. Warning tape shall be metallic detectable type consisting of 0.35 mils thick solid core encased in a protective plastic jacket that is resistant to alkalis, acids and other destructive elements found in the soil. The lamination bond shall be strong enough that the layers cannot be separated by hand. Total composite thickness to be 5.0 mils. Foil core to be visible from unprinted side to

ensure continuity. Warning tape for metallic piping may be 0.4 mils polyethylene film without metallic laminate.

- B. Warning tape shall have a continuous warning message repeated every 18 to 36 inches shall be imprinted on the tape surface. The tape shall contain an opaque color concentrate designating the color code appropriate to the line being buried. Tape shall be minimum 3" wide.
- C. An additional #10 copper wire shall be adhered to all underground nonconductive piping and fastened with plastic zip ties every 4'-0" on center. Provide a long tail tracer wire at valve with ring and cover.

2.11 MATERIALS IN AIR DUCTS AND PLENUMS

- A. No plastic or other non-metallic materials as defined by NFPA 90A shall be used in air ducts or plenums unless specifically rated for such service.

2.12 FLASHING

- A. Metal flashing: 26 gauge galvanized steel.
- B. Lead flashing: 5 lb/sq ft sheet lead for waterproofing.
- C. Flexible flashing: 47 mil thick sheet butyl; compatible with roofing.
- D. Caps: Steel, 22 gauge minimum; 16 gauge at fire resistant elements.

2.13 EQUIPMENT IDENTIFICATION

- A. Provide labels for each starter, control switch, and all equipment. Labels to be engraved black laminated bakelite nameplates with 1/4" high which cut letters, secure to starters, switches or equipment.

2.14 FIRE RATED WOOD

- A. All wood as specified within these construction documents (mechanical, plumbing, sprinkler plans and specifications) shall be of the fire rated type. PYRO-GUARD treated wood as manufactured by HOOVER treated wood products.

2.15 CONCRETE FASTENERS

- A. Fastenings set into concrete to support pipe, air handlers and other mechanical equipment shall be steel or malleable iron expansion shields set in proper size drilled holes. Do not exceed the manufacturer's rated pull out load. The manufacturer's rated load must be based on a factor of safety of 5 or else the allowable load must be reduced to give a factor of safety of 5. Self-drilling Rawl Saber Tooth or Phillip Red Heads may be used. Anchors using lead, plastic or shields of any material other than steel or malleable iron shall not be used.
- B. Powder actuated fasteners, Hilti or Ramset, may be used for loads applied with a factor of safety of 5 but not more than 300 pounds for the largest size. The powder charge shall be found by trial and shall be the smallest charge that gives full insertion into the concrete. These fasteners may be used for ductwork and small pipe.
- C. Not used.
- D. Follow manufacturer's instructions and use setting tools procured from the manufacturer of the drilled-in anchors to expand the shields.
- E. Fasteners of the type set into concrete by drilling shall be self-drilling (Rawl Saber Tooth, Phillips Red Heads, or prior approved equal).

- F. Powder actuated fasteners shall be Hilti or Ramset.

2.16 PROTECTIVE COATING FOR UNDERGROUND PIPING

- A. Underground pipe and fittings including the portion through the floor shall be protected against corrosion by application of protective coatings.
- B. Prior to coating, pipe and fittings shall be cleaned of all rust, scale, dirt, and oil.
- C. Pipes and fittings shall be given a wash coat of epoxy primer having a dry film thickness of 1.5 - 2.0 mils. Over the primer apply two coats of coal-tar base epoxy coating, each having a dry film thickness of 6 mils.
- D. Coatings shall have a holiday test using a ½" spark. Recoat any areas not passing test.
- E. Provide for all underground metal piping up from grade.
- F. 2-Part coal-tar epoxy to be Carboline 300M or prior approved equal.
- G. Applicable to ferrous piping below grade.

2.17 EMS CONDUIT AND BOXES (COORDINATE WITH TEMPERATURE CONTROLS CONTRACTOR)

- A. UNDERGROUND EMS CONDUIT: Rigid Nonmetallic Conduit (RNMC): Schedule 40, rigid polyvinylchloride, rated for 90 degrees C conductors, with pull string, solvent cement connectors and couplings. Nonmetallic strap hangers allowing thermal expansion movement. Conduit to meet NEMA TC-2; fittings to meet NEMA TC-3. Expansion Coupling: Nonmetallic to compensate for thermal expansion.
- B. EMS CONDUIT WITHIN BUILDING: Shall be hot dipped galvanized rigid steel conduit. All conduits shall be new and shall bear the inspection label of the Underwriter's Laboratories, Inc. Metallic conduit shall be hot-dipped galvanized. Fittings for conduit shall be an approved type specially designed and manufactured for their purpose. Rigid metal conduit fittings, bushings, and other components shall be galvanized. Setscrew connector fittings shall not be permitted. All fittings for rigid steel or aluminum conduit shall be threaded and coupled unless specifically approved otherwise by the Engineer.
- C. Pull Boxes: Communication/EMS ground mounted pull boxes shall be polymer concrete, ANSI/SCTE 77 2002 – Tier 22 rated, provide dimensions indicated on the drawing. Open bottom. Cover to be labeled "Communications". Secure cover with stainless steel standard hex head bolts. Covers shall be traffic rated. ALL PULL BOXES TO BE SIZED IN ACCORDANCE TO NEC (NATIONAL ELECTRIC CODE).
- D. Stainless Steel EMS Enclosure: NEMA 3R enclosure (UL 508A Listed). Manufactured from Type 304 16 gauge stainless steel; 16 gauge doors and 14 gauge bodies, Minimum-width body flange provides maximum body opening, Pre-cut gland plate openings in the bottom of the enclosure with a seal to ensure protection, External formed 90 degree body flange, Door opens 210 degrees, Mounting holes in back of body for direct mounting or for optional external mounting brackets, Type 316 stainless steel hinge pins, Corner-formed doors are easily removed by pulling clip-style hinge pins, Quarter-turn latches furnished with 3mm double-bit insert, Seamless foam-in-place gasket, Self-grounding latch system with double seal, Grounding stud on the body, Full-sized galvanized steel back panel included, Bonding provision on the door, Furnished hardware kit includes: gasketed gland plates and hardware, grounding hardware and sealing washers for wall-mounting holes, Three-point latching, Finish: Door and body have smooth #3 brushed finish. Hoffman medium GL66 series stainless steel wall mount enclosure.

2.18 PREPARED OPENINGS

- A. Piping and tubing installed through masonry or concrete walls, floor/ceiling assemblies and floors above grade shall be installed through pipe sleeves.
- B. Duct installed through masonry or concrete walls and non-rated concrete floors above grade shall pass through 20-gauge galvanized sheet metal sleeves. Duct sleeve shall have a ½" maximum annular clearance around duct. Allowances shall be made for external duct wrap (if specified). Ducts, tubing and piping installed through floors of mechanical rooms shall have a 4" high concrete curb on each side to prevent water from leaking through openings. Exposed piping installed through walls shall be fitted with chromium plated escutcheons on each side of the wall. Exposed ductwork passing through non-rated masonry or concrete walls shall be fitted with a 2" wide sheet metal flange around each side of duct on each side of the wall.
- C. Ducts installed through partitions, walls or floors which are smoke rated or have a fire rating of one hour or greater shall be installed in accordance with SMACNA standards. Piping and tubing installed through partitions, walls or floors which are smoke rated or have a fire rating of one hour or greater shall be installed through pipe sleeves.

2.19 NOT USED.

2.20 SAFING MATERIAL

- A. Safing material shall be installed in annular spaces between sleeve and pipe or tubing where sleeve and pipe or tubing penetrate partitions that are designated as smoke separations. Material shall be mineral wool designed for hand packing. Material shall have an ASTM E84 rating of flame spread -10, fuel contributed -0, smoke developed -0 and shall be rated non-combustible per ASTM E 136.

2.21 TAMPER PROOF FASTENERS

- A. Where equipment is specified to have tamper proof or vandal proof fasteners, the Contractor shall coordinate and use the same type of fastener on each item. Provide User Agency with two wrenches, screw drivers, etc., for each type of fastener used on the project.

2.22 ENCLOSURES

- A. Control equipment enclosures provided by the Contractor or provided as part of a packaged piece of equipment shall meet the following minimum standards unless specifically indicated otherwise. Where indicated on the drawings or specifications, flush mounted enclosures shall be provided.
- B. Control equipment enclosure provided within the building shall be equivalent to or greater than NEMA 12 type construction. Control equipment enclosures provided outside of the building, a non-enclosed area of the building or in an accessible crawl space under a building shall be equivalent to or greater than NEMA 3R type construction with drain and breather. Control equipment enclosures provided within hazardous areas, controlling explosion-proof equipment shall be NEMA 7 or 9 type construction. Control equipment enclosures provided for cooling towers and associated equipment within 20'-0" of towers shall be NEMA 4X noncorrosive type construction.

2.23 SAFETY PANS

- A. Safety pans shall be fabricated from 12-gauge (min.) 304 stainless steel. Sides of pans shall be a minimum of 4" high with top edges hemmed. Sides longer than 6'-0" shall have additional flat bar or angle top edge bracing to prevent sagging. Joints and seams shall be watertight. Pans shall be extended at least 6" beyond the sides of the equipment it is serving. Provide a 1" stainless steel female pipe coupling in side of pan near the bottom of overflow piping connection. All joints and seams to be of welded construction. This is applicable for all auxiliary drain pans under air handling units, hot water heaters, etc.

1. Provide float switch in auxiliary drain line, HVAC unit to de-energize when float switch is tripped.
2. Pipe safety pans to nearest floor drain or floor sink. Provide ball valve in safety pan condensate drain line (normally closed).

PART 3 EXECUTION

3.01 CUTTING AND PATCHING

- A. Cut all openings as required for the work under this section. Patching shall be done by the craft whose work is involved. Furnish and install all necessary sleeves, thimbles, hangers, inserts, etc., at such time and in such a manner so as not to delay or interfere with the work of other trades. No beams or joists shall be cut. After resurfacing has been done, any further cutting, patching and painting shall be done at the expense of the Contractor.

3.02 COORDINATION

- A. Coordinate all mechanical work with other phases of the work, including ceilings systems and tiles, electrical work, other mechanical work, etc.

3.03 PAINTING

- A. Factory painted equipment that has been scratched or marred shall be repainted to match original color.
- B. Steel equipment hangers and supports, un-insulated black steel pipe, and black steel pipe supports exposed to sight outside the building which are not provided with factory prime coat shall be cleaned of rust, grease, and scale. After cleaning hangars, supports and pipe, a field-applied prime coat and two coats of a bituminous aluminum paint shall be provided. Insulated pipe outside the building shall be cleansed of rust, grease and scale. Paint all exposed piping, insulation, grilles, fans, etc., in building or on roof, if not factory finished. Paint piping equipment, hangers, and accessories in all mechanical equipment rooms, including covering and foundations with two (2) coats of approved paint after thoroughly cleaning. Size insulation covering before painting. Equipment having factory finish, if damaged or scratched, shall be touched up and given one additional coat of machinery enamel.
- C. All painting shall conform to the requirement of the PAINTING & COATINGS Section.

3.04 CLEANING AND ADJUSTING

- A. All equipment, pipe, valves, and fittings shall be cleaned of grease, oil, paint spots, metal cuttings, sludge, and construction debris.
- B. Ducts, plenums and casings shall be cleaned of all debris and blown free of all particles of rubbish and dust before installing outlet faces.
- C. Bearings shall be lubricated as recommended by the equipment manufacturer.
- D. Temporary filters shall be provided for fans that are used during construction. At the time of starting the balancing of the air distribution system, new filters shall be installed.

3.05 PENETRATION THROUGH FIRE SEPARATIONS

- A. Pack annular space between sleeve and pipe (insulation) and / or conduit in rated construction with fire resistant putty, sealant and / or caulk. Material shall be non asbestos based and installed in accordance with manufacturers instruction for fire rating required.
- B. Penetrations of multiple items and penetrations with annular space greater than ½" shall be provided with approved backing material in accordance with manufacturer's instructions.
- C. Fire retardant sealer and system shall meet ASTM E-84, ASTM E-814, and UL-1479.

3.06 EXCAVATION, TRENCHING AND BACKFILLING

- A. General: The Contractor shall perform all excavation to install piping herein specified. During excavation, material for backfilling shall be piled back from the banks of the trench to avoid over-loading and to prevent slides and cave-ins. All excavated materials not to be used for back

filling shall be removed and disposed of by the Contractor. Grading shall be done to prevent surface water from flowing into trenches and excavations, and any water accumulating therein shall be removed by pumping. All excavation shall be made by open cut. No tunneling shall be done. Trenches shall not be cut below a plane extending at a 45 degree angle down and away from any footing.

- B. Trench Excavation. The bottom of the trenches shall be graded to provide uniform bearing and support for each section of the pipe on undisturbed soil at every point along its entire length, except for the portions of the pipe sections excavated for sealing joints. Depressions for joints shall be dug after the trench bottom has been graded. Over depths shall be backfilled with loose, granular, moist earth, tamped. Remove unstable soil that is not capable of supporting the pipe and replace with specified material for a minimum depth of 12" below invert of pipe.
- C. Backfilling. The trenches shall not be backfilled until all specified pressure tests are performed. The trenches shall be backfilled with the excavated materials approved for backfilling consisting of earth, loam, sandy clay, sand and gravel or soft shale, free from large clods of earth and stones, deposited in 6" layers and rammed until the pipe has a cover of not less than the adjacent existing ground, but not greater than 2" above existing ground. The backfilling shall be carried on simultaneously on both sides of the trench so that injurious side pressures do not occur. All trenches under pavements and all trenches within the building walls and to 5 feet outside the building walls shall be compacted in accordance with requirements specified in the EARTHWORK Section. For all trenches, the compaction of the filled trench shall be at least equal to that of the surrounding undisturbed material, except that trenches occurring in areas to be filled shall be backfilled in 6" maximum layers and each layer compacted to 95% maximum density. Settling the backfill with water will not be permitted. Re-open any trenches not meeting compaction requirements; or where settlement occurs, refill, compact, and / or restore the surface to the grade and compaction specified above, mounded over and smoothed off.

3.07 FLASHING

- A. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or water proofed walls, floors, and roofs.
- B. Flash vent and soil pipes projecting 3 inches minimum above finished roof surface with lead worked one inch minimum into hub, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counterflash and seal.
- C. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36 x 36 sheet size. Fasten flashing to drain clamp device.
- D. Seal floor drains watertight to adjacent materials.
- E. Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms, installed in accordance with manufacturer's instructions for sound control.
- F. Provide curbs for mechanical installations 14 inches minimum high above roofing surface. Flexible sheet flash and counterflash with sheet metal; seal watertight.

3.08 TESTING PIPE AND DUCT SYSTEMS

- A. General: Concealed piping and duct work and insulated piping and ductwork shall be tested in place before concealing or covering. Piping and ductwork located underground shall be tested before backfilling. Equipment, materials, and instruments for testing shall be furnished by the contractor without additional cost to the owner. System components not rated for the respective test pressure shall be isolated from the system during the test.
- B. Observation: The Contractor shall notify the owner's representative 7 days prior to a scheduled test. The owner's representative, at his option, has the right to witness the test.
- C. Sanitary, Waste, and Vent System
 - 1. The hydrostatic test shall be performed before installing fixtures. Water tests shall be applied to each system(s) either in its entirety or in sections. If the test is applied to the entire system, all openings in the piping shall be closed except the highest opening, and the system shall be filled with water and tested with at least a 10ft. head of water. In

testing successive sections, at least the upper 10 ft. of the next preceding section shall be tested so that each joint or pipe in the building except the uppermost 10 ft. of the system has been submitted to a test of at least a 10 ft. head of water. The water shall be kept in the system or in the portion under test for at least 2 hours before the inspection starts. The system shall be tight at all joints.

2. Provide notice of test to engineer/architect for witness of test. Provide engineer/architect results of test in writing on contractor letterhead.
3. The final test of the completed drainage and vent system shall be visual and in sufficient detail to insure that the provisions of this section have been complied with, provided, however, that the plumbing undergo a smoke test. The smoke test shall be made by filling all traps with water and then introducing into the entire system a pungent, thick smoke produced by one or more smoke machines. When the smoke appears at stack openings on the roof (at furthest vent), they shall be closed and a pressure equivalent to a one inch water column shall be built and maintained for fifteen minutes before inspection starts.

D. Domestic Water Systems

1. The hydrostatic test shall be made upon completion of the roughing-in and before setting fixtures. The entire domestic cold water and hot water, and hot water circulation piping system shall be tested at a hydrostatic pressure of 1.5 times the working pressure of the system (but not less than 140 psig) and proved tight at this pressure for a period of not less than 2 hours in order to permit inspection of all joints. Where a portion of the water piping system is to be concealed before completion, this portion shall be tested separately in a manner described for the entire system.
2. Provide notice of test to engineer/architect for witness of test. Provide engineer/architect results of test in writing on contractor letterhead.

E. Fire Protection Systems

1. Automatic Sprinkler and Standpipe Piping. The automatic sprinkler and standpipe system(s) shall be hydrostatically tested in their entirety or in zones defined by shut-off valves. The piping shall be tested at a pressure of 200 psig or at component rated pressure measured at the low point in the system or zone, and shall be proved tight at this pressure for a period of not less than 4 hours. Leaks detected shall be repaired by tightening, rewelding joints, or replacing pipe fittings. Caulking of joints will not be permitted.
2. Fire Service Piping. Underground fire service piping shall be hydrostatically tested in its entirety or in zones defined by shut-off valves. The piping shall be tested at a pressure of 200 psig or at component rated pressure for 4 hours. The amount of leakage shall not exceed 1 oz. liquid measure per hour per inch of pipe diameter per joint. The leakage amount shall be measure by pumping from a calibrated container.
3. Provide notice of test to engineer/architect for witness of test. Provide engineer/architect results of test in writing on contractor letterhead.

F. Heating and Air Conditioning Piping System

1. Not used.
2. Field erected refrigerant piping shall be tested with a halide leak detector.
3. No loss in pressure will be permitted. Leaks detected shall be repaired by tightening, re-welding joints, or replacing pipe and fittings. Caulking of joints will not be permitted.
4. Provide notice of test to engineer/architect for witness of test. Provide engineer/architect results of test in writing on contractor letterhead.

G. Air Distribution Systems

1. Ductwork classified and constructed as pressure class 3" W.G. and above shall be tested for leakage. Leakage test shall be as outlined in AABC for Total System Balance. Test

pressure and allowable leakage rate shall be as indicated in the table below. Pressure class and test pressure shall be positive (+) on fan system discharge side and negative (-) on fan system suction side.

TABLE 1 - DUCT LEAKAGE

<u>Pressure Class</u>	<u>Test Pressure</u>	<u>Maximum Leakage</u>
(3)"	3"	1.0%
(4)"	4"	1.0%
(6)"	6"	1.0%
(10)"	10"	1.0%

2. Ductwork in pressure classes less than +3" W.G. shall be tested for leakage. Leakage test shall be as outlined in AABC for Total System Balance. Test pressure and allowable leakage rate shall be not greater than 2.0%. Pressure class and test pressure shall be positive (+) on fan system discharge side and negative (-) on fan system suction side.
3. Provide notice of test to engineer/architect for witness of test. Provide engineer/architect results of test in writing on contractor letterhead.

H. Sanitary Sewer Systems Outside the Building

1. The sanitary sewer system shall be tested for leakage by either infiltration tests or exfiltration tests, as appropriate. Prior to testing for leakage, the trench shall be backfilled up to at least the lower half of the pipe. Backfill shall be placed to prevent pipe movement during testing, leaving the joints uncovered to permit inspection. Visible leaks encountered shall be corrected regardless of leakage test results. Leakage as measured by either the infiltration test or exfiltration test shall not exceed 0.15 gallons per inch diameter per 100 feet of pipe line per hour. When leakage exceeds the maximum amount specified, satisfactory correction shall be made and retesting accomplished.
2. When the water table is 2 ft. or more above the top of the pipe at the upper end of the pipe line section to be tested, an exfiltration test shall be made by filling the line to be tested with water so that the head of at least 2 ft. is provided above the water table and the top of the pipe at the upper end of the pipe line to be tested. The filled line shall be allowed to stand until the pipe has reached its maximum absorption, but not less than 4 hours. After absorption, the head shall be re-established. The amount of water required to maintain this water level during a two-hour test period shall be measured and shall not exceed exfiltration rate specified hereinbefore.
3. Provide notice of test to engineer/architect for witness of test. Provide engineer/architect results of test in writing on contractor letterhead.

3.09 FLOOR AND CEILING PLATES (ESCUTCHEONS)

- A. Where any pipe or risers pass exposed through walls, partitions, floors or ceiling, use chrome-plated floor and ceiling plates.
- B. Plates shall be large enough to completely close the hole around the pipes and shall be round with the least dimension not less than 1-1/2" larger than the diameter of the pipe. Plates shall be secured in an approved manner.

3.10 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
 - 1. New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
 - c. Insulated Piping: One-piece, stamped-steel type with spring clips.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece or Split-casting, cast-brass type with polished chrome-plated finish.
 - f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - g. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type with concealed or exposed-rivet hinge and set screw or spring clips.
 - h. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
 - i. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.
- L. Install sleeves for penetrations of walls, ceilings, and floors according to the following:
 - A. Sleeves are not required for core-drilled holes.
 - B. Permanent sleeves are not required for holes formed by removable PE sleeves.
 - C. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
 - D. Cut sleeves to length for mounting flush with both surfaces.
 - 1. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 - E. Install sleeves in new walls and slabs as new walls and slabs are constructed.
 - F. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
 - 1. Steel Pipe Sleeves: For pipes smaller than NPS 6.
 - 2. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
 - 3. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron

soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 7 Section "Sheet Metal Flashing and Trim" for flashing.

4. Seal space outside of sleeve fittings with grout.

- G. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.
- H. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- I. Install steel pipe for sleeves smaller than 6 inches in diameter.
- J. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter
- K. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- L. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- M. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- N. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 7 Section "Through-Penetration Firestop Systems" for materials
- O. Verify final equipment locations for roughing-in.
- P. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.11 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.
- E. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
- F. All installation shall be in accordance with manufacturer's published recommendations.
- G. Piping may be run exposed in rooms typically without ceilings such as mechanical rooms, janitor's closets, tight against pan soffits in exposed "tee" structures, or storage spaces, but only where necessary. Shutoff and isolation valves shall be easily accessible.
- H. All pipe, conduits, etc., shall be cut accurately to measurements established at the building and shall be worked into place without springing or forcing. All ducts, pipes and conduits run exposed in machinery and equipment rooms shall be installed parallel to the building lines,

except that piping shall be sloped to obtain the proper pitch. Piping and ducts run in furred ceilings, etc., shall be similarly installed, except as otherwise shown. All pipe openings shall be kept closed until the systems are closed with final connections.

- I. Prior to the installation of any ceiling material, gypsum, plaster or acoustical board, the Contractor shall notify Owner's Project Manager so that arrangement can be made for an inspection of the above-ceiling area about to be "sealed" off. The Contractor shall provide written notification to the Owner at least five (5) calendar days prior to the inspection.
- J. Precedence of Materials:
 1. The Specifications determine the nature and setting of materials and equipment. The Drawings establish quantities, dimensions and details.
 2. If interference is encountered, the following installation precedence of materials shall guide the Contractor to determine which trade shall be given the "Right of Way":
 - a. Building lines
 - b. Structural members
 - c. Structural support frames supporting ceiling equipment
 - d. Soil and drain piping
 - e. Vent piping
 - f. Supply, return and outside air ductwork
 - g. Exhaust ductwork
 - h. Condensate piping
 - i. Domestic water (cold and hot, softened, treated)
 - j. Refrigerant piping
 - k. Electrical conduit
 3. Coordinate fire suppression, plumbing and HVAC systems with transport systems as required to maintain transport system right-of-way.

3.12 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
- B. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
- C. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
- D. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
- E. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
- F. Install anchor bolts to elevations required for proper attachment to supported equipment.
- G. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
- H. Use 5000-psi, 28-day compressive-strength concrete and reinforcement
- I. Provide #5 rebar 12" on center each way.
- J. Refer to detail sheets for typical concrete equipment pad detail.
- K. Contractor to install 4" wide reflective acrylic self-adhesive vinyl black/yellow striped caution/warning tape on vertical rise of all concrete housekeeping pads, tape to be in compliance with manufacturing model #146, tape to meet ASTM D-4956-99, submit submittal of tape to engineer for review.

3.13 GROUTING

- A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Clean surfaces that will come into contact with grout.
- B. Provide forms as required for placement of grout.
- C. Avoid air entrapment during placement of grout.
- D. Place grout, completely filling equipment bases.
- E. Place grout on concrete bases and provide smooth bearing surface for equipment.
- F. Place grout around anchors.
- G. Cure placed grout.

3.14 ADDITIONAL CLOSE-OUT DOCUMENT REQUIREMENTS

- A. LEAD CONTENT CERTIFICATE: As part of the close-out documents, the contractor is to include a certificate stating that the lead content in the domestic water system complies with governing code and Health Department criteria. A test shall be made at each faucet, spigot, drinking fountain, and any other fixture drinking water may be obtained.
- B. Contractor to provide a set of drawings showing valve schedule & valve location on drawings (full size set, 24"x36 drawings). Drawings to have valve type, manufacturer and model #. Also provide replacement part contact information for each valve.
- C. Contractor shall provide a minimum of three (3) sets of record documents of fire protection system. Contractor shall instruct designated owner personnel on system.

3.15 TROUBLESHOOTING

- A. By Contractor: If, during the start-up or warranty period, mechanical systems operational problems occur for which the root cause is not readily apparent, Contractor shall promptly, through a Subcontractor or other resource designated by Subcontractor, provide diagnostic and investigative services to determine the cause or causes.
- B. By Engineer:
 - 1. At Contractor's request, Engineer will provide the services necessary to determine the cause or causes of the operational problems.
 - 2. Under the provisions of the General Conditions, Engineer will also provide these services if Contractor fails to respond satisfactorily to operational problems within a reasonable time after written notice from Engineer.
 - 3. If while working at Contractor's request or under the provisions of the General Conditions, Engineer determines that the problems are due to failure of the Work to comply with the requirements of the Contract Documents, Owner will compensate Engineer for additional services and deduct the amount paid from payment or payments to Contractor.

3.16 DIVISION OF WORK

- A. In accordance with the general conditions, contractor is responsible for dividing the work among the subcontractors and suppliers and for delineating the work to be performed by specific trades. Any mention of mechanical and/or plumbing contractor, control and/or electrical contractor are suggestions as to how the work may be divided. This is not a complete list of all the work. It is the contractor's responsibility that a complete and entire system is to be installed.

3.17 FIRE RATED WOOD

- A. All wood as specified within these construction documents (mechanical, plumbing, sprinkler plans and specifications) shall be of the fire rated type. PYRO-GUARD treated wood as manufactured by HOOVER treated wood products.

3.18 ADDITIONAL TRAINING

- A. In addition to all training specified herein, the contractor shall provide the additional training services to the owner:

1. An "Owner Training Coordination Meeting" shall be the first training session and it shall be conducted by the Installing Contractor. This training session shall be conducted upon completion of construction and just prior to Owner Occupancy. This session shall be approximately be one hour long and consist of a tour of the facility to show the location, type, and brands of equipment, include a basic high level description of the system. This session shall conclude with Maintenance Foreman providing a list of equipment where they want additional training. This session has two functions as follows:
 - a. First, it allows maintenance foreman to become familiar with equipment location. This coupled with their general knowledge of Systems allows them to respond to and investigate potential warranty issues before turning over the issue to the contractor.
 - b. Secondly and at the conclusion of this session, the Maintenance Foreman, after having seen the equipment installed has the opportunity to determine if they want the specified Owner training for each piece of equipment. The Maintenance Foremen shall make the decision based on staff knowledge. For example, the HVAC Crew may not want to sit through training because their entire staff sat through 5 prior trainings in the last 2 years for a particular piece of equipment. However, they may choose to have training if they have hired new technicians since last training.
2. The traditional "Owner Training" shall be conducted during the second training session. This session shall be conducted as the Final Punch List Item. It shall be not be scheduled until all equipment is completely operational, Testing and Air Balancing Work has been completed, and the HVAC Building Automation System has been completed and commissioned. This training Session shall include the following:
 - a. Basis of Design – To be conducted, via telephone, by Designing Engineer for Mechanical Systems including items like hydronic pumping configurations, unique system components, fresh air theory, etc.
 - b. Equipment Training – To be conducted by Vendor/Manufacturer's Rep for each piece of equipment requested during the Owner Training Coordination Meeting.
 - c. HVAC Building Automation Training – To be conducted primarily by the Installing Contractor and then EMS System Integrator.
 - d. Allow at least 2 hours for each system. Total training to be at least 40 ours due to the owner.
3. The vendors will then supply brief refresher training at approximately 6 months from the date of substantial completion. Allow at least 4 hours for each system.
4. The vendor will then supply in depth training at 10 months from the date of substantial completion. This training will include all maintenance and operation requirements of each piece of equipment and system and in depth training on control systems. Allow at least 8 hours for each system.
5. All training to be videotaped and supplied to owner & architect/engineer on DVD format.

3.19 FILTERS

- A. Construction Filters - Provide MERV 13 high efficiency filters, with rolled filter media clipped over return air grilles & duct openings for course filtration. All filters to be replaced during construction as needed. Replace all filters after construction with an additional set to the owner.
 - a. The contractor is responsible for maintaining keeping the equipment, filters and ductwork clean during construction and that the mechanical system shall see minimal run time prior to owner's acceptance (for startup & testing/balancing purposes only). During construction, the contractor shall provide and maintain for the HVAC a minimum of a MERV 13 high efficiency filters with rolled filter media clipped over return air grilles for course filtration. All filters shall be replaced as needed during construction and with permanent filters upon completion of project. Condenser coils shall also be maintained as needed. If allowed to get dirty, the contractor shall clean all air

handling units, condenser coils, ductwork, piping and all associated items at no cost to the Owner.

- B. Contractor to provide a complete list of permanent filters with the filter sizes, type, equipment being filtered and location of filter. Submit list to owner prior to substantial completion.

3.20 TRENCHING AND BACKFILLING OUTSIDE BUILDING SLAB

- A. Clearing and Grubbing - The Contractor shall clear and grub the surface areas and remove surface materials of whatever nature encountered, over the line of and to either side of the trenches where the piping systems are to be installed. Existing sidewalks, driveways or other cement or asphalt surfaces which are to remain and have been damaged during excavating shall be repaired to match the adjacent work in material and finish.
- B. Trenches:
 - 1. Prior to any excavating or trenching, the Contractor shall contact the regional underground utilities notification program (Louisiana One Call) for assistance in securing the location of any underground utilities that may be affected by this work.
 - 2. Trenches shall be dug so that pipe can be laid to the alignment, depth and slope indicated. Excavation shall be only so far in advance of the pipe laying as to reveal any obstructions, but never more than 100' in advance of the pipe installation unless specifically approved by the Architect/Engineer. Trenches shall be graded such that each section of pipe will rest upon the trench bottom for the full length of its barrel. Provide bell holes at each joint as required for this purpose.
- C. Dewatering:
 - 1. Remove any water which may be found or may accumulate in the trenches and excavations and shall perform the work necessary to keep them clear of water while the work is in progress, or as may be required for inspections. Use due vigilance and care so that no water originating on his work, or due to his work, which he is obligated to handle and dispose of under his contract, shall discharge or be discharged upon the work or into the trenches of another contract, unless by mutual agreement of parties affected. should any dispute arise from this cause, the matter shall be referred to the Architect/Engineer for final settlement.
- D. Bedding and Backfill:
 - 1. Bedding and backfill material shall be river sand. Backfilling shall not begin until the pipe work to be covered has been inspected by the Architect/Engineer. The Architect/Engineer reserves the right to order any trench backfilled at any time after installation of pipe, if, in his opinion, the particular trench remaining open constitutes a public nuisance. Settlement of backfill in trenches excavated for work of this Division shall be the responsibility of this Division. Trenches shall be refilled as often as necessary to bring them back to required or original grades.
 - 2. Bedding under pipe - Trenches shall be bedded by hand. A 6" layer of river sand shall be placed in the trench and compacted and graded prior to installing the pipe. After the pipe is installed, river sand shall be carefully placed in 3" layers on both sides of the pipe and compacted and graded by hand. The sand shall be deposited in the trench for its full width on each side of the pipe, fittings and appurtenances, simultaneously.

- a. Backfilling to 1' above pipe - From the centerline of the pipe, fittings and appurtenances to a depth of 1' above the top of the barrel of the pipe, the trench shall be backfilled by hand or approved mechanical means with river sand. Use special care in placing this portion of the backfill so as to avoid injuring or moving the pipe or disturbing the pipe hangers. This part of the backfill shall be compacted by method approved by the Architect/Engineer.
- b. Backfilling to grade - From 1' above the barrel of the pipe up to grade, the trench shall be filled with river sand. Backfill shall be compacted by methods specified in DIVISION 2 - SITEWORK or to 95% maximum density per ASTM D1557 (modified proctor). Where sheeting and bracing are removed from the trench or excavation as backfilling progresses, care shall be taken to insure that voids left by the withdrawn timbers are carefully and thoroughly compacted and that pipe hangers are left vertical and plumb.

3.21 DISPOSAL OF EXCESS EXCAVATED MATERIAL

- A. Excess fill taken from excavations shall, unless otherwise provided in the Contract Documents, be removed as soon as possible as work of this Division.

3.22 SUB-SURFACE OBSTRUCTIONS

- A. Care must be taken not to disturb, injure or remove any pipes, cables, conduits or other underground structures or utilities that are to remain. As work of this Division, shore-up and protect underground piping, conduit structures or utilities which may be endangered during the work and maintain such structures and utilities during construction. Sub-surface obstructions shall be uncovered in advance of construction so that the method of avoiding same may be determined before pipe laying reaches the obstruction.
- B. In the event subsurface structures, pipes, cables, conduits or utilities are broken or damaged in the execution of the work, the User Agency and proper authorities shall be notified and proper repairs shall be made, as work of this Division, to the satisfaction of the Architect/Engineer and authorities involved. Damage to persons or property caused by such breaks shall also be the responsibility of this Division. The change or rearrangement of any underground structures which may interfere with the construction of the work of this Division.

3.23 SHEETING AND SHORING

- A. Sheeting and shoring shall be placed in excavations and trenches as required to suit the ground conditions and to properly and safely support the excavations and trench walls and any adjacent structures. Placement of the sheeting and shoring in the trench shall not restrict the excavation and trench width specified in other Sections. Sheeting and shoring for excavations and trenches less than five feet in depth may be of treated wood. Wood indicated to remain in excavations and trenches shall be treated type. Sheeting and shoring for excavations and trenches greater than five feet in depth shall be of steel construction.
- B. The Contractor shall employ a Civil Engineer licensed in the state of this project to design the steel sheet piling system required for excavations of five feet or greater. The Contractor shall submit one copy of the Engineer's sealed calculations and drawings to the Architect/Engineer for record and file purposes only. The Contractor shall be responsible for the design and construction of the sheet piling system.
- C. Unless otherwise instructed by the Architect/Engineer wood sheeting, shoring and bracing shall be cut-off at an elevation of 24" below finished grade. The lower portion of the sheeting and bracing below grade shall remain in the ground. If instructed by the

Architect/Engineer to remove the wood or steel sheeting and shoring it shall not be removed until backfilling is completed.

3.24 RESTRAINED JOINTS

- A. Restrained joints shall be provided for underground water mains 4" and larger and sewer force mains at each change of direction 11 ¼ degrees or greater and at tees. Restrained joints shall be installed per NFPA 24.

3.25 FRICTION LOSSES, ELECTRICAL RATINGS AND SPACE REQUIREMENTS

- A. The values of air and water friction losses, electrical current ratings and space requirements for various pieces of equipment, as contained in these specifications or as scheduled, are estimated values and sizes and have been used in obtaining specifications for equipment and for sizing ducts, pipe, electrical wiring and motor controls. Any necessary changes in any of these items resulting from values other than the estimated ones shown shall be the responsibility of the Contractor and shall be subject to the approval of the Architect/Engineer. The Contractor shall pay any costs for additional labor and material required including costs of any other Contractor involved. Should substitute equipment require different requirements from that shown on the drawings, the Contractor shall be responsible for the cost of the changes. Any such changes must be approved by the Architect/Engineer.

3.26 CHANGES TO PIPING OR DUCTS

- A. Should the Contractor desire to make changes in the routing or arrangement of piping or ducts, whether for his own convenience, to avoid conflict with the work of other trades, or to conform to local codes, such changes shall not be made without the prior approval of the Architect/Engineer.

3.27 OPERATING INSTRUCTIONS

- A. Prior to the time scheduled for occupancy, the Contractor shall provide the services of a competent mechanic to instruct the User Agency in the care and operation of equipment. Before final acceptance, the Contractor shall prepare and deliver to the Architect/Engineer three bound copies of operating instructions, which shall be contained in a hard back loose leaf type binders, divided into a suitable number of volumes so as to permit easy reference and shall include:
 - 1. Description of major components of systems, including the function of major items.
 - 2. Detailed operating instructions and instructions for making routine minor adjustments.
 - 3. Routine maintenance operations.
 - 4. Manufacturer's catalog data, service instructions wiring diagrams, fabrication drawings and parts list for each piece of operating equipment.
 - 5. Copies of equipment submittals and shop drawings, including review sheet, reviewed by and acceptable to the Architect/Engineer.
 - 6. Guarantee and Warranty Information.
 - 7. Names and telephone numbers of subcontractors and suppliers.

3.28 WORK RELATED TO EQUIPMENT NOT FURNISHED AS WORK OF THIS DIVISION

- A. Unless specifically indicated otherwise, any required mechanical services for and required mechanical connections to items indicated on the drawings or in the specifications or items provided by User Agency shall be mechanically connected as work of this Division. The Contractor shall provide piping, valves, traps, etc., as required for complete operation of each piece of equipment.

3.29 DISSIMILAR METALS

- A. Inert NSF/FDA lines dielectric nipples shall be provided between copper, bronze or brass piping material or valves and steel piping material or steel tanks. Dielectric nipples and brass or copper unions or flanges shall be provided at cast iron valves and equipment where hereinbefore specified for equipment maintenance. Dissimilar metals shall be isolated from surface contact with Each other by the use of a non-conductive material, tape, etc.

3.30 OPENINGS, GROUNDS AND CHASES

- A. Openings, grounds, chases and lintels will be provided under other Divisions, as directed by this Division, to accommodate the piping, ductwork and equipment. Sleeves and prepared openings shall be accurately located in slabs or walls before pouring of concrete. It shall be the responsibility of this Division to verify that openings and chases are properly located. Openings associated with work of this Division. Coordinate location of grease ducts through roof and arrange for roof framing to be relocated to avoid offsetting of ducts.
- B. Holes through existing concrete shall be either core drilled or saw cut. Drilled or cut holes required shall have the approval of the Architect/Engineer prior to cutting or drilling. Sleeves set in openings cut in existing masonry or concrete walls or concrete slabs shall be one pipe size smaller in outside diameter than the cored hole. The sleeve shall be grouted in place with non-shrinking waterproof grout. Where piping is installed through smoke and/or fire separations, fill annular space between sleeve and piping with safing or fire barrier material.

3.31 PROTECTION OF WORK

- A. The Contractor shall protect equipment, fixtures and work from damage. Damaged work will be rejected and replaced at the expense of the Contractor. Where possible, rooms containing new plumbing fixtures shall be kept locked until the building is turned over to the User Agency. Immediately after installation of each plumbing fixture, it shall be covered with a fixture protector.
- B. Mechanical equipment shall be protected from and from the weather. Provide adequate and proper storage facilities for items during the progress of the work.

3.32 PROJECT CLOSEOUT DOCUMENTS

- A. Prior to the final acceptance of the project the Contractor shall deliver to the Architect/Engineer for review, the following in two three-ring binders:
 - 1. Certificates of approval from local regulatory agencies.
 - 2. Extended equipment warranties.

3. Signed receipts showing that keys to access doors, locked equipment, underground valve wrenches and vandal-proof screwdrivers have been delivered to the User Agency.
 4. Valve tag list.
 5. Operating instruction manuals which shall include copies of reviewed submittals and shop drawings include review sheet.
 6. Results of potable water sterilization tests.
 7. Performance tests of backflow preventer.
 8. NFPA 13 acceptance certificates for the sprinkler systems.
 10. Copy of reviewed sprinkler and standpipe system shop drawings.
 11. Signed receipt showing that the temperature/pressure test kit has been delivered to the User Agency.
 12. HVAC test and balance reports.
 13. Record drawings.
- B. Final payment will be withheld until each applicable item has been provided to and is found satisfactory by the Architect/Engineer.

END OF SECTION

9-2-25

SECTION 20 01 11 – ENVIRONMENTAL CONTROL SERVICES

PART 1 GENERAL

1.1 SUMMARY

- A. The purpose of the specification is to define the approved methods and equipment or the use of temporary dehumidification/air conditioning system during construction.
- B. The dehumidification system shall be part of the General Contract. Any extra hardware, components or accessories, i.e., duct work, temperature control, transformers, inlet/outlet transitions, etc. Shall be considered incidental with no separate payment for any of the above items.

1.2 SUBMITTALS

- A. Dehumidification supplier shall provide drawings showing equipment placement and sizes, air distribution and power cable routing.

PART 2 GENERAL

2.1 ENVIRONMENTAL CONTROLS

- A. Dehumidification / Air conditioning equipment shall be used to control the environment in the space 24 hours a day while interior finishes are being stored or installed.
- B. Pressurization, all construction areas to be in negative pressure by means of Contractors "Means and Methods". Contractor shall submit method to Engineer for approval prior to any installation.

2.2 TEMPERATURE CONTROLS

- A. Auxiliary heat, cooling and/ or insulation may be necessary to maintain the temperature at a level acceptable to the contractor performing the reconstruction inside the work space. This auxiliary equipment must be approved for use by the dehumidification/ Air conditioning equipment supplier and shall meet the following requirements.
 - 1. Heaters and refrigerant-type systems will be installed in the process air supply between the dehumidifier and the space as close to the space as possible.
 - 2. Only, electric, indirect gas fired and steam coil auxiliary heaters will be used. No direct fired space heaters will be allowed during the construction.
 - 3. Heaters will be equipped with controls that automatically turn the heater off if the airflow is interrupted or the internal temperature of the heater exceeds its designed temperature or that of the supply duct.
 - 4. Seal the area where dehumidification is introduced to allow the air to escape away from the entry point while maintaining a slight positive pressure unless dust from the operation is hazardous. The design of the filter system, if necessary, will be designed so that it does not interfere with the dehumidification equipment's ability to control the relative humidity and temperature parameters in that space. Do not re-circulate the air from the space or from filtration equipment back through the dehumidifier during reconstructions unless authorized by the dehumidification supplier.

2.3 SPECIFIED EQUIPMENT SIZE AND TYPE

- A. Style and size of equipment will be determined by the contractor. The style and size may vary depending on volume of air space needing to be controlled, time of year, containment of area, and any other requirement that may diminish the ability to control the environment.
 - 1. Basis of bid to be 250 square foot per ton of HVAC.

2.4 POWER

- A. The required electrical power will not be supplied by the owner. The necessary voltage and amperes needed for operation will be coordinated with the general contractor. The contractor is responsible for providing temporary power necessary to energize the dehumidification/ Air conditioner system.

PART 3 EXECUTION

3.1 INSTALLATION

- A. The contractor shall install dehumidification/ Air conditioning equipment in accordance with manufacturer's written instructions and approved submittals.
- B. Dehumidification/ Air conditioning supplier will use flexible duct and temporary ducting to distribute the dry air through the controlled space. Distribution of dry air will be decided by the dehumidification supplier and the general contractor.
- C. Temporary power cord will be used to energize the dehumidifiers / Air conditioners.

END OF SECTION

9-2-25

SECTION 20 02 00 - MISCELLANEOUS MECHANICAL REQUIREMENTS

PART 1 GENERAL

1.01 GENERAL

- A. The term Contractor refers collectively to the general contractor and his subcontractors, and does not distinguish between the parties. The General or Prime contractor is solely responsible to the Owner for coordinating all work between different trades. Any required work not included in subcontractor's contract will be performed at the General or Prime Contractor's expense.
- B. Contractor shall furnish and install complete operating systems including all equipment, materials and accessories indicated on the drawings, in the specification, or as required for a complete working system.
- C. All equipment shall be stored, handled, installed, tested, calibrated and placed in operation in strict accordance with the manufacturer's recommendations.
- D. Equipment manufacturer's representative shall be on site at the time of start up for all equipment. Equipment shall not be placed in operation until manufacturer's representative confirms that all system parameters are approved for start-up.
- E. Any additional work caused by prior approved equipment substitutions shall be at the Contractor's expense.
- F. All work shall be performed in accordance with the International Building Code. Miscellaneous construction materials required to meet code requirements shall be furnished and installed by the Contractor at the Contractor's expense regardless of whether or not such items are specifically detailed on the Contract drawings. The Contract Drawings are schematic in nature and are not intended to show every detail or component required for a complete working system and complete Code conformance.
- G. Contractor shall provide any field wiring and auxiliary equipment or component required by equipment manufacturer's installation instructions and detailed wiring and control diagrams for proper interlocking and safe operation of the equipment. Contractor shall provide cooling water piping, control power supply, and any other utilities or auxiliary components required for proper operation.
- H. All equipment drain connections, etc. shall be piped full size to nearest floor or hub drain. Minimum drain line size shall be 1-1/4".
- I. Provide adequate clearances around all equipment in accordance with manufacturer's recommendations for proper service, maintenance, and operation of the equipment.
- J. Provide OSHA approved belt and coupling guards on all rotating equipment.
- K. Any modification of construction details shown on the contract drawings which are necessary to suit actual equipment certified dimensional data or field conditions shall be approved by the Architect. The Contractor will not receive any additional compensation for minor changes in construction details required to accommodate job site conditions, equipment dimensions, etc. A complete job and good workmanship are required.
- L. All openings through walls, floors and roof provided for equipment, piping or conduit shall be properly framed, caulked, and flashed to insure water tightness and weather protection. Provide fire stop sealant system in accordance with code requirements.
- M. All steel materials used for construction shall be stainless steel, painted steel, or galvanized steel. Bare steel will not be acceptable under any circumstances.
- N. Contractor shall provide fire dampers, smoke dampers, smoke detectors and firestats as shown on the drawings and as required by Code.
- O. Vibration mountings shall be installed under mechanical equipment to protect the finished installation from objectionable noise and vibration. Flexible connections shall be installed in piping and duct work systems where necessary to prevent transmission of vibrations and noise.
- P. Where there is a conflict between information shown on contract drawings, specifications Code requirements or industry standards, etc., the strictest and most conservative interpretation shall

govern. In the event of a discrepancy between new and existing materials, Contractor shall assume the material to be new. If any item is indicated to be new any place on the drawings or in the specifications, the item in question shall be include in the Contractor's bid as new equipment or material.

- Q. Contractor shall not furnish, install, or utilize any equipment, products, or product components that contain any amount of asbestos material in any form.
- R. The Architect will have the authority to order minor changes in the work not involving an adjustment in the Contract Sum or the Contract Time and not inconsistent with the intent of the Contract Documents in accordance with AIA Document A201-1976.
- S. All shop drawings and product data submittals shall include a written, signed statement of total compliance with the Contract Documents. All product data shall be manufacturer's published data. Approval of shop drawings does not relieve the Contractor of responsibility to comply with the Contract Documents. **NO SUBSTITUTIONS OR VARIATIONS WILL BE ACCEPTED EXCEPT AS CLARIFIED BEFORE THE BID DATE BY ADDENDUM.**
- T. Coordination with electrical: Contractor to submit copy of any & all shop drawings that indicate electrical requirements to the project electrical engineer for electrical service & electrical load verification. Applicable to all mechanical items.
- U. All materials for new work shall be new and not used.
- V. All multi-blade dampers used in HVAC systems shall be U.L. listed and certified to meet U.L. Standard 555S, Class 1 leakage.
- W. Fire Rated Wood: All wood as specified & mentioned within these construction documents (mechanical, plumbing, sprinkler plans and specifications) shall be of the fire rated type. PYRO-GUARD treated wood as manufactured by HOOVER treated wood products.
- X. All exhaust and fresh air penetrations through sidewalls shall be a minimum 10'-0" above adjoining grade.
- Y. **ADDITIONAL CLOSE DOCUMENTS:** Contractor to provide a set of drawings showing valve schedule & valve location on drawings (full size set, 24"x36 drawings). Drawings to have valve type, manufacturer and model #. Also provide replacement part contact information for each valve.
- Z. The contractor shall submit to the mechanical engineer, as soon as feasible after award of the contract, equipment room layouts at a scale not less than $1/4" = 1'-0"$ showing the layout of the actual equipment to be used and all necessary clearances. This drawing is to comprehensive of all trades as to eliminate conflicts. The contractor will be responsible to verify all access for maintenance as required by the manufacturer.
- AA. All sprinkler heads shall be located in center of ceiling tiles where applicable. Any relocation of heads shall be at contractors expense in order to center heads in tile. Sprinkler head layout, if shown, is a guide only, contractor shall add sprinkler heads as required to meet all requirements of NFPA 13 and 2001.
- BB. Maintain a minimum 5'-0" horizontal separation between building drain or building sewer and underground water service piping per section 603.2 of International Plumbing Code (current edition). Should sewer and water pipe cross, the water pipe shall be installed above the sewer a minimum of 12".
- CC. **STAINLESS STEEL PIPE HANGERS:**
 - A. Provide stainless steel pipe hangers for all piping located under building slab.
 - 1. Piping up to 6" (Outer Diameter) and less shall utilize 1/4" thick stainless steel hanger rods.
 - 2. Piping greater than 6" (Outer Diameter) up to 10" (Outer Diameter) shall utilize 3/8" thick stainless steel hanger rods.
 - 3. Piping greater than 10" (Outer Diameter) shall utilize 1/2" thick stainless steel hanger rods.

- B. Hanger rods to span two (2) steel re-bars with 90 degree bend (2" in length) at ends of hanger rods within slab.
- C. Twist hanger rods tightly around top of piping two (2) complete 360 degree turns.
- D. Provide hanger rods every 4'-0", at all changes in directions, and at all fittings & joints.

DD. This Section shall apply to all work in Division 20, 21, 22 and 23.

1.02 DRILLING FLOOR SLABS AND WALLS

- A. Holes through the concrete floor slabs and masonry walls for chilled water and drain piping shall be made with rotary masonry core bits. Diamond tip cutters are recommended, but not required.
- B. The use of a jack hammer or any other impact tool for drilling or coring is prohibited.
- C. Layout the hole locations, pipe diameters including insulation and furring around pipes before drilling any holes for the pipes. Drill a small pilot hole and check the floor slab from the bottom to be sure that the pipes will miss all beams and joists.
- D. Water pipe insulation shall be continuous through the holes. Heating water and drain pipe insulation shall be interrupted at the holes to permit minimum size holes through the floor slabs.
- E. The annular space around floor penetrations shall be packed with rated fire proofing material.

1.03 CONCRETE FASTENERS

- A. Fastenings set into concrete to support pipe, air handlers and other mechanical equipment shall be steel or malleable iron expansion shields set in proper size drilled holes. Do not exceed the manufacturer's rated pull out load. The manufacturer's rated load must be based on a factor of safety of 5 or else the allowable load must be reduced to give a factor of safety of 5. Self drilling Rawl Saber Tooth or Phillip Red Heads may be used. Anchors using lead, plastic or shields of any material other than steel or malleable iron shall not be used.
- B. Powder actuated fasteners, Hilti or Ramset, may be used for loads applied with a factor of safety of 5 but not more than 300 pounds for the largest size. The powder charge shall be found by trial and shall be the smallest charge that gives full insertion into the concrete. These fasteners may be used for ductwork and small pipe.
- C. Suitably located existing inserts which were cast into the concrete at the time of construction may be reused.

1.04 PROTECTIVE COATING FOR UNDERGROUND PIPING

- A. Underground pipe and fittings including the portion through the floor shall be protected against corrosion by application of protective coatings.
- B. Prior to coating, pipe and fittings shall be cleaned of all rust, scale, dirt, and oil.
- C. Pipes and fittings shall be given a wash coat of epoxy primer having a dry film thickness of 1.5 - 2.0 mils. Over the primer apply two coats of coal-tar base epoxy coating, each having a dry film thickness of 6 mils.
- D. Coatings shall have a holiday test using a 1/2" spark. Recoat any areas not passing test.
- E. Provide for all underground metal piping up from grade.
- F. 2-Part coal-tar epoxy to be Carbolite 300M or prior approved equal.
- G. Applicable to ferrous piping below grade.

1.05 EMS (TEMPERATURE CONTROLS) CONDUIT AND BOXES

- A. UNDERGROUND EMS CONDUIT: Rigid Nonmetallic Conduit (RNMC): Schedule 40, rigid polyvinylchloride, rated for 90 degrees C conductors, with pull string, solvent cement connectors and couplings. Nonmetallic strap hangers allowing thermal expansion movement. Conduit to meet NEMA TC-2; fittings to meet NEMA TC-3. Expansion Coupling: Nonmetallic to compensate for thermal expansion.
- B. EMS CONDUIT WITHIN BUILDING: Shall be hot dipped galvanized rigid steel conduit. All conduits shall be new and shall bear the inspection label of the Underwriter's Laboratories, Inc. Metallic conduit shall be hot-dipped galvanized. Fittings for conduit shall be an approved type

pecially designed and manufactured for their purpose. Rigid metal conduit fittings, bushings, and other components shall be galvanized. Setscrew connector fittings shall not be permitted. All fittings for rigid steel or aluminum conduit shall be threaded and coupled unless specifically approved otherwise by the Engineer.

- C. Pull Boxes: Communication/EMS ground mounted pull boxes shall be polymer concrete, ANSI/SCTE 77 2002 – Tier 22 rated, provide dimensions indicated on the drawing. Open bottom. Cover to be labeled “Communications”. Secure cover with stainless steel standard hex head bolts. Covers shall be traffic rated. ALL PULL BOXES TO BE SIZED IN ACCORDANCE TO NEC (NATIONAL ELECTRIC CODE).
- D. Stainless Steel EMS Enclosure: NEMA 3R enclosure (UL 508A Listed). Manufactured from Type 304 16 gauge stainless steel; 16 gauge doors and 14 gauge bodies, Minimum-width body flange provides maximum body opening, Pre-cut gland plate openings in the bottom of the enclosure with a seal to ensure protection, External formed 90 degree body flange, Door opens 210 degrees, Mounting holes in back of body for direct mounting or for optional external mounting brackets, Type 316 stainless steel hinge pins, Corner-formed doors are easily removed by pulling clip-style hinge pins, Quarter-turn latches furnished with 3mm double-bit insert, Seamless foam-in-place gasket, Self-grounding latch system with double seal, Grounding stud on the body, Full-sized galvanized steel back panel included, Bonding provision on the door, Furnished hardware kit includes: gasketed gland plates and hardware, grounding hardware and sealing washers for wall-mounting holes, Three-point latching, Finish: Door and body have smooth #3 brushed finish. Hoffman medium GL66 series stainless steel wall mount enclosure.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Fasteners of the type set into concrete by drilling shall be self-drilling (Rawl Saber Tooth, Phillips Red Heads, or prior approved equal).
- B. Powder actuated fasteners shall be Hilti or Ramset.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Follow manufacturer's instructions and use setting tools procured from the manufacturer of the drilled-in anchors to expand the shields.
- B. Underground EMS conduit to be installed in strict accordance with National Electric Code with pull boxes at every fourth bend, no more that three (3) turns without installation of pull box. Provide pull boxes at every 200' and at all changes of direction.

END OF SECTION

9-2-25

SECTION 20 0413 - ELECTRICAL PROVISIONS FOR MECHANICAL WORK

PART 1 GENERAL

1.01 SCOPE

- A. Extent of electrical provisions to be provided as mechanical work is indicated in other Division-23 sections, on drawings, and as further specified in this section.
- B. Types of work normally recognized as electrical but provided as mechanical, specified or partially specified in this section, include but are not necessarily limited to the following:
 - 1. Motors for mechanical equipment.
 - 2. Starters for motors of mechanical equipment.
- C. Refer to Division 23 sections for specific individual mechanical equipment.
- D. Refer to other Division 23 sections for specific individual mechanical equipment electrical requirements.
- E. Refer to Division 26 sections for junction boxes and disconnect switches required for motors and other electrical units of mechanical equipment.

1.02 QUALITY ASSURANCE

- A. Wherever possible, match elements of electrical provisions of mechanical work with similar elements of electrical work specified in Division 26 sections. Comply with applicable requirements of Division 26 sections for electrical work of this section which is not otherwise specified.
- B. For electrical equipment and products, comply with applicable NEMA standards, and refer to NEMA standards for definitions of terminology herein. Comply with National Electrical Code (NFPA 70) for workmanship and installation requirements.

1.03 SUBMITTALS

- A. Concurrently, with submittal of mechanical products listing submit separate listing showing rating, power characteristics, application and general location of every motor to be provided with mechanical work. Submit updated information promptly when and if initial data is revised.
- B. Coordination with electrical: Contractor to submit copy of any & all shop drawings that indicate electrical requirements to the project electrical engineer for electrical service & electrical load verification. Applicable to all mechanical items.

PART 2 PRODUCTS

2.01 GENERAL - DIVISION OF WORK

- A. In accordance with the general conditions, contractor is responsible for dividing the work among the subcontractors and suppliers and for delineating the work to be performed by specific trades. The following are suggestions as to how the work may be divided. It is the responsibility of the contractor to ensure a complete and working system. This is not a complete list of all the work:
 - 1. GENERAL: The Mechanical Contractor shall furnish to the Electrical Contractor for installation, all the motors, motor starters, start-stop switches, pilot lights, etc., for each piece of motor driven equipment unless shown otherwise.
 - 2. The Electrical Contractor shall install all motor starters, start-stop switches and pilot lights as furnished by the Mechanical Contractor. The Electrical Contractor shall also do all power wiring, and electrical termination's required for the installation of such mechanical equipment. Control Contractor shall be responsible for providing all control wiring.
 - 3. The Electrical Contractor shall furnish and install all equipment interlocking power wiring and the control contractor shall be responsible for installing control wiring as described in the control section. The Mechanical & General Contractor shall be responsible for coordinating and checking out all work to provide a complete system in working order, coordination to occur prior to bid.
 - 4. All electrical equipment shall have the UL label and shall meet the standards of the National Electrical Code and NEMA Rated, I.E.C. is not acceptable.

2.02 MOTOR AND MOTOR CONTROLLERS

- A. Motors shall be provided to meet the requirements of the driven equipment. Motors shall be selected to be non-overloading and capable of normal scheduled operation without operating in the service factor range. Unless required otherwise, three phase motors shall be squirrel-cage

induction type, with copper windings, designed for a 40 C rise from 40 C ambient, have minimum Class B insulation and unless required otherwise, have NEMA design B normal starting torque. Motors are to be open drip-proof for indoor applications and totally enclosed fan cooled for outdoor or wet applications.

1. Provide shaft grounding rings for all motors that are to be used with variable frequency drives.
- B. All motors shall be high power factor, premium energy efficient type with a minimum 1.15 service factor and minimum 0.85 full load power factor. Motor efficient shall meet or exceed that values listed in the attached table when tested in accordance with NEMA test standards MG112.53a, IEE Test Procedure 112, Method B, using accuracy improved by segregated loss measurements
- C. Motors controlled by VFD's shall comply with NEMA MG1, Part 31, Definite Purpose Inverter Fed Motors. (Withstand repeated voltage peaks of 1600V with rise times of 0.1 microseconds and greater).
- D. Starters for single phase motors which are not automatically started shall be manual type with melting alloy thermal overload protection and pilot light. Starters for automatically controlled single phase motors shall be magnetic type with NEMA rated AC magnetic contractor, melting alloy thermal overloads and pilot light.
- E. Starters for three phase motors 15 horsepower and below shall be combination type starter/disconnect, full voltage non reversing (FVNR), with magnetic NEMA rated contractors rated for horsepower of motor served, adjustable trip magnetic circuit breaker disconnect (motor circuit protector) capable of being padlocked in the open position, 10K AIC minimum fault rating with higher rating when necessary, due to available fault levels. Starters shall have a fused 100VA minimum control transformer (120V, unless required otherwise), HOA switch, push to test operating pilot light, solid state overload relays set for actual motor nameplate full load amps, phase failure and phase reversal protection relay, minimum two N.O. and two N.C. auxiliary contacts and terminal blocks factory prewired for field wiring. Starter shall be housed in a NEMA 1 enclosure for indoor locations and NEMA 3R enclosure for outdoor or wet locations.
- F. Starters for motors 20 horsepower and above shall be soft start type or variable frequency drives.

Motor Efficiency at full load

HP	Nominal	Nominal	Nominal
1	82.5	82.5	80.0
1 ½	84.0	84.0	87.5
2	84.0	84.0	87.5
3	86.5	90.2	89.5
5	89.5	89.5	89.5
7 ½	89.5	91.7	91.7
10	90.2	91.7	91.7
15	91.0	93.0	92.4
20	92.4	93.6	92.4
25	93.0	94.1	93.6
30	93.6	94.1	93.6
40	93.6	94.5	94.1
50	93.0	94.5	94.1
60	93.6	95.4	95.0
75	94.5	95.4	95.9
100	94.5	96.2	95.4
125	95.0	95.4	95.4
150	94.5	96.2	95.8
200	95.0	96.2	95.4

2.03 SOFT START STARTERS

- A. Refer to 23 04 14 MOTOR STARTERS Specification.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install motors on motor mounting systems in accordance with motor manufacturer's instructions, securely anchored to resist torque, drive thrusts, and other external forces inherent in mechanical work. Secure sheaves and other drive units to motor shafts with keys and Allen set screws, except motors of 1/3 HP and less may be secured with Allen set screws on flat surface of shaft. Unless otherwise indicated, set motor shafts parallel with machine shafts.
- B. Deliver starters and wiring devices which have not been factory-in-stalled on equipment unit to electrical Installer for installation.
- C. Install power and control connections for motors to comply with NEC and applicable provisions of Division 26 sections. Install grounding where non-grounded isolation of motor is indicated.

END OF SECTION

9-2-25

SECTION 20 05 29 - HANGERS AND SUPPORT DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

- A. Work Included
 - 1. Hangers and supporting devices for all mechanical piping.

1.3 SUBMITTALS

- A. General: All submittals comply with the requirements of Division 20 Section 200100 - GENERAL PROVISIONS
- B. Product Data: Data shall be submitted on the following items:
 - 1. Hangers and supporting devices to be used.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Provide all hangers and rods, turnbuckles, angles, channels and other structural supports to support the piping systems.
- B. Pipe hangers, hanger rods, trapeze type hangers, upper attachments and other supports shall be selected based on pipe size (plus insulation of pipes specified to be insulated) and the weight of the medium being transported or the medium used for testing, whichever is heavier. For sprinkler piping, in addition to the pipe and water, allow a minimum of 250 pounds applied at the point of hanging.
- C. Rods for pipe hangers shall be carbon steel. Rod size shall be:

Pipe Size	Standard Hanger Rod Diameter	Fire Protection Hanger Rod Diameter
½" - 2"	3/8"	
2 ½" - 3"	½"	
4" - 5"	5/8"	in accordance with NFPA 13
6"	¾"	
8" - 12"	7/8"	
14" - 16"	1"	
18"	1 1/8"	
20" & larger	1 1/4"	

- D. All ferrous metal pipe hangers, except copper plated hangers, and concrete inserts shall be provided with a factory-applied coat of rust inhibiting paint.
- E. Pipe hangers for suspending the following horizontal non-insulated piping shall be sized to fit directly around the pipe and protective shield.
 - 1. Sanitary Sewer & Vent Piping.
 - 2. Fire Water Piping.
- F. Pipe hangers for suspending the following horizontal insulated piping shall be sized to fit around the pipe, pipe insulation and pipe insulation protective shields:
 - 1. Refrigerant suction piping.
 - 2. Condensate drain piping from HVAC units.
 - 3. Waste piping from drinking fountains.

4. Waste piping receiving condensate from HVAC units.
 5. Domestic cold water piping.
 6. Domestic hot water and hot water circulating piping.
- G. Pipe hangers for suspending the following horizontal insulated piping shall be sized to fit around the pipe, pipe insulation and pipe insulation protective saddle:
1. Not used.
- H. All supporting equipment with the exception of springs in spring isolation hangers shall be designed with a minimum factor of safety of five based on the ultimate tensile strength of the material.

2.2 PIPE SUPPORTS FOR SUSPENDED HORIZONTAL PIPING

SYSTEM	PIPE MATERIAL	PIPE SIZE	HANGER NUMBER
Domestic Cold & Hot Water	Copper	All Sizes	IV
Soil, Waste, & Vent	PVC	All Sizes	V
Soil, Waste, & Vent	Cast Iron	All Sizes	I
Fire Protection	Steel	6" & Larger	I
Fire Protection	Steel	4" & Smaller	VI
Refrigerant (Insulated)	Copper	All Sizes	IV
Refrigerant (Uninstalled)	Copper	All Sizes	IV
Miscellaneous Drains	Steel	All Sizes	I
	Copper	All Sizes	IV
Condensate Drains	Copper	All Sizes	IV
Relief Valve Discharge	Copper	All Sizes	IV

- A. Hanger numbers listed in schedule above shall be the following types:
1. Hanger Number I: Clevis hanger, steel.
 2. Hanger Number II: Adjustable split ring hanger, malleable iron.
 3. Hanger Number III: Adjustable swivel clevis roller hanger with black cast iron roller and carbon steel yoke and cross bolt.
 4. Hanger Number IV: Clevis hanger, copper plated steel.
 5. Hanger Number V: Clevis hanger, plastic coated steel.
 6. Hanger Number VI: Adjustable band hanger, steel.

- B. Hanger numbers listed above shall be:

HANGER NUMBER	ELCEN	CARPENTER & PATERSON	ITT GRINNELL	B-LINE SYSTEMS	MICHIGAN HANGER CO.
I	12	100	260	83100	400
II	--	240	104	-----	111
III	14x	16	---	83111	612
IV	312	100CT	CT-65	83104CT	402
V	---	100 PVC	---	83100C	420
VI	89	800	70	83170	100

- C. Upper Attachments:
1. Steel Construction
 - a. For suspending pipes from steel beams, upper attachments shall be beam clamps and shall be:

- Michigan Hanger Co. No. 364
 - B-Line System Fig. 83055
 - Carpenter & Patterson Fig. 268
 - b. For suspending joints from bottom chord of steel bar joists, upper attachments shall be C-clamps with retaining clips and shall be:
 - ITT Grinnell Fig. 87
 - B-Line Systems Figs. 8351, 83362, and 83363
 - c. For suspending pipes from the top chord of steel bar joists, upper attachments shall be top-of-beam C-clamps and shall be:
 - B-Line Systems Fig. 83034
 - ITT Grinnell Fig. 62
 - Elcen No. 236L
 - Carpenter & Paterson Fig. 192
2. Concrete Construction
- a. New Construction
 - 1. For suspending pipe in concrete construction, upper attachments shall be adjustable type concrete inserts. Where weight to be supported by an insert is 300 lbs. or more, install two No. 3 steel reinforcing bars, each 3 ft. long, through the yoke of the insert. Concrete inserts shall be:
 - ITT Grinnell Fig. 281
 - B-Line Systems Fig. 82500
 - Michigan Hanger Co. No. 355
 - Elcen No. 86
 - Carpenter & Paterson Fig. 75
 - b. Existing Construction
 - 1. Not used.

2.3 PIPE SUPPORTS FOR FLOOR SUPPORTED HORIZONTAL PIPING

- A. General
 - 1. Pipe supports for horizontal piping supported on concrete floors and on concrete bases shall be adjustable pipe saddle support with U-bolt and screwed floor flange. Bolt floor flange to floor and bases utilizing all bolt holes. Adjustable pipe saddle supports shall be steel and shall be:
 - B-Line Systems Fig. 83090
 - Carpenter & Paterson Fig. 125
 - Elcen No. 49
 - 2. Pipe supports for horizontal piping in trench below floor level shall be adjustable pipe roller stands. Base shall be bolted to the trench floor utilizing all bolt holes. Adjustable pipe roller stands shall be steel and cast iron and shall be:
 - B-Line Systems Fig. 83118
 - Carpenter & Paterson Fig. 40
 - Elcen No. 20
 - ITT Grinnell Fig. 274

- Michigan Hanger Co. No. 619

2.4 PIPE SUPPORTS FOR VERTICAL PIPING

- A. Supports for vertical piping shall be riser clamps sized to fit directly around the pipe.
1. Riser clamps shall be steel and shall be:
 - B-Line Systems Fig. B3373
 - Carpenter & Patterson Fig. 126
 - Elcen No. 39
 - ITT Grinnell Fig. 261
 - Michigan Hanger Co. No. 510
 2. Offset pipe clamps shall be steel and shall be:
 - B-Line Systems Fig. B3148
 - Carpenter & Paterson Fig. 179
 - Elcen No. 44
 - Michigan Hanger Co. No. 700
 3. Clamps for copper tubing shall be copper plated.

2.5 PIPE INSULATION PROTECTIVE SHIELDS AND SADDLES FOR HORIZONTAL PIPING

- A. Shields shall be galvanized sheet metal type. Shields shall be 180 degrees type at all pipe hangers, except on trapeze hangers, pipe rack and on floor supported horizontal pipe shields shall be 360 degrees type. Shields sizes shall be:

Pipes 2 in and smaller - - 18 gage x 12" long

Pipes 2 ½ in. thru 6" - - 16 gage x 18" long

Pipes 8 in. and longer - - 14 gage x 24" long

- B. Saddles shall be steel and shall be:

<u>INSULATION THICKNESS</u>	<u>ELCEN</u>	<u>CARPENTER & PATERSON</u>	<u>ITT GRINNELL</u>	<u>B-LINE SYSTEMS</u>	<u>MICHIGAN HANGER CO</u>
1"	251	351	160	B3160	630
1 ½"	252	352	161	B3161	631
2"	253	353	162	B3162	632
2 ½ "	254	354	163	B3163	633
3"	255	355	164	B3164	634
4"	256	356	165	B3165	635

2.6 FACTORY - FABRICATED FRAMING CHANNELS AND FITTINGS

- A. Factory fabricated framing channels and fittings shall be used for:
1. Constructing pipe racks for supporting multiple horizontal pipes where indicated on the drawings.
 2. Constructing trapeze type hangers for suspending multiple horizontal pipes where indicated on the drawings.
 3. Securing vertical exposed water service drops for hose bibbs and wall hydrants.
 4. Securing vertical exposed compressed air service drops for compressed air outlets.
 5. Securing vertical exposed gas service drops for gas outlets and equipment.
- B. Framing channels and fittings shall be provided with factory applied baked

enamel finish.

- C. Galvanized pipe clamps, including bolts and nuts, shall be provided with the framing channels and shall be used for securing pipes to channels, except pipe roller type supports shall be provided for pipes 2 ½ inches and larger for hot water heating, pipe roller supports shall include rollers, ½ inch diameter axle, nuts and angle brackets. Pipe clamps on insulated pipes shall fit around pipe, pipe insulation and pipe insulation protection shield. Pipe roller supports on insulated pipes shall be sized to fit around pipe saddles.
- D. Framing channels and fittings shall be:
 - Michigan O-Strut System
 - B-Line Systems B-Line's Strut System
 - Unistrut Metal Framing System

2.7 DIELECTRIC ADAPTERS/SEPARATORS

- A. Dielectric adapters/separators shall be provided between copper and iron pipe connections and between ferrous and non-ferrous piping or equipment or between dissimilar metals.

PART 3 EXECUTION

3.1 HORIZONTAL PIPE SUPPORT INSTALLATION

- A. Spacing of hangers and supports shall be as follows:
 - 1. Cast iron pipe shall be supported at not more than four (4) feet intervals and near each hub or coupling & at base of all risers. PVC soil pipe shall be supported at not more than four (4) feet intervals and near each hub or coupling & at base of all risers.
 - 2. Copper Tubing:
 - Sizes ½" thru 1-½": Piping supported from structural member of structure shall be at each member or 4'0" on centers, all sizes.*
 - Sizes 2" & Larger: Piping supported from structural member of structure shall be at each member or 4'0" on centers, all sizes.*
 - 3. Steel Pipe:
 - All Sizes: Any piping supported from structural member of structure shall be at each member or 4'0" on centers, all sizes.*
- B. Additional hangers shall be provided adjacent to all valves and fittings size 8" and larger.
- C. Intermediate pipe supports shall be provided between building structural members so as not to exceed maximum support spacing hereinbefore specified.
 - 1. In filler type concrete construction, intermediate angle supports shall be fastened to concrete joists or beams. In no case shall angle supports be fastened in floor slabs or in roof slabs. Intermediate supports shall be fastened to concrete slabs. Intermediate supports shall be fastened to concrete with concrete inserts or concrete anchors.
 - 2. In steel construction, intermediate supports shall be welded to steel beams and to steel joists. In no case shall supports be attached to roof purlins, roof decks, or permanent metal forms.
 - 3. In steel construction, install additional supports as recommended by Structural Engineer due to loading capacity of structure.

3.2 UNDERGROUND PIPING

- A. Piping underground shall be laid on a firm bed of minimum 6" pea gravel for its entire length, provide minimum 6" cover of pea gravel. Refer to pipe trench detail.
 - 1. Figure in bid backfilling with pea gravel. Should pipe manufacturer recommend river sand in lieu of pea gravel, then the contractor shall comply with the manufacturer's recommended installation guidelines and provide a credit back to the owner.

3.3 VERTICAL PIPE SUPPORT INSTALLATION

- A. Supports for all pipes shall fit directly around the pipe. On insulated pipes, the support shall be insulated and provided with vapor barrier as specified for pipe insulation .
- B. Vertical pipes passing through floors shall be provided with a riser clamp at each floor. Riser clamps shall have steel lugs, 1/4" thick x 2" high x 1 1/2" long, welded to the clamp arms so that clamp does not come in contact with the pipe sleeve; the lugs shall support the clamp from the floor.
- C. Where distance between floors is 15 ft. or more, in addition to the riser clamps, vertical pipes shall be provided with offset pipe clamps anchored to walls at the approximate midpoint between floors.
- D. Where noted on drawings, exposed to sight vertical service drops to hose bibbs, and wall hydrants, and misc. outlets shall be supported with not less than two equally spaced sections of factory-fabricated framing channel with standard pipe clamps. Channel section shall be 8" long and shall be fastened to wall with not less than two spring wing toggle bolts.
- E. Copper tubing supported by channel framing shall be provided with a lead sleeve to isolate the pipe from the framing channel and the pipe clamp.
- F. Contractor to provide pipe supports for all domestic cold/hot water piping drops within walls to fixtures/equipment. Pipe clamp to be Anvil CT-138R copper plated split tubing clamp, provide 3/8" threaded rod as required to nearest wall framing member, provide 3/8" female threaded rod zinc-plated baseplate (Anvil 128R) fastened to wall framing member. Provide a minimum of one (1) support assembly at each drop in addition to copper plated Holdrite system.

3.4 CONCRETE INSERTS AND ANCHORS

- A. In filler type concrete construction, inserts and anchors shall be installed in joists or beams only. Install inserts in sides of joists or beams.
- B. In framed type concrete construction, inserts and anchors shall be installed for all piping.

3.5 SHIELD AND SADDLE INSTALLATION

- A. Shields shall be installed at all pipe hangers in horizontal insulated piping, as noted in section 2.1,F above.

3.6 EXTERIOR PIPE SUPPORT COATINGS

- A. All exterior pipe supports are to receive a brush painted, 2 layers, cold zinc galvanizing paint for exterior use.

END OF SECTION

9-2-25

SECTION 20 05 33 - ELECTRIC HEAT TRACING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division I Specifications section, apply to work of this section.

1.02 DESCRIPTION OF WORK

- A. Extent of electric heat tracing work is indicated by drawings and the requirements of this section. Provide electric heat tracing as follows:
 - 1. At plumbing system utilities/piping located in areas subject to freezing.
 - 2. At fire water piping located in areas subject to freezing.

1.03 QUALITY ASSURANCE

- A. Manufacturer's: Firms regularly engaged in manufacture of electric heat tracing cables, of types and sizes required, whose products have been in satisfactory use in similar service.
- B. Installer: Qualified with successful installation experience on projects with electric heat tracing cable similar to that required for projects.
- C. NEC Compliance: Comply with NEC (NFPA No. 70) applicable to installation of electric heat tracing cables.
- D. UL Compliance: Provide electric heat tracing cables which are UL-listed and labeled.

1.04 SUBMITTALS

- A. Product Data: Provide manufacturer's data on electric heat tracing cables.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Protect electric heat tracing cables from damage during shipping and handling.
- B. Store electric heat tracing cables in original cartons and protect from weather and construction traffic. Wherever possible, store indoors; where necessary to store outdoors, store above grade and enclose with watertight wrapping.

PART 2 PRODUCTS

2.01 ELECTRIC HEAT TRACING CABLE

- A. Electric Heat Tracing Cable: The self-regulating heater shall consist of two (2) 16 AWG tinned-copper bus wires embedded in parallel in a self-regulating polymer core that varies its power output to respond to temperature all along its length, allowing the heater to be crossed over itself without overheating, to be used directly on plastic pipe, and to be cut to length in the field. The heater shall be covered by a radiation cross-linked modified polyolefin dielectric jacket.
- B. Regulation: In order to provide energy conservation and to prevent overheating, the heater shall have a self-regulating factor of at least 90 percent. The self-regulating factor is defined as the percentage reduction, with thermostatic control, of the heater output going from 40-degrees F. pipe temperature operation to 150-degrees F. pipe temperature operation.
- C. Electrical: The heater shall operate on line voltage of 120 volts without use of transformers.
- D. Capacity: The heater shall be sized in accordance to the following table. The required heater output rating is in watts per foot at 50-degrees F. (heater selection based on minimum 1" fiberglass or equivalent insulation on metal piping).

<u>PIPE SIZE</u>	<u>MINIMUM AMBIENT- 10 DEGREES F.</u>
4 inch or less	5 watt
5 inch or 6 inch	8 watt
8 inch	2 strips - 5 watt
10 to 14 inch	2 strips - 8 watt

- E. Accessories: Power connection and end seal kits components shall be applied in the field.
- F. Controls: The system shall be controlled by an ambient sensing thermostat set a 40-degrees F.

G. Pump Installation: For pump installation utilize heater designated for 6" pipe.

H. Manufacturer's:

Chromalox	Series RTSR
Pyrotenax	Series SR
Raychem	Series 8XC

PART 3 EXECUTION

3.01 INSTALLATION

- A. Apply the heater linearly on the pipe under insulation after piping has been successfully pressure tested. Apply "electric traced" signs to the outside of the thermal insulation.
- B. Install in strict accordance with manufacturer's recommendations.

3.02 TESTS

- A. After installation and before and after installing the thermal insulation, subject heat to testing using a 1000 VDC megger. Minimum resistance shall be 20 megaohms regardless of length. Replace faulty cable.

END OF SECTION

9-2-25

SECTION 20 0548 - VIBRATION ISOLATION FOR MECHANICAL SYSTEMS

PART 1 GENERAL

1.01 GENERAL

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.02 SUMMARY

- A. Work Included:
 - 1. Isolation Pads
 - 2. Spring Isolators
 - 3. Spring Hangers
 - 4. Inertia Bases

1.03 SUBMITTALS

- A. General: All submittals shall comply with the requirements of Division 1 - GENERAL REQUIREMENTS and Section 20 01 00 - General Provisions.
- B. Product Data: Data shall be submitted on the following items:
 - 1. Spring Hangers
 - 2. Vibration Isolators
 - 3. Inertia Bases

PART 2 PRODUCTS

2.01 SOLE SOURCE

- A. All isolators and bases shall be from same manufacturer.

2.02 DEFLECTION

- A. All spring isolators shall have 1" min. deflection unless otherwise specified.

2.03 TYPE I ISOLATORS

- A. Type I Isolators shall be neoprene waffle embossed pads with crossed double ribs. A steel shim plate shall be provided between the two layers. Pads shall be molded using oil resistant 25,000 PSI tensile strength neoprene. Pads shall be:

Kinetics Noise Control	NPD Series
Amber Booth	NP-NR Series
Mason Industries	WMW Series

2.04 TYPE II ISOLATORS

- A. Type II Isolators shall be double deflection neoprene type designed for loading in both shear and compression. Isolator shall be one piece molded assembly with ribbed base plate and top. Isolators shall be:

Kinetics Noise Control	RD Series
Amber Booth	NRV Series
Mason Industries	ND Series

2.05 TYPE III ISOLATORS

- A. Type III Isolators shall be free-standing, un-housed, laterally stable steel springs incorporating leveling bolts and 1/4" thick ribbed neoprene isolation pads. The spring shall have a lateral spring stiffness, and shall be designed to provide 50% overload capacity over 5000 lbs. Springs shall be welded to the top and bottom load plate assemblies. Isolators shall be:

Kinetics Noise Control	FDS Series

Amber Booth	SW Series
Mason Industries	SLFH Series

2.06 TYPE IV ISOLATORS

- A. Type IV Isolators shall be vertically restrained steel springs incorporating leveling blots, 1/4" thick ribbed noise isolation pads, and steel housing. Springs shall be designed to provide 50% overload capacity over 5000 lbs. Springs shall be welded to the top and bottom load plates assemblies. Assembly for outdoor installation shall be hot dipped galvanized after fabrication. Isolators shall be:

Kinetics Noise Control	FLS Series
Amber Booth	CT Series
Mason Industries	SLR Series

2.07 TYPE V ISOLATORS

- A. Type V Isolators shall be combination spring and neoprene hangers, incorporating double deflection neoprene noise and vibration pads in series with the springs, all encased in welded steel brackets. Springs shall be designed for 50% overload capacity, and shall accommodate rod misalignment over a 30 degree arc. Brackets shall be designed to carry 50% overload without failure. Isolators shall be:

Kinetics Noise Control	SRH Series
Amber Booth	BSR Series
Mason Industries	DNSH Series

2.08 TYPE VI THRUST RESTRAINTS

- A. Type VI Thrust Restraints shall be un-housed, laterally stable steel spring with 1/4" thick ribbed neoprene isolation pad in a steel frame. Spring shall be designed to provide 50% overload capacity over 5000 lbs. Units shall be factory set for thrust anticipated and adjusted in the field for a maximum 1/4" movement. Unit shall be provided with two rods and angle brackets for mounting. Thrust restraints shall be:

Kinetics Noise Control	HSR Series
Mason Industries	WB Series

2.09 TYPE VII STRUCTURAL STEEL BASE

- A. Type VII Structural Steel Base shall have isolator support brackets and pre-packed and drilled anchor bolt holes. Isolators support brackets shall be welded to structural steel bases shall be rigid, distortion free and mounted on Type III Isolators - six isolators per base minimum. Bases shall be:

Kinetics Noise Control	SFB Series
Amber Booth	SW Series
Mason Industries	WFSL Series

2.10 TYPE VIII INERTIA BASES

- A. Type VIII Bases shall be reinforced concrete inertia bases, the steel members of which are designed and supplied by the isolator manufacturer. The concrete shall be poured into a welded steel frame, incorporating pre-located equipment anchor bolts, 1/2" diameter reinforcing bars (nominal 8" centers each way) and recessed isolator mounting brackets to reduce the mounting height of the equipment but yet remain within the confines of the base. The thickness of the base shall be a minimum of 1/12th of the longest span of the base, but not less than 6 inches. Where inertia bases are used to mount pumps, the bases shall be wide enough to support piping elbows. Anchor bolts for supporting equipment shall be welded to the reinforcing bars. Bases shall be:

Kinetics Noise Control	CLB Series
Amber Booth	CPF Series

2.11 TYPE IX SPRING ISOLATOR

- A. Kinetics Model FRS vibration isolators consist of free-standing, large diameter, stable steel springs assembled into top and bottom load plate assemblies, which provide vertical restraint in the event load is removed or external forces are applied. Spring elements are complete with 1/4 in. (6 mm) thick noise isolation pads, and they have an adjusting and leveling bolt as part of the top load plate assembly. Holes are provided for bolting to the structure, and the leveling bolt allows attachment to the supported equipment. To assure stability, the springs have a lateral stiffness greater than 0.8 times the rated vertical stiffness, and are designed to provide a minimum of 50% overload capacity. FRS springs are available with deflections from 1.00" to 2.00" (25 mm to 51 mm), and with capacities from 35 to 3500 lbs. (16 kg to 1588 kg).

2.12 TYPE X SPRING ISOLATED CURB EXTENSION ON STANDARD CURB

A. General Requirements

1. A rooftop noise control system shall be supplied with each rooftop air handling unit. The noise control system shall limit the breakout noise from the roof top unit casing and supply and return ductwork to NC 15 in the occupied space below the unit. In addition, external vibration isolation shall be supplied which meets deflection requirements in the 2003 ASHRAE Handbook – HVAC Applications, Chapter 46.
2. The noise control system shall consist of supply and return air silencers with a high transmission loss (HTL) casing and a vibration isolation rail system with an HTL barrier, as required to meet the noise criteria.
3. All components of the RTR and barrier system shall be factory fabricated and supplied by the same manufacturer as an integrated system.

Vibro-Acoustics

RTR Series

B. Vibration Isolation Rail System Construction

1. The rail system shall consist of galvanized steel upper and lower sections formed to fit the roof curb and the air handling unit. A flexible air and weather seal shall join the upper and lower rail sections.
2. Isolation springs shall be designed as laterally stable and properly selected to provide minimum specified deflection with 50% additional travel to solid.
3. The rail assembly shall have neoprene cushioned wind restraints which allow 1/4" movement before engaging in resisting wind loads in any lateral direction.
4. An HTL barrier shall be integrated into the rail system. The HTL barrier shall have factory supplied openings for the supply and return air silencer connections. The HTL barrier shall consist of a protective metal skin, mass layer, acoustic media consisting of 100% natural cotton fibers treated with an EPA registered, non-toxic borate solution, "flash dried" to provide resistance to mold, mildew and fungi, and perforated metal as required to obtain the specified room NC level. The HTL barrier shall provide thermal insulation as well as acoustical absorption within the roof curb.
5. The isolation rail assembly shall be shipped in major sections for field assembly as required.
6. Minimum spring deflection shall be 2".

2.13 TYPE XI ISOLATORS

- A. Type XI Isolators shall be natural rubber waffle embossed pads with crossed double ribs. Two layers of 1" (19mm) thick natural rubber pad consisting of 4" (50mm) square waffle modules separated horizontally by a 16 (1.5mm) gauge galvanized shim. Load distribution plates shall be used as required. Pads shall be type Maxi Super W, as manufactured by Mason Industries, Inc. Load rating of isolator shall be 40 durometer per square. Maximum deflection of 1".

Mason Industries

SW Series

PART 3 EXECUTION

3.01 INSTALLATION

- A. All isolation products shall be installed in accordance with the manufacturer's installation instructions.
- B. All spring-mounted equipment shall be leveled.
- C. Type II isolators shall be bolted to the floor or base and to the equipment or equipment base.
- D. Type III isolators shall be bolted to the floor or base and to the equipment and base.
- E. Type IV isolators shall have the bottom plate bolted to the structure and the top plate tack welded to the equipment rails in four places.
- F. Type V isolators shall have jam nuts on the top and bottom rods to prevent movement of nuts.
- G. Type VI thrust restraint shall have angle brackets welded or bolted to equipment, duct or structure, as applicable.
- H. Type VII and VIII bases shall be bolted to the equipment.

3.02 ISOLATION SCHEDULE

- A. Isolators and bases shall be installed on equipment and piping as indicated on schedule below:

ITEM	ISOLATOR	BASE	NOTES	MIN. DEFLECT.
AIR HANDLERS	XI	-- --	1,2	1.0 IN.
FAN(S)	V	--	----	0.75 IN.
CONDENSING UNITS	I	-- --	----	

- B. Schedule Notes:

1. Provide additional vibration isolators as recommended by equipment manufacturers.
2. Provide at all corners and every 12" around perimeter of air handling unit.

END OF SECTION

9-2-25

SECTION 20 05 53 - IDENTIFICATION OF PIPING, VALVES AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

- A. Work Included:
 - 1. Valve Tags
 - 2. Pipe Bands
 - 3. Equipment Labels

1.3 SUBMITTALS

- A. General: All submittals shall comply with the requirements of Division 1 - *GENERAL REQUIREMENTS*, AND Section 200100- *GENERAL PROVISIONS*.
- B. Product Data: Data shall be submitted on the following items:
 - 1. Valve Tags
 - 2. Pipe Bands

1.4 QUALITY ASSURANCE

- A. Standards:
 - 1. American National Standards Institute (ANSI):
 - a. Standard A13.1, The Scheme for Identification of Piping Systems, 1981 Edition.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Pipe identification shall comply with ANSI A13.1.

2.2 VALVE TAGS

- A. Valve tags shall be 18 gauge (minimum) brass with 1 1/4" (minimum) height and width. Identification letters and numbers shall be stamped in tag and shall be filled with black enamel paint. Valve tags shall be:

Emedco	CB/W Series
Seton	Valve Tags
Brady	Valve Tags

- B. Valve tag shape and designations shall be as indicated in Table I, hereinafter.

2.3 PIPE BANDS

- A. Pipe identification bands shall be snap-on type with clear polyester exterior surface. Bands shall be of size, color and background as outlined in Table II and III, hereinafter, with directional flow arrows and legends. Identification bands on pipe or coverings 5 1/2" or less in diameter shall have stainless steel spring fasteners. Pipe identification bands shall be:

Seton / Setmark	SNA / STR
Series Brady	Snap-on Series

- B. Contractor has option to use Seton Custom Opti-Code Self-Adhesive Pipe Markers in lieu of snap on labels, Seton style M4154. Secure with additional cable tie (minimum two (2) per label).

2.4 EQUIPMENT LABELS / TAGS

- A. Plastic Tags: Laminated three-layer plastic with engraved white letters on black contrasting background color. Tag size minimum 1 ½ inch (40 mm) wide, length as required, with lettering minimum 3/4" tall.

2.5 TAPE

- A. Identification tape shall be vinyl pressure sensitive type with adhesive backing. Tape width shall be a minimum of 2". Tape shall be color to match pipe identification band background. Tape shall be:

Emedco	T100 Series
Seton	PST Series
Brady	Tape

2.6 CABLE TIES

- A. Cable ties for valve tag attached shall be self-locking nylon ties. Cable ties shall be:

Thomas & Betts	Ty-Rap-Nylon
Ideal	Double Lock Cable (Plain Head)
Efcor	Sure-Ty Self-Locking Cable Ties

2.7 VALVE CHART

- A. Valve chart shall be typed listing of all valve tags. List shall include identification number, valve location in system (e.g., water heater, chilled water pump, etc.) And its function (e.g., shut-off, balancing, drain, etc.). Chart shall be mounted in a wooden frame with glass cover. Chart shall be mounted where shown on the drawings.

2.8 IDENTIFICATION

- A. Valve tags shall be installed at all shut-off, balancing, metering, and drain valves in the following systems:

TABLE 1 - VALVE TAGS

<u>SYSTEM</u>	<u>SHAPE</u>	<u>IDENTIFICATION NUMBER</u>
Domestic Cold Water	Hexagonal	CW - 1, 2, 3, ...
Domestic Hot Water	Hexagonal	HW - 1, 2, 3, ...
Domestic Hot Water Circulation	Hexagonal	HWC - 1, 2, 3, ...
Domestic Tempered Water	Hexagonal	TW - 1, 2, 3, ...
Domestic 110°F Hot Water	Hexagonal	110 - 1, 2, 3, ...
Domestic 140°F Hot Water	Hexagonal	140 - 1, 2, 3, ...
Fire Sprinkler	Rectangular	AS - 1, 2, 3, ...

- B. Pipe identification shall comply with ANSI A13.1 - 1981 Standard entitled "Scheme for Identification of Piping Systems." Pipe identification bands shall be installed on piping at each valve, each piece of equipment, each change of direction, wall penetration, each branch take-off, and at a maximum spacing of 15 feet on exposed straight run piping. Pipe bands shall be installed on systems indicated below. Install on all piping exposed in mechanical rooms & above all ceiling, all piping to receive labels & directional flows arrows.

TABLE II - BAND AND LETTER SIZE

<u>PIPE OR PIPE COVERING</u>	<u>WIDTH OF BAND</u>	<u>LETTER & NUMBER SIZE</u>
<u>DIAMETER (inches)</u>	<u>(Inches)</u>	<u>(inches)</u>
3/4 to 1 1/4	8	½

1 ½ to 2	8	3/4
2 ½ to 6	12	1 1/4
8 to 10	24	2 ½
Over 10	32	3 ½

TABLE III - BAND COLORING

<u>PIPE</u>	<u>BAND</u>	<u>LETTERING</u>	<u>LETTER COLORING</u>
Refrigerant Suction	Yellow	REF. SUCTION	Black
Refrigerant Liquid	Yellow	REF. LIQUID	Black
Domestic Cold Water	Green	DOM. COLD WATER	White
Domestic Hot Water	Yellow	DOM. HOT WATER	Black
Domestic Hot Water Circulation	Yellow	CIRCULATION WATER	Black
Domestic Tempered Water	Green	TEMPERED WATER	White
Domestic 110°F Water	Yellow	110°F - HOT WATER	Black
Domestic 140°F Water	Yellow	140°F - HOT WATER	Black
Fire Sprinkler	Red	SPRINKLER - FIRE	White

- B. Equipment identification labels with 2" high letters shall be installed on the following equipment:

TABLE IV - EQUIPMENT LABELS

<u>ITEM</u>	<u>BAND</u>	<u>LETTERING</u>	<u>LETTER COLORING</u>
AHU's, VAV Boxes, Fans, Condensing Units, Etc. & Misc. Mech/Plumbing/Fire Suppression Equipment.	Yellow	See Equipment Schedules	Black

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Valve tags shall be attached to the handwheel with cable ties.
- B. Plastic pipe bands shall be wrapped around pipe or pipe covering under pressure so that no gaps or wrinkles occur. Bands on pipe or pipe covering 6" or smaller shall overlap and adhere to themselves. Bands on pipe or pipe covering larger than 6" shall be further secured at both ends with tape. Tape shall overlap and adhere to itself.
- C. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- D. Install tags with corrosion resistant chain.
- E. Install plastic pipe markers in accordance with manufacturer's instructions.
- F. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- G. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- H. Identify air handling units, pumps, heat transfer equipment, tanks, and water

treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.

- I. Identify control panels and major control components outside panels with plastic nameplates.
- J. Identify valves in main and branch piping with tags or numbered plastic nameplates.
- K. Identify piping, concealed or exposed, with plastic tape pipe markers. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 15 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

3.2 PAINTING

- A. All surfaces requiring painting shall be left clean by the Mechanical Subcontractor. All painting shall be done by the General Contractor's painting Subcontractor. All exposed piping, grilles, or fans, in building or on roof will be painted. All insulated piping to be covered in color coated PVC Jackets, color to be determined by Owner. If owner has no preference, color to be same as band color in schedule. Paint pipe, equipment, hangers and accessories in Equipment Rooms including covering and foundations with two (2) coats of approved paint after thoroughly cleaning. Equipment having factory finish shall be touched up and given one (1) additional coat of machinery enamel color as selected. The above shall be done by the General Contractor. See Section PAINTING SECTION.
- B. All piping throughout project (HVAC, Plumbing, & Sprinkler) shall be identified with pipe markers with directional arrows. The color code shall be as per Table III above. Labels should appear every 10'-0" and at all changes in direction.
- C. Provide color coded PVC jackets, piping labels, & directional flow arrows on all insulated piping (HVAC, Plumbing, & Fire Water) whether exposed or concealed above ceiling space. All piping (entire piping system) to have color coded PVC jackets, piping labels, & directional flow arrows. PVC jacket color to match band color as specified in Table III within these specifications. Fire water piping to receive piping labels.

END OF SECTION

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SECTION 20 07 00 - PIPE INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping Insulation
- B. Jackets and Accessories

1.02 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

- A. Section 20 05 29 - Hangers and Support Devices

1.03 RELATED SECTIONS

- A. Section 20 01 00 - General Provisions

1.04 REFERENCES

- A. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.
- B. ASTM C177 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
- C. ASTM C195 - Mineral Fiber Thermal Insulation Cement.
- D. ASTM C335 - Steady-State Heat Transfer Properties of Horizontal Pipe Insulation.
- E. ASTM C449 - Mineral Fiber Hydraulic-setting Thermal Insulating and Finishing Cement.
- F. ASTM C518 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- G. ASTM C534 - Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
- H. ASTM C547 - Mineral Fiber Performed Pipe Insulation.
- I. ASTM C552 - Cellular Glass Block and Pipe Thermal Insulation.
- J. ASTM C578 - Preformed, Block Type Cellular Polystyrene Thermal Insulation.
- K. ASTM C585 - Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing.
- L. ASTM C591 - Rigid Preformed Cellular Urethane Thermal Insulation.
- M. ASTM C610 - Expanded Perlite Block and Pipe Thermal Insulation.
- N. ASTM C640 - Corkboard and cork Pipe Thermal Insulation.
- O. ASTM C921 - Properties of Jacketing Materials for Thermal Insulation.
- P. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.
- Q. ASTM D1667 - Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Closed Cell Foam).
- R. ASTM D2842 - Water Absorption of Rigid Cellular Plastics.
- S. ASTM E84 - Surface Burning Characteristics of Building Materials.
- T. ASTM E96 - Water Vapor Transmission of Materials.
- U. NFPA 255 - Surface Burning Characteristics of Building Materials.
- V. UL 723 - Surface Burning Characteristics of Building Materials.

1.05 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Provide product description, list of materials and thickness for each service, and locations.
- C. Manufacturer's Installation Instructions: Indicate procedures which ensure acceptable workmanship and installation standards will be achieved.

1.06 QUALITY ASSURANCE

- A. Materials: Flame spread/smoke developed rating of 25/50 in accordance with ASTM E84, NFPA 255, and UL 723.

1.07 QUALIFICATIONS

- A. Applicator: Company specializing in performing the work of this section.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products to site under provisions of Section 01600.
- B. Deliver materials to site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- C. Store insulation in original wrapping and protect from weather and construction traffic.
- D. Protect insulation against dirt, water, chemical, and mechanical damage.

1.09 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cement.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 GLASS FIBER

- A. Manufacturers:
 - 1. Knauf - ASJ - SSL
 - 2. Owen Corning 25 ASJ/SSL
- B. Insulation: ASTM C547; rigid molded, noncombustible.
 - 1. 'K' value: ASTM C335, 0.23 at 75 degrees F.
 - 2. Minimum Service Temperature: -20 degrees F.
 - 3. Maximum Service Temperature: 850 degrees F.
 - 4. Maximum Moisture Absorption: 0.2 percent by volume.
- C. Vapor Barrier Jacket:
 - 1. ASTM C921, white kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
 - 2. Moisture Vapor Transmission: AST E96; 0.02 perm inches.
 - 3. Secure with self sealing longitudinal laps and butt strips.
 - 4. Secure with white vapor barrier tape and vapor barrier mastic.
 - 5. Provide bonds for identification per Section 15190 Requirements.
- D. Tire Wire: 16 gage stainless steel with twisted ends on maximum 12 inch centers.
- E. Indoor Vapor Barrier Finish
 - 1. Manufacturers:
 - a. Childers Model CP-30
 - b. Manville Model Insulkote
 - 2. Vinyl emulsion type acrylic, compatible with insulation, white color.
- F. Outdoor Vapor Barrier Mastic
 - 1. Manufacturers:
 - a. Childers Model CP-30
 - b. Manville Model Insulkote
 - 2. Vinyl emulsion type acrylic, compatible with insulation, white color.
- G. Fittings:

1. Mitered segments of insulation held in place with white vapor barrier tape and Zeston 25/50 PVC, knauf 25/50 rated PVC, pre-molded insulated fitting covers.

2.02 CELLULAR GLASS

- A. Manufacturers:
 1. Pittsburgh Model Foamglass
 2. Corning Model Foamglass
- B. Insulation: ASTM C552.
 1. 'K' value: 0.40 at 75 degrees F.
 2. Maximum Water Vapor Transmission: 0.1 perm.
- C. Vapor Barrier Jacket: Similar to Glass Fiber.
- D. All joints to be caulked and glued with a vapor barrier sealant as per manufacturer's recommendations.

2.03 POLYURETHANE FOAM

- A. Insulation:
 1. 'K' value: ASTM 518; 0.14 at 75 degrees F.
 2. Minimum Service Temperature: -250 degrees F.
 3. Maximum Service Temperature: 250 degrees F.
 4. Maximum Moisture Absorption: ASTM D2842; 0.054 percent by volume.
 5. Moisture Vapor Transmission: 1.26 perm inches.
 6. Maximum Flame Spread: ASTM E84; 20.
 7. Connection: Waterproof vapor barrier adhesive.

2.04 CELLULAR FOAM

- A. Manufacturers:
 1. Armstrong Armaflex 25/50.
 2. Aerotube 25/50.
- B. Insulation: ASTM C534; flexible, cellular elastomeric, molded or sheet.
 1. 'K' value: ASTM C177 or C518; 0.27 at 75 degrees F.
 2. Minimum Service Temperature: 0 degrees F.
 3. Maximum Service Temperature: 220 degrees F.
 4. Maximum Moisture Absorption: ASTM D1056; 1.0 percent (pipe) by volume, 1.0 percent (sheet) by volume.
 5. Moisture Vapor Transmission: ASTM E96; 0.20 perm inches.
 6. Maximum Flame Spread: ASTM E84; 25.
 7. Maximum Smoke Developed: ASTM E84; 50.
 8. Connection: Waterproof vapor barrier adhesive.
- C. Elastomeric Foam Adhesive
 1. Manufacturers:
 - a. Armstrong 520
 - b. Manville Elastomeric Adhesive
 2. Air dried, contact adhesive, compatible with insulation.

2.05 JACKETS

- A. PVC Plastic
 1. Manufacturers:
 - a. Proto

- b. Zeston
- 2. Jacket: ASTM C921; One piece molded type fitting covers and sheet material. See color chart in Section 15190 for jacket colors.
 - a. Minimum Service Temperature: -20 degrees F.
 - b. Maximum Service Temperature: 140 degrees F.
 - c. Moisture Vapor Transmission: ASTM E96; 0.002 perm inches.
 - d. Maximum Flame Spread: ASTM E84; 25.
 - e. Maximum Smoke Developed: ASTM E84; 50.
 - f. Thickness: 30 mil.
 - g. Connections: Brush on welding adhesive.
 - h. Fitting covers with inserts supplied by the manufacturers.
- 3. Covering Adhesive Mastic:
 - a. Manufactures:
 - 1. Proto PVC Glue.
 - 2. Zeston PVC Glue.
 - b. Compatible with insulation.
- B. Aluminum Jacket: ASTM B209.
 - 1. Thickness: 0.016 inch sheet.
 - 2. Finish: Smooth.
 - 3. Joining: Longitudinal slip joints and 2 inch laps.
 - 4. Fittings: .020 inch thick die shaped fitting covers with factory attached protective liner.
 - 5. Metal Jacket Bands: ½ inch; 0.015 inch thick aluminum.
- C. Stainless Steel Jacket: Type 304 stainless steel.
 - 1. Thickness: 0.010 inch.
 - 2. Finish: Smooth.
 - 3. Metal Jacket Bands: ½ inch wide; 0.010 inch thick stainless steel.

2.06 AIR HANDLING UNIT ROOMS

- A. Finish and install over entire areas of walls/doors/ceiling of air handling rooms/elevator equipment rooms 2" thick acoustical type fiberglass hullboard insulation 3# density, applied over Stick-Klips 12" on center. Stick-Klips shall be applied to wall with Construction Adhesive. Acoustical material shall be applied over Stick-Klips with duct linear adhesive spotted between pins. Joints to be sealed with fiberglass lagging tape.
- B. Manufacturer:
 - 1. Nautica IMO PFG Acoustic Board as manufactured by RB, LLC.

2.07 GLASS FIBER, FLEXIBLE

- A. Insulation: ASTM C553; flexible, noncombustible blanket.
 - 1. 'K' ("ksi") value: ASTM C518, 0.29 at 75 degrees F.
 - 2. Maximum service temperature: 250 degrees F.
 - 3. Maximum moisture absorption: 0.20 percent by volume.
 - 4. Density: 0.75 lb/cu ft.
- B. Vapor Barrier Jacket
 - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
 - 2. Moisture vapor transmission: ASTM E96; 0.04 perm.
 - 3. Secure with pressure sensitive tape.
- C. Vapor Barrier Tape

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

D. Tie Wire: Annealed steel, 16 gage.

2.08 PLENUM RATED INSULATION

- A. Contractor to provide plenum rated insulation. Insulation to have a flame spread index of not more than 25 and a smoke developed index of not more than 50. Manufacturer to be Morgan Thermal Ceramics PlenumWrap+ or prior approved equal. Insulation shall be listed to UL 1887, NFPA 262 (UL910), and ASTM E84. PlenumWrap+ core blanket shall be manufactured using Morgan Thermal Ceramics's patented Superwool fiber, a 2000F rated, non-combustible, alkaline-earth silicate wool with low biopersistence. Insulation shall be OPL (Intertek) Listed, and be part of both OPL's and UL's Listing and Follow-up Service Programs to ensure the consistent quality essential to the critical nature of this life-safety application. Install in strict accordance with manufacturer's recommendations.

1. Thickness: 1/2"

2.09 APPROVED MANUFACTURERS

- A. Johns Manville, Knauf, DOW, Owens Corning

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. On exposed piping, locate insulation and cover seams in least visible locations.
- C. Insulated dual temperature pipes or cold pipes conveying fluids below ambient temperature.
 1. Provide vapor barrier jackets, factory applied or field application.
 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe.
 3. Finish with glass cloth and vapor barrier adhesive.
 4. PVC fitting covers shall be used.
 5. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations.
 6. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- D. For insulated pipes conveying fluids above ambient temperature:
 1. Provide standard jackets, with or without vapor barrier, factory applied or field applied.
 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe.
 3. Finish with glass cloth and adhesive.
 4. PVC fitting covers shall be used.
 5. For hot piping conveying fluids below 140 degrees F, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- E. Inserts and Shields:
 1. Application: All piping.
 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 3. Insert Location: Between support shield and piping and under the finish jacket.
 4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.

5. Insert Material: ASTM C640 cork or other heavy density insulating material suitable for the planned temperature range.
- F. Finish insulation at supports, protrusions, and interruptions.
- G. For pipe exposed in mechanical equipment rooms, garage, or in exposed finished spaces, finish with color coded PVC jacket and fitting covers. Color to be as indicated in Section 230553 - Identification of Piping, Valves and Equipment.
- H. For exterior applications, provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.
- I. All HVAC & Plumbing piping to have PVC color coded jacket, typical entire piping system s throughout entire project.

3.03 TOLERANCE

- A. Substituted insulation materials shall provide thermal resistance within 10 percent at normal conditions, as materials indicated.

3.04 GLASS FIBER INSULATION SCHEDULE

<u>SYSTEMS</u>	<u>PIPE SIZE (inch)</u>	<u>THICKNESS (inch)</u>
1. Domestic Hot Water	½" thru 1-1/4"	1"
2. Domestic Hot Water	1-1/2" & Larger	1-1/2"
3. Domestic Cold Water	All	1"

Note: 1. All piping exterior to building (above grade, excluding refrigerant piping) shall be covered in 16 mil aluminum jacket with premolded aluminum fittings, no PVC (Zeston) fittings allowed.

2. All HVAC & Plumbing piping to have PVC color coded jacket, typical entire piping systems throughout entire project.

3.05 CELLULAR FOAM INSULATION SCHEDULE

<u>SYSTEMS</u>	<u>PIPE SIZE (inch)</u>	<u>THICKNESS (inch)</u>
1. Water Piping (exposed to weather)	½" - 4"	1"
2. Condensate Drain Lines	All Sizes	1"
3. Refrigerant Piping	All Sizes	1"

Note: 1. All piping exterior to building (above grade, excluding refrigerant piping) shall be covered in 16 mil aluminum jacket with premolded aluminum fittings, no PVC (Zeston) fittings allowed.

2. All insulated piping exterior to building to receive two (2) coats of Aerocel Aerocoat pure acrylic emulsion paint. Allow 4 hours drying time in between coat applications.

3. All HVAC & Plumbing piping to have PVC color coded jacket, typical entire piping systems throughout entire project.

3.06 CELLULAR GLASS INSULATION SCHEDULE

A.	SYSTEMS	PIPE SIZE (inch)	THICKNESS (inch)
	Not used.		

3.07 PLENUM RATED INSULATION SCHEDULE

<u>SYSTEMS</u>	<u>PIPE SIZE (inch)</u>	<u>THICKNESS (inch)</u>

1. Sanitary Sewer Waste Piping	All Sizes	1/2"
2. Sanitary Sewer Vent Piping	All Sizes	1/2"

**All noncompliant ASTM E84 piping within return air plenum shall receive 1/2" thick plenum rated insulation.*

3.08 LAVATORY P-TRAP AND SUPPLY LINES

- A. Insulate P-trap, tailpiece and water supplies on all lavatories with Truebro Model 102, Handi Lav-Guard, Bocar "Trap Wrap" or approved equivalent insulating system.
- B. All wall hung lavatory's are to come with Truebro Lav-Shield in lieu of Lav-Guard, no exception.

3.09 PIPE SUPPORTS

- A Contractor shall insulate down minimum 12" for all pipe supports in direct contact with HVAC water piping with same material and jacket as pipe insulation.

3.10 WASTE LINE P-TRAPS

- A. P-traps receiving HVAC condensate and associated horizontal waste lines shall be insulated with fiberglass ductwrap insulation with aluminum foil vapor barrier. Insulation shall be sealed at all seams and joints.

3.11 FLEXIBLE GLASS FIBER PIPE INSULATION SCHEDULE

<u>LOCATION</u>	<u>THICKNESS (inch)</u>	<u>FINISH</u>
Not used.		

END OF SECTION

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SECTION 20 21 16 - PIPING SPECIALTIES

PART 1 GENERAL

1.01 GENERAL

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.02 SUMMARY

- A. Work Included:
 - 1. Piping specialties for plumbing systems.

1.03 SUBMITTALS

- A. General: All submittals shall comply with the requirements of Division 1 - GENERAL REQUIREMENTS and Section 20 01 00 - GENERAL PROVISIONS.
- B. Product Data: Data shall be submitted on the following items:
 - 1. Strainers
 - 2. Pressure Reducing Valves
 - 3. Air Vents
 - 4. Dielectric Adapters
 - 5. Thermometer and Test Wells
 - 6. Pressure Gauges and Gauge Cocks

1.04 QUALITY ASSURANCE

- A. Standards
 - 1. American Society of Mechanical Engineers (ASME):
 - a. Boiler and Pressure Vessel Code, Section VIII - Unfired Pressure Vessels.
 - 2. American Society for Testing and Materials (ASTM):
 - a. Standard A53, Pipe, Steel, Black and Hot-Dipped Zinc-Coated, Welded and Seamless.
 - b. Standard A74, Cast Iron Soil Pipe and Fittings.

PART 2 PRODUCTS

2.01 STRAINERS

- A. All strainers, except those installed as integral part of equipment, shall be the product of a single manufacturer.
- B. Y-Type Strainers:
 - 1. Strainers 2 inches and smaller shall be iron-body with screwed end connections and screwed plug in blow-off. Strainers shall be rated for 400 pounds minimum and 250 pounds minimum SWP. Screens for water and steam service shall be 20 mesh model. Strainers shall be:

Keckley	Style B
Metraflex	Style S
Mueller	No. 11-FCB
Spirex Sarco	Type IT
 - 2. Strainers 2 1/2 inches and larger shall be iron-body with 125-pound flanged end connections for installation between 150-pound raised face slip-on weld flanges. Strainers shall be rated for 175-pound minimum WOG and 125-pound minimum SWP. Strainers shall have blow-down connection which shall be provided with full size gats valve. Strainers shall be equipped with perforated baskets or perforated baskets lined with mesh screens. Strainer screens and baskets shall be stainless steel in accordance with the following:

Size

Service

Perforation Diameter

2-1/2", 3"	Water	.033"
	Air or Gas	.009"
4", 5"	Water	1/8"
	Air or Gas	.033"
6", 8"	Water	1/8"
	Air or Gas	3/64"
10", 12"	Water	1/4"

Strainers shall be:

Schade Davis	No. 78M
McAlear	No. 528-8
Keckley	Style D
Metra Flex	Series M1
Mueller	No. 751 to 12", No. 752 14" & larger
Spirex Sarco	Type C1-125

C. Basket Strainers: Not Used.

2.02 PRESSURE REDUCING VALVES

- A. Pressure reducing valves shall be field adjustable with outlet pressure set as specified hereinafter or as indicated on drawings.
- B. All internal parts subject to wear shall be replaceable without removing the pressure reducing valve from the piping.
- C. Not used.
- D. For Plumbing Systems

The Pressure Reducing Valve shall be certified to NSF/ANSI 372, consisting of a low lead bronze body and bronze bell housing, a separate access cover for the plunger and a bolt to adjust the downstream pressure. The bronze bell housing and access cap shall be threaded to the body and shall not require the use of ferrous screws. The assembly shall be of the balanced piston design and shall reduce pressure in both flow and no-flow conditions. The assembly shall be accessible for maintenance without having to remove the body from the line. The Pressure Reducing Valve shall be a ZURN WILKINS Model 500XL.

1. Type "A" pressure reducing valves for water service shall be diaphragm actuated type with bronze body and 150 psi (minimum) working pressure. Valves shall have an adjustable outlet pressure range of not less than 10-35 psi. Valves shall be:

Watts U5LP

A.W. Cash Type E Series 3

2. Type "B" pressure reducing valves for water service shall be diaphragm actuated type with bronze body and 150 psi (minimum) working pressure. Valves shall have an adjustable outlet pressure range of not less than 35 to 75 psi. Valves shall be:

Watts No. 223-S Series

A.W. Cash Type E Series 3

3. Type "C" pressure reducing valves for compressed air service shall be diaphragm actuated type with an adjustable outlet pressure range of not less than 0 to 200 psi. Valves shall be:

Watts No. 199 Series

A.W. Cash Type E-55 Series

4. Plumbing contractor shall provide pressure reducing valve at dishwasher prior to connection to hot water line.

2.03 AIR VENTS

- A. Automatic Air Vent: Designed to vent automatically with float principle; bronze body and nonferrous internal parts; working pressure; operating temperature; with discharge connection and inlet connection. Air vents shall be:
- Armstrong No. 71
Hoffman No. 78
Thrush No. 8
Taco No. 424
- B. Manual Air Vent: Bronze body and nonferrous internal parts; working pressure; operating temperature; manually operated with screwdriver or thumbscrew; with discharge connection and inlet connection.

2.04 DIELECTRIC ADAPTERS

- A. Dielectric adapters shall be the union type for pipes 2" in size and smaller and flanged type for pipes 2-1/2 " in size and larger. Adapters shall have a working pressure of 250 psi for union type and 175 psi for flanged type. The insulating gasket shall have an operating range of 40°F to 240°F and shall limit the galvanic corrosion to a maximum of 1% of the short circuit current.

2.05 THERMOMETER AND TEST WELLS

- A. Thermometers:
1. Thermometers shall be the blue-reading spirit-filled adjustable angle type. Thermometer shall be adjustable to any angle through a 180° arc and shall be provided with a locking device.
 2. Thermometers shall have V-cast aluminum case with baked enamel separable sockets and where installed on insulated pipes, sockets shall be extension neck type to provide for 2" thick insulation.
 3. Thermometer scale range shall be
 - a. Not used.
 - b. Not used.
 - c. Domestic Water Systems - 30-240°F
 - d. Not used
 4. Thermometers shall be:

Weksler Adjust-Angle Series Type AA-5
Trerice Adjustable Angle Series Type BX
Weiss Vari-Angel Series Type BS
- B. Test Wells:
1. Test wells shall be for use with engraved stem thermometers. Test wells shall be brass and shall be provided with cap and chain with gasket for sealing when not in use.
 2. Wells installed in insulated pipes shall be extension neck-type to provide for 2" thick insulation.

2.06 PRESSURE GAUGE AND GAUGE COCKS

- A. Pressure Gauges
1. Gauges shall be flangeless type and shall have 4-1/2 dials, cast aluminum cases, stainless steel rotary gear movements, phosphor bronze bourdon tubes, forged brass rod sockets and tips, 1/2% accuracy of scale range, Plexiglass dial covers, safety blow-out disc and 1/4 inch lower connections.
 2. Gauges in pump suction line shall be the compound type. Gauges in all other locations and discharge shall be the plain pressure type.
 3. Range for pressure gauges shall be selected so that the normal operating point for each application falls in the approximate midpoint of the gauge range. Shop drawings shall indicate ranges.
 4. Gauges shall be:

Weksler Type AA1

Trerice No. 500X Series

Weiss Series PG

B. Gauge Cocks:

1. Gauge cocks shall be brass lever handle type. Gauge cocks shall be:

Weksler Type A

Trerice No. 880

Weiss type LC

2.07 TEMPERATURE/PRESSURE TEST FITTINGS

- A. Fittings shall be the combination temperature pressure test type with brass body, self-sealing EPDM gasket, threaded connections and cap. Temperature/Pressure Test Fittings shall be:

Pete's Plug

Sisco

P/T plug

Fairfax

Test plug

2.08 PIPE SLEEVES

A. Pipe Sleeves

1. Sleeve size shall be such as to provide an annular space of the sleeve and the passing pipe or pipe insulation.
2. Sleeve material shall be as follows:
 - a. In walls below grade: Schedule 40 black steel pipe, ASTM A53.
 - b. In concrete floors on grade: Service weight cast-iron pipe, ASTM A74.
 - c. In walls and partitions above grade: 20-gauge galvanized sheet steel with lock-type longitudinal seams.
 - d. In concrete floors above grade: 20-gauge galvanized sheet steel with lock-type longitudinal seams.
 - e. In concrete roofs: Service weight cast-iron pipe, ASTM A74.

2.09 FLOOR, WALLS AND CEILING PLATES

- A. Escutcheons shall be chrome-plated steel plates, hinged type with set screw.
- B. Escutcheons for chrome-plated connections at plumbing fixture shall be as specified under the plumbing fixtures.

PART 3 EXECUTION

3.01 GENERAL

- A. All equipment shall be installed where indicated on the drawings and shall be installed in accordance with manufacturer's instructions.
- B. Unless otherwise indicated on the drawings, thermometers and pressure gauges shall be installed no higher than 8 feet above finished floor. Final position of each thermometer and pressure gauge shall be such that it is readable from the floor.
- C. Pipe sleeves in walls, partitions and roofs and in floors on grade shall be cut flush with each surface except where clamping flanges are used. Sleeves through floors above grade shall be cut flush with the underside of the floor and shall extend 1" above the top side of the floor.
- D. Except where otherwise specified, pipes passing through concrete and masonry walls, concrete and masonry partitions, concrete floors and roofs, and fire rated gypsum board or plaster partitions shall be provided with pipe sleeves which shall be installed at the time of construction of walls, partitions, floor or roof. Sleeves are not required for water and waste connections through a wall or partition to an individual fixture not for cast-iron pipe through concrete slab on grade. Sleeves shall not be installed in structural members except where specifically indicated or approved by the Architect. The annular spaces between pipe and sleeve and between insulation and sleeve, including drain pipes at water closets, shall be sealed. In addition,

penetrations through fire-rated walls and partitions and through floors above grade shall be packed solid with Fiberglass insulation behind a backup material and sealant.

- E. A strainer shall be provided on the inlet side of each pressure reducing valve. Pressure reducing valves provided with an integral strainer do not require a separate strainer.
- F. Dielectric adapters shall be installed between copper and iron pipe connections and between ferrous and non-ferrous metal piping or equipment.
- G. Test wells shall be installed above the horizontal so as to hold oil and wells shall be filled with oil.
- H. Pressure gauges shall be connected to the piping system with threaded brass pipe and screwed brass fittings. Install gauge cock on inlet pipe to gauge. All gauges used on services exceeding 200°F shall be mounted on a brass pigtail siphon.
- I. Where exposed piping, bare or insulated, passes through floors, walls and ceiling, except in Mechanical rooms, escutcheons shall be provided.
- J. Expansion tank shall be mounted as indicated on the drawing or from building. Expansion tank shall not be supported by piping systems.
- K. N. All sanitary sewer piping routed up thru grade beams shall be down within cast iron pipe sleeve one pipe size larger than service pipe. Pack annular space between cast iron pipe and service piping with closed cellular foam insulation.

END OF SECTION

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SECTION 21 03 03 - AUTOMATIC SPRINKLER SYSTEM

PART 1 GENERAL

1.1 GENERAL

- A. The General Conditions of the Contract and Supplementary Conditions of the Contract shall govern the work under this Section of the specifications. The Contractor is specifically directed to refer to said conditions.
- B. It is understood that these specifications, and the accompanying drawings, complete apparatus, fully erected and in successful operating condition. All work must be preformed in the best and most substantial manner.
- C. These specifications are intended to provide complete, and in proper operation, all sprinkler system piping, equipment, heads, valves, controls, and accessories, all as specified herein or shown on the accompanying drawings, or reasonably implied in either. The building shall be provided with complete coverage sprinkler system for the spaces designated on the drawings classification as required. System shall consist of calculated sprinkler systems unless indicated otherwise. Verify all pertinent criteria. The systems shall conform to layout shown and meet all requirements of agencies listed under "REGULATIONS AND STANDARDS" below. Refer to plans and specifications for additional information.

1.2 SYSTEM LAYOUT:

- A. Where plans indicate layout of system components, the layout shall be verified to comply with "REGULATIONS AND STANDARDS" and shall be revised if required to comply. All layout routes, pipe sizes, head locations, etc. are to be used as a guide, it shall be the sprinkler contractor's ultimate responsibility to design and size the sprinkler system in strict accordance with NFPA 13. Revisions shall be at Contractor's expense. Any such revisions shall be verified with the Architect.

1.3 ELECTRICAL WORK:

- A. See "COORDINATION".

1.4 SPRINKLER SYSTEM CONTRACTOR:

- A. It is intended that the work under this section is to be preformed by a qualified Fire Protection Piping Systems Contractor regularly engaged in this type of work. The Contractor is to hold a current license to perform this work and be certified by the State Fire Marshal. All documents shall bear this certification.

1.5 REGULATIONS AND STANDARDS:

- A. It is the intention of these specifications and the accompanying drawings, that all elements and features of the fire protection system shall be in accordance with the standards of the National Fire Association (NFPA), the State Fire Marshal, all applicable building codes, Owner's Insurance Agency and Property Insurance Association of Louisiana whether so indicated or not. NFPA standards are on file in office of Architect and may be examined at the Contractor's request.
- B. MANUFACTURER'S OR TRADE NAMES: Where the plans or specifications mention the names of manufacturers or the products of specific manufacturers, it is intended that the contractor shall furnish the item or items as specified. Products of manufacturers that are not mentioned shall be subject to prior review by the Architect and shall in any case mentioned shall be subject to prior reviews by the Architect as stated in Instruction to Bidders, page 1B-3, Paragraph 3.3 substitutions.

1.6 SHOP DRAWINGS AND SUBMITTAL DATA:

- A. Within fifteen (15) days of award of the contract, the contractor shall submit six (6) copies of system piping shop drawings and six (6) copies of manufacturer's data and descriptive literature and drawings for all equipment and materials. Additionally, provide a reproducible (sepia) copy of the system piping shop drawings. All drawings, literature and data on all equipment shall be submitted at the same time; this material shall contain complete layout, capacity data, dimensions and other pertinent information necessary for the Architect/Engineer to properly review and evaluate the item that necessary to meet the requirements for submittal to the State Fire Marshall.

- B. The contractor shall obtain approval of agencies listed under "REGULATIONS AND STANDARDS" before submitting to the Architect, except that the date for State Fire Marshal's review shall be submitted to the Architect prior to submitting to the Fire Marshal. All required review fees and applicable requirements shall be by the contractor. No item of equipment or material shall be placed on order until Final Review comments have been received from the Architect. See "DRAWINGS" below.

1.7 ORDINANCES, RULES AND REGULATIONS:

- A. All material and construction shall conform to the requirements of all building, plumbing and sanitary codes and laws in force in the locality in which the work is to be done. All materials and construction shall also conform to the rules and regulations listed above under "REGULATIONS AND STANDARDS".

1.8 DRAWINGS:

- A. The contractor shall submit detailed drawings for all sprinkler system showing exact locations and sizes of all elements in the system before fabrication is begun. Architect shall have the prerogative of changing the position or configuration of these systems without changing the total scope of work involved to comply with "REGULATIONS AND STANDARDS".
- B. Drawings shall provide the following data and catalog cuts:
 - 1. Project name and locations.
 - 2. Roof and ceiling construction.
 - 3. Water supplies and sizes.
 - 4. Make and type of sprinklers.
 - 5. Number of sprinklers on each riser and total per fire area.
 - 6. Make, type, model and size of alarm check valves, etc.
 - 7. Location of all risers, mains, lines, etc.
 - 8. Cutting length of pipe.
 - 9. Crosses, Tees, riser nipples and size.
 - 10. Type hangers and spacing.
 - 11. Hydraulic calculations.
 - 12. Siamese fire department connection.
 - 13. Underground sprinkler supply riser co-ordinate with foundation drawings.
 - 14. Valves.
 - 15. Inspection test stations.
 - 16. Location of spare sprinkler head cabinets and quantities to be provided of each type of head.

1.9 GUARANTEE:

- A. The contractor shall guarantee all materials and workmanship under this contract for a period of one (1) year from date of final acceptance of his work and shall repair or replace any such defective materials and workmanship without cost to the Owner.
- B. The guarantee shall include complete service, including adjustment service and inspection, during the guarantee period as required by agencies listed under "REGULATIONS AND STANDARDS".

1.10 EXTRA STOCK:

- A. Provide extra sprinkler heads under provisions of NFPA 13.
- B. Provide suitable wrenches for each head type.
- C. Provide metal storage cabinet in sprinkler riser room & fire pump room.

PART 2 PRODUCTS

2.1 GENERAL:

- A. Furnish and install in a neat workmanlike manner, all required to provide a complete, properly operating installation. All piping and accessories shall conform to standards as applicable.
- B. Run piping parallel with the lines of the building, unless specifically shown or noted otherwise. All pipe, fittings, valves, etc., shall have sufficient clearance from other work to finish at least 1/2 inch from other work or finished covering of other piping.
- C. Provide all necessary hangers, anchors, thrust blocks, etc., to properly support and protect piping system, as required by agencies listed under "REGULATIONS AND STANDARDS".
- D. Under no circumstances is the contractor to attach to or support from any bar joist bridging. Any supports to the bar joists or any structural systems are to be approved by the Engineer. All supplement angle or channel iron required to support equipment of this specification is to be furnished by the contractor and is to be independent of any other supports.

2.2 SLEEVES AND PLATES:

- A. Wherever pipes pass through concrete slabs, furnish and install sleeves, properly located for the work.
- B. Use sleeves of sufficient size to allow the specified pipe covering to pass through the sleeves and finish sleeves flush with walls and ceiling.
- C. Sleeves shall be galvanized steel not lighter than 24 gauge.
- D. Seal spaces between sleeve and pipe. Use packing device or material for UL rating to match rating of wall or floor/ceiling as rated under UL File R9658.

2.3 ESCUTCHEONS:

- A. Where pipes passing through floors, walls or ceiling exposed to view in finished areas, provide pressed steel split plates which cover the opening and fit snugly to pipe.

2.4 SPRINKLER HEADS:

- A. Temperature rating on fusible links to suite specific hazard area with minimum margin of safety 50-degrees F.
- B. Sprinkler heads installed under suspended finished ceilings (unless noted here-in- after) shall be fully-recessed type with cover plate with custom color finish. Sprinkler heads installed under solid/sheetrock finished ceilings (unless noted here-in-after) shall be fully-recessed type with cover plate with custom color finish. Extended coverage sprinkler heads to be allowed based on approval of aesthetics of sprinkler head by architect/owner.
- C. For exposed areas, provide standard upright type with chrome finish. In mechanical rooms, janitors closet, etc. finish may be brass.
- D. For Sidewall applications, provide sidewall type with chrome plated finish and escutcheons.
- E. Dry pipe sprinkler heads shall be the closed, automatic type with spray deflector, fusible link and white finish.
- F. All sprinkler heads shall be Underwriter's Laboratories and Factory Mutual Labeled.
- G. All sprinkler heads to be quick response type.
- H. All porches to be protected with dry type sidewall heads.
- I. Provide chrome-plated wire cages, including attachment devices, in areas with upright heads.
 - 1. Wire cages shall be heavy duty type & UL listed for use with respective sprinkler head.

2.5 SPRINKLER VALVE STATION:

- A. Provide approved automatic valve station with OS&Y shutoff valve, alarm valve, main alarm check valve, with variable pressure trimming, including water pressure gauges, retard chamber, alarm test line with valve, drain lines with valves, outside water

alarm, etc.

- B. Wet pipe alarm check valve shall be designed for vertical installation. Valve shall have cast iron body with all surfaces in contact with water non-ferrous. Valve shall be UL Listed or FM Approved, iron body, bronze mounted, variable pressure type with retarding chamber. Provide basic trimmings for alarm test by-pass, gages, drain connections, mounting supports for retarding chamber, and drip funnel. Provide pressure sensitive alarm switch to actuate the fire alarm system.
- C. Water Motor Alarm: Provide alarms of the approved weatherproof and guarded type, to sound locally on the flow of water in such sprinkler system to which it is connected. Mount alarms on the outside of the outer walls of each building, at a location indicated on the plans.
- D. Inspector's Test Connection: Provide test connections about 6 feet above the floor for each sprinkler system equipped with an alarm device and locate at the hydraulically most remote part of each system. Provide test connection piping to a location where the discharge will be readily visible and where water may be discharged without damage.
- E. Main Drains: Provide drain piping to discharge at safe point outside each building. Provide auxiliary drains as required by NFPA 13.
- F. Flow Switches: Flow switch shall be paddle type, designed for direct immersion in water and vertical and horizontal pipe mounting. Switch shall be normally open type with two single pole, double throw switches, pneumatic retard (adjustable), and 120 volt power. Switch shall be UL and Factory Mutual labeled.
- G. Supervisory Switches: Valve supervisory switches shall be designed for valve mounting, vertical and horizontal. Switch shall be normally closed type capable of detecting any motion from the valve full open position. Switch shall be UL labeled. Provide at fire water backflow preventer.

2.6 SIAMESE FIRE DEPARTMENT CONNECTIONS:

- A. Provide remote mounted siamese fire department connection with chrome plated finish, local fire department threads, dust caps and chains, 3/4" automatic drip, marked "SPRINKLER - FIRE DEPARTMENT CONNECTION" (on chrome plated placard with raised chrome letters. Contractor shall co-ordinate with local Fire Department to match their size and type threads. FDC to be sufficient to provide flow required by sprinkler system design.

2.7 VALVES, PIPING AND FITTINGS:

- A. Refer to Section 210516: Fire Protection Piping.

2.8 AUTOMATIC VALVES AND FLOW SWITCHES:

- A. Automatic valves and flow switches shall have bodies of brass or bronze, threaded, for 150 lbs. pressure, electrically operated, 110 volts, UL Listed.
- B. Automatic valves shall be solenoid operated, 110 volts. Valves shall remain open upon loss of power
- C. Water Flow Indicators: The Sprinkler Contractor shall furnish and install all electrical wiring required in connection with sprinkler system. A 120 volt electric water flow indicator shall be installed in the main sprinkler supply to each individual zone. This shall include wiring from each of the indicators to connect with individual zones in the building fire alarm panel.

PART 3 EXECUTION

3.1 DESIGN:

- A. The sprinkler systems shall be designed as required for occupancies specified by experienced personnel with competency in the execution of such work. Sprinkler system design shall be performed only by engineers licensed by the State of Louisiana. Provide the following:
 - 1. Wet pipe systems for all areas.

- a. New construction, contractor to provide wet pipe sprinkler system, light hazard, (0.10 gpm/sq/ ft/ over the most remote 1500 sq. ft.), except kitchen, storage room(s), mechanical rooms, breakrooms, and janitors closets (Refer to NFPA 13) which shall be ordinary hazard, group 2 (0.15 gpm/sq/ ft/ over the most remote 1500 sq. ft.).
- b. Contractor to design system with a mandatory 15 pound cushion.
- c. The following occupancies and areas have been taken from NFPA 13 for the convenience of the contractor. It is the contractors responsibility to design the sprinkler system in accordance with the most current version of NFPA 13.

Light Hazard Occupancies

Churches, Clubs, Eaves & Overhangs (made of combustible material), Educational, Hospitals, Institutional, Libraries, except large stack rooms, Museums, Nursing or Convalescent homes, Offices (including data processing), Residential, Restaurant Seating Areas, Theaters & Auditoriums (excluding stages and prosceniums), Unused Attics

Ordinary Hazard, Group 1

Automobile parking and showrooms, Bakeries, Beverage Manufacturing, Canneries, Dairy products manufacturing and processing, Electronic plants, Glass and glass products manufacturing, Laundries, Restaurant service areas, kitchen, storage room(s), mechanical rooms, breakrooms, and janitors closets.

Ordinary Hazard, Group 2

Cereal mills, Chemical plants (ordinary), Confectionery products, Distilleries, Dry cleaners, Feed mills, Horse stables, Leather goods manufacturing, Libraries (large stack rooms), Machine shops, Metal working, Mercantile, Paper and pulp mills, Paper process plants, Piers and wharves, Post offices, Printing and publishing, Repair garages, Resin application area, Stages, Textile manufacturing, Tire manufacturing, Tobacco products manufacturing, Wood machining, Wood product assembly.

- B. Contractor to provide additional sprinkler heads under any obstructions, overhangs, ductwork, equipment, etc. 4'0" and wider. Contractor to provide sprinkler heads in all exterior overhangs required to protect window walls, above and below.
- C. Contractor to provide any and all sprinkler heads for water curtains required at all rated walls containing glass to maintain designated rating.
- D. All sprinkler heads shall be located in the center of suspended ceiling tile.
- E. Sprinkler contractor shall include in his bid the backflow preventer with isolation valve as required by Department of Health and include pressure drop in hydraulic calculations. Backflow preventer to be located on site, refer to architect/engineer for exact location. It shall be sprinkler contractor responsibility to co-ordinate all facets of system not just inside building for a complete system. Contractor to provide tamper and supervisory switches on shut off valves (OS&Y valves, rising stem) at backflow preventer. Sprinkler contractor to co-ordinate with electrical contractor to provide any required conduit. Provide tamper switches at BFP (provide insulated Hot Box with electric heater inside Hot Box).
- F. Sprinkler contractor shall co-ordinate routing of piping with mechanical and electrical. Contractor can assume that there will be conflicts and shall include in his bid for these possibilities. No additional compensation will be allowed regarding this matter.
- G. Sprinkler contractor to refer to architectural reflected ceiling drawings for fully concealed heads to be custom colored to match color of respective metal/wood panel ceilings.
- H. Provide wire guards for all sprinklers heads located in rooms if head located less than 7'-6" from finished floor.

- I. Due to the complexity of the ceiling heights, sprinkler contractor shall include a preliminary submittal of routing of main sprinkler piping for Architect/Engineers approval prior to submitting final drawings to Fire Marshal.
- J. Sprinkler contractor shall co-ordinate routing of piping with mechanical and electrical. Contractor can assume that there will be conflicts and shall include in his bid for these possibilities. No additional compensation will be allowed regarding this matter.
- K. Sprinkler piping shall be protected from freezing during the lay-a-way period.
- L. The design shall comply with NFPA 13 (latest editions), codes, standards, and recommended practices. No extra charges will be approved for changes to drawings, piping, etc. required to conform to NFPA 13 to be used.
- M. Sprinkler system shall be design on basis of latest available flow test available, contractor to procure flow test.
- N. NFPA rules and regulations governing the design shall be scrupulously adhered to specifically, NFPA 13 of the National Fire Codes shall govern the design of the sprinkler system.
- O. Piping shall be installed in accordance with NFPA Chapter 13.
- P. Co-ordinate all sprinkler alarm/supervisory tie-in connection points with fire alarm contractor prior to bid, whether shown on drawings or not. General contractor to coordinate with sprinkler contractor & fire alarm contractor prior to bid as to ensure a complete and working system.
- Q. All sprinkler heads located in coolers, freezers and storage area with ceiling heights of eight (8) feet or less shall be protected with basket type cages.
- R. Provide cage guards for all upright heads in exposed areas.
- S. Testing & Training to be in accordance with NFPA 25.
- T. A single air vent with connection conforming to NFPA 13 shall be provided on each wet pipe system utilizing metallic pipe. Air vent shall be located near a high point in the system to allow air to be removed from that portion of the system utilizing approved means of air removal.

3.2 INSTALLATION:

- A. Run piping concealed above furred ceiling and in joists to minimize obstructions. Expose only heads.
- B. Coordinate sprinkler piping routing and heads with all trades.
- C. Protect sprinkler heads against mechanical injury.
- D. Sprinkler heads location indicated on plans is to be used as a guide only, exact location and numbered to be based and determined by design of sprinkler system, any additional heads required shall be installed as part of the contract with no additional compensation.
- E. Provide additional heads which may be required for coordinated ceiling pattern, without additional cost, even though number of heads may exceed code minimum requirements.
- F. Include all costs of shop drawings review and approval from authorities in price.
- G. Locate outside alarm on wall of building adjacent to siamese department connections and/or as noted on drawings.
- H. Provide where directed cabinet containing required number of spare heads as per NFPA 13, of each type, along with wrench suitable for each type of head.
- I. Provide flow switch on leaving side of main valve and monitoring switch on main valve. Flow switch shall sense flow and sound appropriate zone of fire alarm system monitoring switch on each main valve; when valve is started to its "closed" position shall indicate trouble on appropriate zone of fire alarm system and sound local audible alarm. Wiring between flow switches and monitoring switches and fire alarm system shall be provided

and coordinated by sprinkler contractor, fire alarm contractor and electrical contractor.

- J. Furnish and install sprinkler zone valves and flow switches where indicated on the drawings for the zoning of the system. Each of these devices shall be connected into the fire alarm system as indicated for the main valve, including local alarming.
- K. Provide all test and drain valves as required for system.
- L. Support sprinkler piping in accordance with NFPA 13.
- M. Provide new water service as shown on the drawings, incur all costs, fees, permits, etc.
- N. Paint all exposed sprinkler piping, color selection to be by architect in field during construction.
- O. All branch pipe connections to sprinkler heads are to be made with swing joints.

3.3 COORDINATION:

- A. All interlock and signal wiring runs to the annunciator panel will be furnished and installed by the Fire Detection Contractor and as part of the Electrical Work.
- B. This contractor shall provide for all switches and interlocking devices on all valves as required.
- C. The sprinkler contractor is to provide plans to fire alarm contractor as to ensure all valve, sensors devices, are monitors and have power. General contractor to ensure a complete and working system.
- D. Sprinkler contractor to coordinate with fire alarm contractor prior to bid, general contractor to ensure a complete and working system per NFPA.

3.4 UNDERGROUND PIPING:

- A. Underground fire protection system piping shall be installed in accordance with the requirements of NFPA 24, Private Fire Service Mains and Their Appurtenances. Provide concrete thrust blocking at each change of direction of the piping and at all tees, plugs, and caps in accordance with NFPA 24. Where thrust blocking is impractical, fittings with a mechanical joint retainer gland, approved for the piping material utilized, may be used in lieu of thrust blocking.

3.5 ADDITIONAL CLOSE OUT DOCUMENTS

- A. Provide a copy of NFPA 25 with sprinkler system close out documents.

3.6 THIRD PART REVIEW

- A. The sprinkler contractor shall have his design reviewed, approved, and stamped by a Louisiana Licensed Mechanical Engineer. Third party review & approval to be performed prior to submitting to design team.

3.7 SYSTEM TESTING AND FLUSHING

- A. Testing, cleaning, flushing and inspection shall be done in accordance with NFPA requirements.
- B. The installing Contractor shall complete and sign the appropriate Contractor's Material and Test Certificates included within NFPA 13.

3.8 TRAINING

- A. Contractor shall provide for the service of a competent, trained and experienced agent to instruct and acquaint the Owner with the proper functioning, operation and maintenance of the fire protection systems and all installed components.

END OF SECTION

9-2-25

SECTION 21 0516 - FIRE PROTECTION PIPING

PART 1 – GENERAL

1.1 GENERAL

- A. Pipe, fittings, valves, and connections for installation of sprinkler as indicated on drawings.

1.2 RELATED SECTIONS

- A. Section 200100 - General Provisions.
- B. Section 200529 - Hangers and Support Devices.
- C. Section 210303 - Automatic Sprinkler System

1.3 REFERENCES

- A. ANSI/ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.
- B. ANSI/ASME B16.3 - Malleable Iron Threaded Fittings, Class 150 and 300.
- C. ANSI/ASME B16.4 - Cast Iron Threaded Fittings, Class 125 and 250.
- D. ANSI/ASME B16.5 - Pipe Flanges and Flanged Fittings.
- E. ANSI/ASME B16.9 - Factory-made Wrought Steel Butt welding Fittings.
- F. ANSI/ASME B16.11 - Forged Steel Fittings, Socket-welding and Threaded.
- G. ANSI/ASME B16.25 - Buttwelding Ends.
- H. ANSI/ASME B36.10 - Welded and Seamless Wrought Steel Pipe.
- I. ANSI/ASME Sec 9 - Welding and Brazing Qualifications.
- J. ANSI/ASTM A135 - Electric-Resistance-Welded Steel Pipe.
- K. ANSI/ASTM A47 - Malleable Iron Castings.
- L. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-coated Welded and Seamless.
- M. ASTM A234 - Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
- N. ASTM A795 - Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.
- O. AWS D10.9 - Specifications for Qualification of Welding Procedures and Welders for Piping and Tubing.

1.4 QUALITY ASSURANCE

- A. Sprinkler Systems: Perform work to NFPA 13.

- B. Welding Materials and Procedures: Perform to ASME Code.
- C. Valves: Bear UL or FM label or marking. Provide manufacturer's name and pressure rating marked on valve body.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store valves in shipping containers, with labeling in place.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

PART 2 PRODUCTS

2.1 SPRINKLER, ABOVE GROUND

- A. Steel Pipe: ASTM A53; ANSI/ASTM A135; ASME B36.10; Schedule 40 black and galvanized, in strict accordance to NFPA 13. All piping 1" to 2-1/2" is to be schedule 40 black steel. All piping 3" and larger to be schedule 10 black steel. All sprinkler piping, valves, & fittings shall have a working pressure of 200psi, minimum.
 - 1. Steel Fittings: ANSI/ASME B16.9, wrought steel, butt welded; ANSI/ASME B16.25, butt weld ends; ASTM A234, wrought carbon steel and alloy steel; ANSI/ASME B16.5, steel flanges and fittings; ANSI/ASME B16.11, forged steel socket welded and threaded.
 - 2. Cast Iron Fittings: ANSI/ASME B16.1, flanges and fittings; ANSI/ASME B16.4, screwed fittings.
 - 3. Malleable Iron Fittings: ANSI/ASME B16.3, screwed type. ANSI/ASTM A47.
 - 4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped composition sealing gasket, steel bolts (security type), nuts, and washers; galvanized for galvanized pipe.

2.2 GATE VALVES

- A. Up to and including 2 Inches : Bronze body, bronze trim, rising stem, handwheel, inside screw, single wedge or disc, threaded ends.
- B. Over 2 Inches: Iron body, bronze trim, rising stem, handwheel, OS&Y, single wedge, flanged ends.

2.3 GLOBE OR ANGLE VALVES

- A. Up to 2 Inches: Bronze body, bronze trim, rising stem and handwheel, inside screw, renewable composition disc, screwed ends, with backseating capacity, repack able under pressure.
- B. Over 2 Inches: Iron body, bronze trim, rising stem, handwheel, OS&Y, plug-type disc, flanged ends, renewable seat and disc.

2.4 BALL VALVES

- A. Up to and including 2 Inches: Bronze or Stainless steel one piece body, stainless steel ball, teflon seats and stuffing box ring, lever handle, and balancing stops, threaded ends.
- B. Over 2 Inches: Cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle, or gear drive handwheel for sizes 10 inches and over, flanged.

2.5 BUTTERFLY VALVES

- A. Bronze body, stainless steel disc, resilient replaceable seat, threaded ends, extended neck, handwheel and gear drive and integral indicating device, and built-in tamper proof switch.
- B. Cast or ductile iron body, chrome plated ductile iron disc, resilient replaceable EPDM seat, wafer or lug ends, extended neck, handwheel and gear drive and integral indicating device, and built-in tamper proof switch.

2.6 CHECK VALVES

- A. Up to and including 2 Inches: Bronze swing disc, screwed ends.
- B. Over 2 Inches: Iron body, bronze trim, swing disc, renewable disc and seat, flanged ends.
- C. Iron body, bronze trim, stainless steel spring, renewable composition disc, screwed, wafer or flanged ends.

2.7 DRAIN VALVES

- A. Bronze compression stop with hose thread nipple and cap.
- B. Brass ball valve with cap and chain, hose thread.

2.8 UNDERGROUND PIPING

- A. Underground fire protection system piping shall be installed in accordance with the requirements of NFPA 24, Private Fire Service Mains and Their Appurtenances. Provide concrete thrust blocking at each change of direction of the piping and at all tees, plugs, and caps in accordance with NFPA 24. Where thrust blocking is impractical, fittings with a mechanical joint retainer gland, approved for the piping material utilized, may be used in lieu of thrust blocking.
- B. Piping: Ductile-iron Pipe (DIP), AWWA C 106, with fittings complying with AWWA C 110 and rubber gaskets complying with AWWA C111 or polyvinylchloride (PVC) C-900 for fire service, 200 psi, UL listed.
- C. Fire water service piping Riser into building: Riser to be AMES Series IBR stainless steel riser (type 304) with end cap. UL listed, FM approved. Designed to meet NFPA 24-2007 section 10.6.5. AWWA C900 Inlet/DIP with AWWA C606 outlet.
- D. Where applicable, Pipe stubbed up from grade for remote mounted pedestal fire department connection shall be schedule 40 galvanized pipe above ground (coated and wrapped per NFPA 24).

2.9 VALVE TAGS

- A. Brass plate, integral legible 1/4" high die-stamped identification.
- B. Provide chain looped thru tag and valve wheel for each valve.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.

- C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

- A. Install piping in accordance with NFPA 13 for sprinkler systems, NFPA 14 for standpipe and hose systems, NFPA 24 for service mains.
- B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- C. Install piping to conserve building space, and not interfere with use of space and other work.
- D. Group piping whenever practical at common elevations.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
- G. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- H. Do not penetrate building structural members unless indicated.
- I. Provide sleeves when penetrating footings, floors and walls. Seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required.
- J. Die cut screw joints with full cut standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.
- K. Install valves with stems upright or horizontal, not inverted.
- L. Provide gate, ball or butterfly valves for shut-off or isolating service.
- M. Provide drain valves at main shut-off valves, low points of piping and apparatus.
- N. All underground piping shall be installed a minimum 36" below grade.
- O. Provide brightly colored, metallic-core, non-deteriorating, minimum 2" wide identification ribbon tape set 24" below finished grade, directly above piping. Install tracer wire on all non-metallic pipe.

END OF SECTION

9-2-25

SECTION 22 0523 - PLUMBING SYSTEM VALVES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Work Included
 - 1. Valves for Domestic Water System

1.03 SUBMITTALS

- A. General: All submittals shall comply with the requirements of Division 1 - GENERAL REQUIREMENTS and Section 20 01 00 - GENERAL PROVISIONS.
- B. Product Data: Data shall be submitted on the following items:
 - 1. Valves

PART 2 PRODUCTS

2.01 GENERAL

- A. Valves shall have the name or trademark of the manufacturer and the working pressure stamped or cast on the valve body.
- B. All valves in each system, except for special types, shall be the product of a single manufacturer.
- C. All valves requiring packing shall be designed and constructed such that they can be repacked under pressure.
- D. Valve hand wheels shall be malleable iron except where specified otherwise.
- E. All domestic water valves to be lead-free type.
- F. Approved Manufacturer's: Kitz, Nibco.

2.02 VALVES FOR DOMESTIC WATER SYSTEM

- A. Gate valves (4" in size and larger) shall have iron body, bronze trim, non-rising stem, solid wedge, and flanged ends for 200 pound W.O.G. Valves to be lead-free. Valves shall be:

Crane	No. 461
Hammond	IR1138
Stockham	G-612
Nibco	F-619
Grinnell	6060A
- B. Ball Valves (3" in size and smaller) shall be bronze body, full port, with PTFE Seats. Full port brass ball, orifice must be drilled, hollow ball is not acceptable. Stem shall be blowout-proof, lever handle, solder ends adjustable packing gland. Ball valve shall be rated for 150 WSP. Valves to be lead-free. Valves shall be:

Watts
Hammond
Apollo
- C. Check valves (4" in size and larger) shall be horizontal swing type with iron body, bronze trim, and flanged ends for 200 pound W.O.G. Valves to be lead-free. Valves shall be:

Crane	No. 373
Hammond	IR1124
Stockham	G-931
Nibco	F-918-B
Grinnell	6300A

- D. Check valves (3" in size and smaller) shall be horizontal swing type with bronze body, composition disc, and solder ends for 200 pound W.O.G. Valves to be lead-free. Valves shall be:

Crane	No. 1342
Hammond	IB943
Stockham	B-310-B
Nibco	S-413-W
Grinnell	3315 SJ

- E. Globe valves (2 ½" in size and larger) shall have iron body, bronze trim, rising stem, and flanged ends for 200 pound W.O.G. Valves to be lead-free. Valves shall be:

Crane	No. 351
Hammond	IR116
Stockham	G-512
Nibco	F-718-B

- F. Globe valves (2" in size and smaller) shall have bronze body, rising stem, composition disc, and solder ends for 200 pound W.O.G. Valves to be lead-free. Valves shall be:

Crane	No. 1310
Hammond	IB423
Stockham	B-14-T
Nibco	S-211-Y
Grinnell	3210 SJ

- G. Hose and drain valves shall be ¾" in size with bronze body, non-rising stem, solid wedge, threaded inlet, and hose outlet with cap and chain for 200 pound W.O.G. Valves to be lead-free. Valves shall be:

Crane	No. 451
Jenkins	372
Nibco	T-113-H

- H. Underground Gate Valves and Valve Boxes:

- Gate valves (4" in size and larger) shall be AWWA approved with iron body, bronze trim, non-rising stem, parallel seat double disc, square operating nut, and [mechanical joint ends] [hub ends] for 200 pound W.W.P. Valves to be lead-free. Valves shall be:

	<u>Mechanical Joint</u>	<u>Hub Ends</u>
Mueller	A-2380-20	A-23 80-5
American Darling	55	53
Stockham	G-743-0	G-744-0

- Gate valves (2" & 3" in size) shall have iron body, bronze trim, non-rising stem, parallel seat double disc, square operating nut, and threaded ends for 200 pound W.W.P. Valves to be lead-free. Valves shall be:

Mueller Company	A-2380-8
Stockham	G-739-0

- Gate valves (1 ½" in size and smaller) shall have bronze, non-rising stem, solid wedge, square operating nut, and threaded ends for 200 pound W.W.P. Valves to be lead-free. Valves shall be:

Mueller Company	H-10280

- Valve boxes shall be provided over each underground gate valve. Valve boxes shall be adjustable cast iron roadway type with belled lower section and removable lid at grade. Lid shall be labeled "Water" and boxes not in paved areas shall be set in a 24" x 24" x 6" concrete pad. Valves to be lead-free. Valve boxes shall be:

Mueller Company	H-10360

Central Foundry	B-5003
Tyler Pipe Company	6850
Russell Foundry	B-122

5. Provide one T-wrench for each size operating nut.

PART 3 EXECUTION

3.01 INSTALLATION

- A. All valves installed in horizontal lines shall be installed with the stems horizontal or above. Valve hand wheels shall be oriented, when installed, to provide maximum accessibility for operation.
- B. All valves located within ceiling space are to have two (2) complete wraps of 1" wide red reflective tape around ceiling grid hanger/support directly below valve. Tape to be concealed above ceiling.
- C. Provide color coded self adhesive "dot" of ceiling grid (T-Bar directly below valve).
- D. All valves to be located within 12" of finished ceiling. Offset piping down as required.
- E. ADDITIONAL CLOSE DOCUMENTS: Contractor to provide a set of plans shows valve schedule & valve location on plans (full size set, 24"x36 plans). Plans to have valve type, manufacturer and model #. Also provide replacement part contact information for each valve.
- F. All valves underground shall be gate valve type.
- G. All domestic water valves are to be lead-free.

END OF SECTION

9-2-25

SECTION 22 05 34 - BACKFLOW PREVENTION ENCLOSURE

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Provide manufactured backflow prevention assembly enclosure. Provide single enclosures sized to house fire water backflow preventer, domestic water backflow preventer & site irrigation backflow preventer, maintain all required access to BFP. Provide access panels on each side of BFP enclosure. Refer to site plan drawing sheet MP1.1 for backflow preventer locations.

1.02 QUALITY ASSURANCE

- A. Qualifications: The backflow prevention assembly enclosure manufacturer shall be a company specializing in the manufacture of backflow prevention assembly enclosures with at least 5 years of successful experience designing and selling enclosures to various customers in different climatic regions.

1.03 STORAGE AND HANDLING

- A. Store products in shipping containers and maintain in dry place until installation.

1.04 ACCEPTABLE MANUFACTURERS

- A. Safe-T-Cover™, Hot-Box Aqua Shield or prior approved equal.

1.05 REFERENCES

- A. ASTM B209.
- B. ASSE 1060-Performance Requirements for Outdoor Enclosures for Backflow Prevention Assemblies.

PART 2 PRODUCTS

2.01 MATERIALS OF FABRICATION

- A. Material of fabrication shall be 5052-H32 marine grade aluminum (.050/18 gauge), and shall meet ASTM B209.
 - 1. Finish of enclosure to be pre-finished, figure in bid custom color. Exact color to be selected by architect during submittal process.
 - 2. Provide sample of finish to architect/engineer with submittal during submittal process.
- B. Insulation shall be 1.5" (10.0 "R" value) minimum thickness polyisocyanurate foam laminated to a glass fiber reinforced facer (each side). The insulation shall have the following properties:
 - 1. Dimensional Stability-Less than 2% linear change, ASTM D-2126;
 - 2. Compressive Strength-20PSI, ASTM D-1621;
 - 3. Water Absorption-Less than 1% by volume, ASTM C-209;
 - 4. Moisture Vapor Transmission-Less than one (1) perm, ASTM E-96;
 - 5. Product Density-Nominal 2.0 lbs. per cubic foot, ASTM D-1622;
 - 6. Flame Spread=25, ASTM E-84;
 - 7. Service Temperature= -1000F to +2500F maximum.
 - 8. The insulation shall be of uniform thickness.
- C. Structural members shall be redwood.

2.02 ROOF, WALLS & PANELS

- A. The roof, walls & panels of the enclosure shall be constructed of 5052-H32 (.050/18 gauge) marine grade aluminum, mill finish, ASTM B209 outside with insulation 1 1/2" (10.0 "R" value) thick in the walls and panels and 3" (20.0 "R" value) thick in the roof.
- B. The aluminum, insulation and redwood shall be securely bonded together to form a composite panel.
- C. The aluminum panels shall be provided with a PVC or similar exterior film to prevent damage before installation. The film shall be removed before installation.
- D. The complete assembly, including valve stems, shall be protected by being inside the enclosure.

- E. The roof shall be securely attached to the walls with screws and inside roof connections.
- F. All screws shall attach to redwood members.
- G. The walls of the enclosure shall be securely attached to the concrete base with inside anchoring brackets.
- H. Access panels shall be completely removable.
- I. Access panels shall be provided with built-in pad lockable folding T-handles.
- J. Drain panel shall have a stainless steel hinge and a stainless steel light strength spring as a positive means of closure so that the drain panel will not be activated by wind.
- K. Drain panel shall be designed to remain closed except during water discharge.

2.03 HEATING EQUIPMENT (ASSE 1060 Class I-Required; ASSE 1060 Class II-Optional)

- A. Heating equipment shall be furnished and designed by the manufacturer of the enclosure to maintain an interior temperature of +400F with an outside temperature of -300F.
- B. The heater shall have two electrical resistance elements completely enclosed within a solid aluminum cast platen base.
- C. The platen heater shall be designed for installation to the concrete base with mounting hardware provided.
- D. The platen heater shall be suitable for installation underneath a reduced pressure zone device and designed to sustain water spray without damage to or impeding the performance of the heater.
- E. The platen heater shall be provided with a thermostat adjustable from +40°F to +100°F. The thermostat, all conduit and wiring fittings provided shall be suitable for "water-tight" installation.

2.04 MOUNTING HARDWARE

- A. Mounting hardware shall be furnished and shall be 300 series stainless steel.
- B. All threaded fasteners shall be furnished and shall be 400 series stainless steel and/or Hilti type Tap-Fast w/Quickcoat™ and Flo Seal washer or equal.
- C. All masonry fasteners shall be furnished and shall be stud type Hilti Kwik Bolt II™ and/or Hilti type Hit Anchors or equal.
- D. All necessary drill bits shall be furnished.

PART 3 INSTALLATION

3.01 GENERAL

- A. Enclosure shall be mounted on a 6" thick concrete reinforced (4000psi concrete; 6x6 woven wire mesh) pad (with chamfered edges), pad to extend 6" all around backflow preventer enclosure.
- B. Enclosure shall be assembled and mounted to concrete pad according to manufacturer's instructions.
- C. Enclosure shall be assembled and mounted to concrete pad in such a way that it will remain locked and secured to pad even if outside screws are removed.
- D. Provide 12x12 block out at center of concrete pad for drain, fill with large gravel. Route drain from backflow preventer to 12x12 block out.

END OF SECTION

9-2-25

SECTION 22 1000 - DOMESTIC WATER SYSTEM

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provision of the contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Work Included
 - 1. Domestic Water Piping
 - 2. Water Hammer Arrestors
 - 3. Hose Bibbs
 - 4. Vacuum Breakers
 - 5. Backflow Preventers
 - 6. Disinfecting
 - 7. Valve Boxes
 - 8. Refrigerator Valve Box w/ Valve
 - 9. Washing Machine Connection Box
- B. Description
 - 1. Provide systems of domestic water piping and accessories so that every fixture and piece of water using equipment in the building will be furnished with a water supply.
 - 2. Extend the domestic cold water service to point shown on the drawings.

1.03 SUBMITTALS

- A. General: All submittals shall comply with the requirements in Division 1 - GENERAL REQUIREMENTS and Section 20 01 00 - GENERAL PROVISIONS.
- B. Product Data: Data shall be submitted on the following items:
 - 1. Domestic Water Piping
 - 2. Water Hammer Arrestors
 - 3. Hose Bibbs
 - 4. Vacuum Breakers
 - 5. Backflow Preventers
 - 6. Valve Boxes
 - 7. Refrigerator Valve Box w/ Valve
 - 8. Washing Machine Connection Box
- C. Operation and Maintenance Instructions: Data shall be provided for the following items:
 - 1. Hose Bibbs
 - 2. Vacuum Breakers
 - 3. Backflow Preventers
 - 4. Water Hammer Arrestors.
 - 5. Washing Machine Connection Box

1.04 QUALITY ASSURANCE

- A. Standards
 - 1. American National Standards Institute (ANSI):
 - a. Standard B16.18, Cast Copper Alloy Solder-Joint Pressure Fittings, 1978 Edition.
 - b. Standard B16.21, Non-Metallic Gaskets for Pipe Flanges, 1962 Edition.
 - c. Standard B16.22, Wrought Copper and Bronze Solder-Joint Pressure Fittings, 1980 Edition.

- d. Standard B16.24, Bronze Flanges and Flanged Fittings, 150 and 300 Pound, 1979 Edition.
 - e. Standard B31.1, Power Piping and Addendum, 1977 Edition.
- 2. American Society for Testing and Materials (ASTM):
 - a. Standard A307, Carbon Steel Externally and Internally Threaded Standard Fasteners, 1980 Edition.
 - b. Standard B88, Specification for Seamless Copper Water Tube, 1983 Edition.
- 3. American Water Works Association (AWWA):
 - a. Standard C110, Grey-Iron and Ductile-Iron Fittings, 3 inc. through 48 inc., for Water and Other Liquids, 1977 Edition.
 - b. Standard C111, Rubber-Gasket Joints for Cast-Iron and Ductile-Iron Pressure Pipe Fittings, 1979 Edition.
 - c. Standard C151, Ductile-Iron Pipe, Centrifugally Cast In Metal Molds or Sand-Lined Molds, for Water or other Liquids, 1976 Edition.
- 4. Federal Specifications (Fed. Spec.):
 - a. Specification BB-C-120B, Chlorine, Technical: Liquid.
 - b. Specification WW-U-516C, Unions, Brass or Bronze, Threaded Pipe Connections, and Solder Joint Tube Connections.
- 5. Plumbing and Drainage Institute (PDI):
 - a. Standard WH-201, Water Hammer Arrestors, 1977 Edition.
- B. Qualifications of Manufacturer
 - 1. All copper piping to be a product of the United States of America. Manufacturer's of copper pipe to be Cerro, Reading, & Mueller. Contractor to provide submittals of pipe as noted within this specification.
- C. Qualifications of Installers
 - 1. All welders employed for the work shall be qualified under the requirements of ANSI B31.9.0, Section 127.5. Certification of welder's qualifications shall be submitted to the Architect before any welds are made.

PART 2 PRODUCTS

2.01 PIPING AND FITTINGS

- A. Pipe and fittings shall be as listed herein and shall be used on the services indicated.
- B. PVC Pipe: ASTM D1785, Schedule 80, or ASTM D2241. SDR for not less than 200 psig pressure rating; Fittings: ASTM D2467, PVC; and Joints: ASTM D2672, solvent weld for:
 - 1. All site domestic water piping shown on Mechanical/Plumbing drawing to 5'-0" from building slab.

Note: Refer to civil specifications for all site domestic water piping shown on civil engineering utility plan drawing.
- C. Type "k" hard down copper tubing, ASTM B88, with silver soldered joints and wrought copper, ASME B16.22, or cast bronze, ASME B16.18, socket fittings for:
 - 1. Under/slab water service piping 4" in size and smaller to a point 3'-0" above the finished floor.
 - 2. All site water piping shown on Mechanical/Plumbing site plan.

Note: Refer to civil specifications for all site domestic water piping shown on civil engineering utility plan drawing.
- D. Type "L" hard down copper tubing, ASTM B88, with soldered joints and wrought copper, ASME B16.22, or cast bronze, ASME B16.18, socket fittings for:
 - 1. Above-ground cold water piping, all sizes.

2. Above-ground hot water piping, all sizes.
 3. All piping located in return air plenum.
 4. All HVAC condensate piping.
- E. Type "L" soft drawn copper tubing, ASTM B88, with soldered joints and socket fittings for:
1. Underground water piping to trap primers. No joints under slab allowed.
Note: All piping underslab shall be fitted with a color coded (red for "hot" and blue for "cold") polyethylene sleeve which shall be extended a minimum 6" above the slab.
- F. Pure Water System Piping (reverse Osmosis):
1. Not used.
- G. PEX piping NOT allowed.
- H. All potable water pipes, pipe related products, and materials that join or seal pipes conform to ANSI/NSF 61.
- I. All solvent cements and primers used to join and seal PVC materials shall comply with the requirements of ANSI/NSF 14.
- J. All underslab piping to be in polyethylene sleeve.

2.02 WATER HAMMER ARRESTORS & AIR CHAMBERS

- A. Contractor shall provide either of the following at every plumbing fixture. If Water Hammer Arrestors are used, they shall be installed in strict accordance with manufacturer's recommendations.
1. Water Hammer Arrestors shall have a spun closed copper tube chamber permanently sealing a pressurized inert gas chamber, O-ring sealed piston and certification stamp as conforming to PDI WH-201. Water hammer arrestors shall be:

Watts	Number 15
Josam	75000-S Series
Sioux Chief	Hydra-rester
 2. Air Chambers: Air chambers shall be Type "L" copper tubing 12" in length and one pipe size larger than the pipe on which it is installed.

2.03 DIELECTRIC ADAPTERS

- A. Dielectric adapters shall be provided between copper and iron pipe connections and between ferrous and non-ferrous piping or equipment. Refer to Section 20 2116- Piping Specialties.

2.04 UNIONS

- A. Unions in copper tubing shall be cast bronze, Fed. Spec. WW-U-516C, with threaded or solder joint ends to match pipe connections.
- B. Unions between ferrous and non-ferrous piping shall be dielectric type as specified hereinbefore under Dielectric Adapters.

2.05 FLANGES

- A. Flanges in copper tubing shall be 150 pound cast bronze, ANSI B16.24, with solder neck and raised or flat face to mate with adjacent flange, valve, fitting, or piece of equipment.
- B. Flanges between ferrous and non-ferrous piping shall be dielectric type as specified hereinbefore under Dielectric Adapters.
- C. Flange gaskets shall be 1/16 inch non-metallic, ring type, ANSI B16.21.

- D. Flange gaskets shall be carbon steel, all threaded type. Nuts shall be carbon steel hexagon type. Steel for bolts and nuts shall conform to ASTM A307, Grade A.

2.06 VACUUM BREAKERS

- A. Vacuum breakers shall be the screw on vandal proof type with finish to match outlet finish - (i.e. chrome plated vacuum breakers on chrome plated hose outlets). Vacuum breakers shall be:

Watts	8A
A.W. Cash	VB101
Nidel	34HD

2.07 BACKFLOW PREVENTERS

- A. Backflow preventers shall be the same size as the pipe on which it is installed unless noted otherwise on the drawings.
- B. Backflow preventers to be lead-free.
- C. Domestic Water BFP: Refer to MP-1.1.
- D. Fire Water BFP: Refer to MP1.1.
- E. Beverage Dispenser Water Supply – Dual Check Valves: Certified to ANSI/NSF Standard 18. Tested and certified under ASSE Standard 1022. Atmospheric port. 316 stainless steel body. Rated maximum pressure 150 psi and working temperature 33 to 130 degrees F. Sizes 1/4" and 3/8" – Watts Regulator Company Series SD-3.

2.08 REFRIGERATOR VALVE BOX

- A. Refrigerator valve box shall be fully recessed flush mounted type constructed of 20 gauge steel (faceplate to be 20 gauge) with powder coat white finish. Metal box to have flame spread of 94 (UL) and 94BHB (ASTM). Valve shall comply with NSF 61 & ASME A112.18.1. Valve to be low-lead type. Valve box to have nail support brackets with screw-on faceplate frame. Valve to be 1/4 turn. Supply connection shall be 1/2" copper sweat connection. Provide with water hammer arrestor (ASSE 1010 compliant).
- B. Manufacturer: Guy Gray Model 88531, Oatey 39140

2.09 FIXED AIR GAPS

- A. Fixed air gaps shall be:

	<u>3/4" - 1"</u>	<u>1 1/4" - 4"</u>
Watts	Series AG	Series AG
J.R. Smith	Series 3950	Series 3951
Josam	Series 1801	Series 1800
Zurn	Series Z-1025	Series Z-1025
Josam	88900	

2.10 TRAP PRIMER

- A. Trap primer shall be automatic type with cast bronze body, removable valve mechanism, integral vacuum breaker, and 1/2 inch diameter socket tube ends.

1. Trap primer shall be:

J.R. Smith	2699-1
Josam	88250
Wade	W-2400-CS
Zurn	Z-1022
Precision	PR-500
Josam	Series 88250

2. Trap Primer serving more than one (1) floor drain shall be:

3. Automatic trap primer shall be equipped with backflow preventer as required by Current Edition, International Plumbing Code.
- B. Drainage-Type Trap Seal Primer Valves: ASSE 1044, fixture-trap, waste-drainage-fed type, with the following characteristics:
 1. Chrome-plated, cast-brass, NPS 1-1/4 DN 32 minimum, lavatory P-trap with NPS 3/8 DN 10 minimum, trap makeup connection.
 2. Contractor shall utilize white PVC flexible tubing for water pipe connection from p-trap connection to wall.
 3. All piping within wall & under slab to be 1/2" soft rolled copper with no joints.

2.11 ICE MAKER CONNECTION BOX

- A. Ice Maker valve box shall be fully recessed flush mounted type constructed of 20 gauge steel (faceplate to be 20 gauge) with powder coat white finish. Metal box to have flame spread of 94 (UL) and 94BHB (ASTM). Valve shall comply with NSF 61 & ASME A112.18.1. Valve to be low-lead type. Valve box to have nail support brackets with screw-on faceplate frame. Valve to be 1/4 turn. Supply connection shall be 1/2" copper sweat connection. Provide with water hammer arrestor (ASSE 1010 compliant).
- B. Manufacturer: Guy Gray Model 88531, Oatey 39140

2.11 ICE MAKER CONNECTION BOX (FIRE RATED)

- A. Ice maker valve box shall be fully recessed flush mounted type constructed of bulk molding compound (BMC) with UL-classified intumescent pads and UL-classified fyrewrap insulating material. Box to be 2 hour fire rated. Valve shall comply with NSF/ANSI 372 (Annex G). Valve to be low-lead type. Valve box to have nail support brackets with screw-on faceplate frame. Valve to be 1/4 turn. Supply connection shall be 1/2" copper sweat connection. Provide with water hammer arrestor (ASSE 1010 compliant).
- B. Manufacturer: Oatey Model 38490, Guy Gray Model 82417

2.12 WASHING MACHINE (LAUNDRY) CONNECTION BOX (FIRE RATED)

- A. All washing Machine (laundry) connection boxes shall be fully recessed flush mounted type constructed of bulk molding compound (BMC) with UL-classified intumescent pads and UL-classified fyrewrap insulating material. The connection box shall include 1/2" FIP inlet valves (hot and cold water) and 2" drain. Supply connection shall be 1/2" mpt or 5/8" sweat connection. Box to be 2 hour fire rated. Valve shall comply with NSF 372 Annex G & ASME A112.18.1. Provide with water hammer arrestor (ASSE 1010 compliant).
- B. Manufacturer: Oatey Model 38478, Guy Gray Model 82371

2.13 ALLOWANCES

- A. Plumbing Contractor shall assume a minimum of five (5) additional water drops (3/4" and below) with ball valves due to possible changes in equipment requirements. These drop will come off nearest available source of sufficient size.

PART 3 EXECUTION

3.01 INSTALLATION

- A. A union or flange shall be provided at all piping connection to equipment.
- B. Faucets, flush valves, and shower heads shall be cleaned of dirt and debris.
- C. Changes in pipe size shall be made with reducing fittings. No bushings will be allowed.
- D. Underground water piping shall have a minimum cover of 3' - 0" to the top of the pipe. Provide tracer warning tape, refer to General Provisions Specifications.

- E. Install water hammer arrestors within the chase or in the wall on the hot and cold water branch lines serving fixtures; on the cold water branch lines serving individual flush valve water closets and urinals; and elsewhere as indicated on the drawings.
- F. Install air chambers on the hot and cold water branch lines to all fixtures not provide with water hammer arrestors. Individual fixtures in a battery or fixtures with water hammer arrestors on the supply line will not require an air chamber.
- G. Vacuum breakers shall be provided on all hose outlets unless the drawings indicate that a backflow preventer is to be provided on the piping serving the outlet.
- H. The atmospheric relief from backflow preventers shall be piped through a fixed air gap to a floor drain.
- I. Underground piping from trap primer to floor drains shall be installed without fittings.
- J. Not used.
- K. The owner provided equipment shall be furnished and set in place under another section of these specifications and/or by separate contract. Plumbing Contractor shall provide necessary rough-in required for this equipment and shall completely connect all plumbing services for this equipment, providing cut-off valves and union for all plumbing supply service to each piece of equipment. It is the obligation of the plumbing contractor to obtain correct roughing-in dimensions and drawings for this equipment as well as the equipment furnished under this contract.
- L. Contractor to test all new backflow preventers in accordance with International Plumbing Code (current edition) & in accordance with one of the following standards: ASSE 5013, ASSE 5015, ASSE 5020, ASSE 5047, ASSE 5048, ASSE 5052, ASSE 5056, CSA B64.10.1, USC's FCCC & HR's "Manual of Cross- Connection Control", or UFL's TREEO's "Backflow Prevention – Theory and Practice". Provide initial certification (at project completion). Include certification within closeout documents (O&M manuals).

3.02 JOINTS

- A. Mechanical joints for ductile iron pipe shall be made with a follower gland, gasket, bolts, and nuts as per AWWA C111.
- B. Push-on joints for ductile iron pipe shall be made with a one piece lubricated compression rubber gasket as per AWWA C111.
- C. Threaded joints shall be made up with Teflon tape. After cutting but prior to threading, pipe shall be reamed and shall have burrs removed.
- D. Brazed joints shall be made using a BcuP-5 brazing alloy with a compatible flux.
- E. Solder joints shall be made using a 95-5 tin-antimony solder with a compatible flux.
- F. Flanged joints shall be made with ring type non-metallic gaskets, bolts and nuts.
- G. At contractor's option, tee branches in aboveground copper tubing may be made using the T-drill method. Joint between main and branch tubing shall be sealed using a BcuP-5 brazing alloy with a compatible flux.

3.03 ADJUSTING

- A. Adjust and balance all water systems to obtain operating flows at all fixtures and water using equipment. Also adjust and balance the hot water circulation from all portions of the building.

3.04 DISINFECTION

- A. All domestic water service and supply piping installed under this DIVISION shall be disinfected with chlorine before it is placed into operation in strict accordance with International Plumbing Code, Current Edition. The Contractor shall submit to the Architect written certification that the system was disinfected. Certification that the system was disinfected. Certification shall include name of project, name of owner, and name of operators, date of disinfection, times of disinfection period, maximum chlorine level, and residual chlorine level.
- B. Flush water system a minimum of three (3) times prior to owner occupancy. Provide in writing record of flush to mechanical engineer on contractor letterhead.
- C. The following is an excerpt of the International Plumbing Code (2021), 610: Disinfection of Potable Water System. The plumbing official may require that a potable water system or any

part thereof installed or repaired be disinfected in accordance with one of the following methods before it is placed in operation.

New potable water systems shall be purged of deleterious matter and disinfected prior to utilization. The method to be followed shall be that prescribed by the health authority or water purveyor having jurisdiction or, in the absence of a prescribed method, the procedure described in either AWWA C651 or AWWA C652, or as described in this section. This requirement shall apply to "on-site" or "in-plant" fabrication of a system or to a modular portion of a system.

1. The pipe system shall be flushed with clean, potable water until dirty water does not appear at the Points of outlet.
2. The system or part thereof shall be filled with a water/ chlorine solution containing not less than 50 parts per million (50 mg/L) of chlorine, and the system or part thereof shall be valved off and allowed to stand for 24 hours; or the system or part thereof shall be filled with a water/chlorine solution containing not less than 200 parts per million (200 mg/L) of chlorine and allowed to stand for 3 hours.
3. Following the required standing time, the system shall be flushed with clean potable water until the chlorine is purged from the system.
4. The procedure shall be repeated where shown by a bacteriological examination that contamination remains present in the system.

3.05 PROTECTIVE COATING FOR UNDERGROUND PIPING

- A. Refer to specification section 200200.

3.06 WATER FLOW TEST

- A. The contractor shall provide A/E written documentation of water flow test results at new connection to existing water system. Test existing water system prior to construction.

3.07 FLUSHING OF SYSTEM

- A. Contractor shall flush new and existing system three (3) times prior to turning facility over to owner.

3.08 PURE WATER TREATMENT SYSTEM & PURE WATER PIPING SYSTEM

- A. Not used.

END OF SECTION

9-2-25

SECTION 22 1123 - NATURAL GAS SYSTEM

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

- A. Work Included
 - 1. Pipe standard compliance certificates.
 - 2. Pressure regulators.
 - 3. Gas Piping & Fittings.
 - 4. Pipe connection methods.
 - 5. Single Seal Anodeless Risers.
 - 6. Gas Connection to Equipment
- B. Description
 - 1. Provide system of natural gas piping to all equipment requiring gas. Provide new gas meter and regulator. The new gas regulator plus extension into the building will be installed by the contractor. Fees for such work shall be the responsibility of the Contractor. Contractor to coordinate with local gas company for delineation point of work (coordinate where gas company will run pipe to and where this contractor begin work). Contractor to coordinate with local gas company and include all associated fees, permits, connections, etc. (including cost of bringing gas pipe service to building). Contractor to provide a complete and working system & include all associated costs (including connection to building from city main).

1.3 SUBMITTALS

- A. General: All submittals shall comply with the requirements of Division 1 - GENERAL REQUIREMENTS and section 200100 - GENERAL PROVISIONS.
- B. Product Data: Data shall be submitted on the following items:
 - 1. Pipe standard compliance certificates.
 - 2. Pressure regulators.
 - 3. Gas Piping & Fittings.
 - 4. Pipe connection methods.
 - 5. Single Seal Anodeless Risers.
 - 6. Gas Connection to Equipment
- C. Operation and Maintenance Instructions: Data shall be provided for the following items:
 - 1. Pressure Regulators.
 - 2. Solenoid valves.

1.4 QUALITY ASSURANCE

- A. Standards
 - 1. American National Standards Institute (ANSI):
 - a. Standard B16.3, Malleable Iron Fittings, 1977 Edition.
 - b. Standard B16.5, Steel Pipe Flanges and Flanged Fittings, Joint Pressure Fittings, 1981 Edition.
 - c. Standard B16.18, Cast Copper Alloy Solder - Joint Pressure Fittings, 1978 Edition.
 - d. Standard B16.21, Non-Metallic Gaskets for Pipe Flanges, 1962 Edition.
 - e. Standard B16.22, Wrought Copper and Bronze Solder - Joint Pressure Fittings, 1980 Edition.
 - f. Standard B31.1, Power Piping and Addendum, 1977 Edition.

2. American Society for Testing and Materials (ASTM):
 - a. Standard A120, Pipe, Steel, Black and Hot-dipped Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses, 1983 Edition.
 - b. Standard A234, Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures, 1982 Edition.
 - c. Standard A307, Carbon Steel Externally and Internally Threaded Standard Fasteners, 1982 Edition.
 - d. Standard B88, Specification for Seamless Copper Water Tube, 1983 Edition.
 - e. Standard D2513, Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings, 1984 Edition.
3. Federal Specifications (Fed. Spec.):
 - a. Specification WW-U-516C, Unions, Brass and Bronze, Threaded Pipe Connections, and Solder Joint Tube Connections.
 - b. Specification WW-U-531E, Union, Pipe, Steel or Malleable Iron, Threaded Connection, 150 lbs. and 250 lbs.
- B. Qualifications of Manufacturer:
 1. Pipe and fittings shall be manufactured in the United States.
- C. Qualification of Installers:
 1. All welders employed for the work shall be qualified under the requirements of ANSI B31.2.0, Section 127.5. Certification of welders qualifications shall be submitted to the Architect/Engineer before any welds are made.

PART 2 PRODUCTS

2.1 GENERAL

- A. All gas equipment specified herein shall be designed and constructed for use with natural gas.

2.2 PIPE AND FITTINGS

- A. Pipe and fittings shall be listed herein and used on the services indicated.
- B. Schedule 40 black steel pipe, ASTM A153, with welded joints and standard weight black steel butt welding fittings, ASTM A234, for:
 1. Above ground gas piping 2-1/2" in size and larger downstream of regulator.
 2. All piping within building above concealed ceiling.
- C. Schedule 40 black steel pipe, ASTM A120, with screwed joints and 150 pound threaded malleable iron fittings, ANSI B16.3, for:
 1. Above ground gas piping 2" in size and smaller downstream/upstream of regulator.
- D. Polyethylene Pipe: ASTM D2513, SDR 11.5, with fittings: ASTM D2683 to ASTM D2513, socket type and joints shall be fusion welded, for:
 1. Gas piping installed underground.
- E. Corrugated Stainless Steel Tubing: **Gas Piping as noted on drawings:**
 1. CSST gas piping shall be routed in PVDF pipe sleeve and shall conform to the requirements of the ANSI LCI Standard for corrugated stainless steel tubing (CSST) fuel gas piping systems. Product shall carry the American Gas Association (AGA) international logo or symbol. The flexible corrugated tubing shall be made of Type 304 Series stainless steel. The tubing jacket shall be of polyethylene and shall be yellow to comply with international color code for gas. The mechanical fittings, terminations and striker plated used in the installation of CSST shall be tested and listed as a system. No joints allowed underslab. CSST shall be Gastite Flexible Gas Piping, TracPipe Gas Piping or Diamondback Gas Piping.
 2. Codes: ICC Codes (IFGC, IRC, IMC, IPC), NFPA 54, UPC, CAN/CSA B149.1, NFPA58 Standards: ANSI LC1/CSA 6.26, ASTM E84 (UL723), ICC LC 1024, ANSIZ223.1
 3. Listings: CSA, ICC PMG, UL (Through Penetration Firestop System)

4. **Pipe** - CSST tubing shall be 300 series Stainless Steel Strip conforming to ASTM A240 rated for 25 psi and have an elevated pressure rating of 125G for sizes up to 1 ¼" and 25G for 1 ½" and 2". Tubing shall not be subjected to heat treating or annealing after the corrugation forming operation.
 5. **Jacket** - CSST jacket shall be an extruded fire-retarded engineered polymer designed to enhance the energy dissipating properties of the flexible gas piping. Conductive jacket shall conform to ASTM E-84 (UL723) flame spread rating not to exceed 25 and ASTM-E84 (UL723) smoke density rating shall not exceed 50. Conductive jacket shall be resistant to UV.
 6. **Fittings** - CSST fittings shall be made of yellow brass and be tested and listed by CSA International for use in concealed locations. The fittings shall flare the tubing using a stainless steel insert to pilot the tubing ID or an integral snap ring in a one piece fitting. The fitting and tubing assembly shall provide a metal to metal seal. Brass fittings shall not contain gaskets or O-rings to facilitate the seal between the tubing and the fitting.
 7. **Quality Assurance** - CSST shall be listed by CSA International to the performance requirements of ANSI LC 1 / CSA 6.26. The conductive jacket shall meet the requirements of ANSI LC 1 / CSA 6.26, Part 5.16.
 8. **Installer Qualifications** - Each installer must meet applicable state and local requirements established by the Authority Having Jurisdiction (AHJ) and must be successfully trained through the manufacturer's installation program.
 9. **Installation** –
 - a. **Appliance Terminations:** Termination Mount fittings are to be used for the tubing at all moveable appliance locations and other stub-out points. The tubing may be run directly to the manual shut-off valve on fixed appliances
 - b. **Regulators:** Regulators shall be listed to a recognized national standard for pressure regulators. Line Pressure Regulators listed to ANSI Z21.80 and equipped with a vent limiter do not require a vent line to be run outdoors.
 - c. **Protection:** Striker plates shall be used where necessary and marked with the symbol of the Manufacturer and CSA International. Striker Plates shall be made from carbon steel, heat treated to >RB75 and <RB85. Floppy type RW galvanized steel electrical conduit shall be used for additional protection.
 - d. **Identification** - CSST shall be marked with the manufacturer's name or symbol, approving agencies, pressure rating and manufacturing date code. The piping system shall be marked by the manufacturer with the word "GAS" in black letters every two feet. Do not paint, stencil or apply unapproved labels to the piping system.
 - e. **Electrical Bonding** - Flexible gas piping shall be bonded in accordance with the National Electrical Code NFPA 70 Article 250.104 and the National Gas Code NFPA 54, and any local requirement which may exceed the national codes.
 - f. If bonding is required, a bonding clamp must be attached to the brass fitting or to a black pipe component in the same electrically continuous gas piping system. The corrugated stainless steel portion of the gas piping shall NOT be used as a bonding attachment under any circumstance.
- F. Schedule 80 black steel pipe, ASTM A153, with welded joints and standard weight black steel butt welding fittings, ASTM A234, for:
1. Gas piping serving natural gas generator.
 - a. All aspects of the natural gas supply shall be in accordance with NFPA, 37, 54 and 110. Where the gas supply is connected to the building gas supply system, it shall be connected on the supply side of the building main gas shutoff valve and marked as supplying an emergency generator. The building's main gas shutoff valve shall be marked to indicate the existence of the separate generator shutoff valve. Gas piping shall be Schedule 80, black steel, painted ANSI "Natural Gas" Yellow and installed by a licensed plumbing contractor. The connection at the generator is to be made with a flexible piping connection provided by the generator manufacturer. Gas trains shall include an equipment isolation valve at the generator, a manual shutoff valve in a

remote location, a regulator and two automatic safety shutoff valves at the generator each with manual leak test valves. The automatic safety shutoff valves shall stop the flow of fuel in the event the engine stops for any cause. All gas piping shall be tested and purged in accordance with NFPA 54:8.

2.3 UNIONS

- A. Unions in copper tubing shall be cast bronze, Fed. Spec., WW-U-516C, with threaded or solder joint ends to match pipe connections.
- B. Unions in steel piping shall be 150 pound malleable iron, Fed. Spec. WW-U-531E, with threaded ends to match pipe connections.
- C. Unions between ferrous and non-ferrous piping shall be dielectric type as specified hereinbefore under Section 202130 - PIPING SPECIALTIES.

2.4 FLANGES

- A. Flanges in steel pipe shall be 150 pound steel, ANSI B16.5, slip-on type welding flange with raised or flat face to mate with adjacent flanges, valve, fittings, or piece equipment.
- B. Flanges between ferrous and non-ferrous piping shall be dielectric type as specified hereinbefore under Section 202130- PIPING SPECIALTIES.
- C. Flange gaskets shall be 1/16 inch non-metallic, ring type, ANSI B16.21.
- D. Flange bolts shall be carbon steel, all threaded type. Nuts shall be carbon steel hexagon type. Steel for bolts and nuts shall conform to ASTM A307, Grade A.

2.5 GAS PRESSURE REGULATORS

- A. Service Pressure Regulator(s): Gas service pressure regulator(s) shall be as provided by the serving utility company (upstream gas meter).
- B. Line Pressure Regulator(s): Line pressure regulator(s) shall be provided for precise control of the gas pressure and flow rate delivered to gas-burning appliances. Line pressure regulator's shall be provided and installed by the contractor.
- C. Regulators shall be installed where line pressure exceeds the gas pressure ratings for appliances supplied thereof and as shown on Drawings.
- D. Regulators shall be required to ensure protection for gas-fired appliances against emergency gas exposure of at least 2 psig.
- E. Regulators shall comply with ANSI Z21.80 and fabricated with internal parts that are corrosion-resistant. Regulators shall be capable of maintaining outlet pressure under no flow condition or dead end lock up situation. Approved model # shall be GOVERNOR by Pietro Fiorentini or prior approved equal.
- F. Venting of Gas Regulators: If located indoors, gas pressure regulators shall have an independent vent pipe routed to the outside of the building. The vent pipe shall be arranged so as to preclude the entry of water or foreign objects. Separate vent piping is not required if the regulator is less than 1¼", is equipped with and is labeled for utilization with approved vent-limiting device installed as per the manufacturer's recommendations.
- G. Plumbing contractor to co-ordinate with General Contractor on all Owner supplied equipment which require gas. Contractor to provide additional regulators at each piece of equipment.

2.6 SINGLE SEAL ANODELESS RISERS

- A. Provide single seal anodeless riser (premanufactured epoxy coated steel to polyethylene gas pipe riser) as manufactured by Elster Perfection. Provide single fused joint under grade at riser connection to polyethylene piping (Medium Density PE2406).
 - 1. Provide where gas piping extends from below grade to above grade.
 - 2. Provide at all gas piping entry points into building.

2.7 GAS CONNECTION TO EQUIPMENT

- A. The contractor shall provide final connection of all equipment/appliances requiring natural gas. Install connection to equipment in strict accordance with equipment manufacturer's recommended installation guidelines. Where equipment manufacturer allows for the use of flexible connections the contractor shall provide.

- B. Provide connections, shutoff valves, regulators and unions at each and every appliance and piece of equipment requiring natural gas, including equipment furnished under other Divisions of these Specifications and/or by the Owner.
- C. Provide and install union type connections at all equipment to permit removal of service piping.
- D. Gas service connections shall have a diameter at least one pipe size larger than that of the inlet connection to the equipment as provided by the manufacturer and be of adequate size to provide the total input demand of the connected equipment.
- E. Food Service Equipment Connections: Provide listed and labeled appliance connectors complying with ANSI Z21.69 and listed for use with food service equipment having casters, or that is otherwise subject to movement for cleaning, and other large movable equipment. Connectors shall have listed and labeled quick-disconnect devices and shall have retaining cables attached to structures and equipment. Connectors shall not be concealed within or extended through wall, floor or partition and shall be located entirely in the same room as the connected equipment. Provide an accessible shut-off valve not less than the nominal size of the equipment connector, immediately ahead of the connector.
- F. Rigid metallic pipe and fittings shall be used at service connections to all stationary equipment.
- G. Provide 6" dirt/drip leg with threaded cap at connection to all appliances/equipment requiring natural gas.

PART 3 EXECUTION

3.1 INSTALLATION

- A. A valve and union shall be provided at each connection to a piece of equipment. Equipment provided with a flanged inlet shall have a flanged connection.
- B. Horizontal gas piping shall slope up in the direction of flow not less than 1/4 inch in 15 feet.
- C. Drip legs, 6-inches long, shall be provided in gas piping at ends of horizontal runs, at the base of risers, and at connections to equipment.
- D. Gas piping from the regulator shall be run above ground on the existing pipe rack.
- E. Branch piping shall be taken off the top or sides of horizontal lines but not from the bottom.
- F. Changes in pipe size shall be made with reducing fittings. No bushings will be allowed.
- G. Contractor shall obtain prices from the local gas company for their services. Prices shall include all necessary equipment, labor, etc. for tie-ins to mains including but not limited to all meters. Contractor's bid shall include the cost for these services. Contractor is responsible for coordinating all tie-ins to mains with the local utility companies.
- H. The owner equipment shall be furnished and set in place under another section of these specifications and/or by separate contract. Plumbing Contractor shall provide necessary rough-in required for this equipment and shall completely connect all plumbing services for this equipment, providing cut-off valves and union for all plumbing supply service to each piece of equipment. It is the obligation of the plumbing contractor to obtain correct roughing-in dimensions and drawings for this equipment as well as the equipment furnished under this contract.
- I. ALL PE pipe to be traced with copper wire when bored, when installed using open trench the pipe shall have a metallic tracer tape with words "caution gas".
- J. A steel striker barrier not less than 0.0508" thick, or equivalent, shall be installed between the gas tubing (within walls) and the finished wall and extend a minimum of 4" beyond the concealed penetrations of plates, fire stops, wall studs, and so forth.
- K. Route pipe vents from gas pressure reducing valves and pipe casing sleeves to the exterior of the building and terminated with outlet turned down and capped with corrosion resistant insect screen. Vent terminations shall be at least seven feet above grade or pedestrian traffic and a minimum three (3) feet above or ten (10) feet horizontally from all air intakes or building openings.

- L. Provide access to the regulator and ensure that the device is properly installed by following the arrow indicating the gas flow direction. Line pressure regulator must be installed in a horizontal position if the device is equipped with a vent limiter.

3.2 JOINTS

- A. Threaded joints shall be made with a mixture of graphite and oil applied to male threads only. After cutting and prior to threading, pipe shall be reamed and shall have burrs removed.
- B. Welded joints shall be fusion welded in accordance with ANSI B31.1, Section 6.
- C. Flanged joints shall be faced true, provided with gasket, and made square and tight.
- D. Brazed joints shall be made up using a BCuP-5 brazing alloy with a compatible flux.
- E. Polyethylene Pipe: Fused joints shall be made by applying electric resistance heat to the joint in accordance with Federal Register 192.285, Title 49.

3.3 GENERATOR GAS PIPING INSTALLATION

- A. All aspects of the natural gas supply shall be in accordance with NFPA, 37, 54 and 110. Where the gas supply is connected to the building gas supply system, it shall be connected on the supply side of the building main gas shutoff valve and marked as supplying an emergency generator. The building's main gas shutoff valve shall be marked to indicate the existence of the separate generator shutoff valve. Gas piping shall be Schedule 40, black steel, painted and installed by a licensed plumbing contractor. The connection at the generator is to be made with a flexible piping connection provided by the generator manufacturer. Gas trains shall include an equipment isolation valve at the generator, a manual shutoff valve in a remote location, a regulator and two automatic safety shutoff valves at the generator each with manual leak test valves. The automatic safety shutoff valves shall stop the flow of fuel in the event the engine stops for any cause. All gas piping shall be tested and purged in accordance with NFPA 54:8.
 - 1. Automatic Emergency Shut-off Valves shall be U.L. Listed F.M. Approved for natural gas service, 2-way electrically tripped solenoid type; fail safe closed; manual reset; Type 3; 24 volt; solenoid enclosure; Aluminum body; POM core guide; PTFE Rider Ring, stainless steel core and plugnut; NBR seals and disc; stainless steel core tube and springs; copper shading coil; manufactured by ASCO Red Hat Series 8214 or prior approved equal (Emerson approved manufacturer). UL listed to standard 429. FM approved to class 7400. CSA certified to standard C22.2, Automatic Gas Valves Z21.21, & Automatic Gas Safety Shutoff Valves File 112872.

3.4 TRACER WIRE & WARNING TAPE

- A. Refer to General Provisions specification.

3.5 WELD TESTING:

- A. All welds are subject to inspection, visual and/or x-ray, for compliance with Specifications. The Owner will at the Owner's option, provide employees or employ a testing laboratory for the purposes of performing said inspections and/or x-ray testing. Initial visual and x-ray inspections will be provided by the Owner. The Contractor shall be responsible for all labor, material and travel expenses involved in the re-inspection and retesting of any welds found to be unacceptable. In addition, the Contractor shall be responsible for the costs involved in any and all additional testing required or recommended by ASME/ANSI Standards B31.1 and B31.3 due to the discovery of poor, unacceptable or rejected welds.
- B. Welds lacking penetration, containing excessive porosity or cracks, or are found to be unacceptable for any reason, must be removed and replaced with an original quality weld as specified herein. All qualifying tests, welding and stress relieving procedures shall, moreover, be in accord with Standard Qualification for Welding Procedures, Welders and Welding Operators, Appendix A, Section 6 of the Code, current edition.

END OF SECTION

9-2-25

SECTION 22 1300 - SANITARY WASTE & VENT AND STORM DRAINAGE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Work Included
 - 1. Piping
 - 2. Floor Drain(s)
 - 3. Drainage Accessories
 - 4. Cleanouts
 - 5. Traps
 - 6. Flashing

1.03 SUBMITTALS

- A. General: All submittals shall comply with the requirements of Division 1 - GENERAL REQUIREMENTS and Section 20 01 00 - GENERAL PROVISIONS.
- B. Product Data: Data shall be submitted on the following items:
 - 1. Piping
 - 2. Floor Drain(s)
 - 3. Drainage Accessories
 - 4. Cleanouts
 - 5. Traps
 - 6. Flashing

1.04 QUALITY ASSURANCE

- A. Standards
 - 1. American National Standards Institute (ANSI):
 - a. Standard B16.3, Malleable Iron Threaded Fittings, 1977 Edition.
 - b. Standard B16.5, Steel Pipe Flanges and Flanged Fittings, 1981 Edition.
 - c. Standard B16.12, Cast-Iron Threaded Drainage Fittings, 1977 Edition.
 - d. Standard B16.18, Cast Copper and Bronze Solder-Joint Pressure Fittings, 1978 Edition.
 - e. Standard B16.21, Non-metallic Gaskets for Pipe Flanges, 1962 Edition.
 - f. Standard B16.22, Wrought Copper and Bronze Solder-Joint Pressure Fittings, 1980 Edition.
 - 2. American Society for Testing and Materials (ASTM):
 - a. Standard A74, Cast Iron Soil Pipe and Fittings, 1982 Edition.
 - b. Standard A120, Pipe, Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses, 1983 Edition.
 - c. Standard A234, Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures, 1982 Edition.
 - d. Standard A307, Carbon Steel Externally and Internally Threaded Standard Fasteners, 1980 Edition.
 - e. Standard B43, Specification for Seamless Red Brass Pipe, Standard Sizes, 1984 Edition.
 - f. Standard B88, Specification for Seamless Copper Water Tube, 1983 Edition.
 - g. Standard B306, Specification for Copper Drainage Tube, 1983 Edition.

- h. Standard C444, Specification for Perforated Concrete Pipe, 1980 Edition.
 - i. Standard C564, Specification for Rubber Gaskets for cast Iron Soil Pipe and Fittings, 1970 Edition.
 - j. Standard D2148, Specification for Polyethylene Plastics Molding and Extrusion Materials, 1981 Edition.
 - k. Standard D2146, Specification for Propylene Plastic Molding and Extrusion Materials, 1982 Edition.
- B. Qualifications for Manufacturer
- 1. Pipe and fittings shall be of domestic manufacturer. Manufacturers of cast iron to be Charlotte Pipe or Tyler Pipe of Texas. PVC pipe manufacturers to be Charlotte Pipe or JM Eagle.

PART 2 PRODUCTS

2.01 PIPE AND FITTINGS

- A. Pipe and fittings shall be as listed herein and shall be used for the services indicated.
- B. PVC pipe: Solid Wall Schedule 40 ASTM D 2665 (cellular "Foam Core" NOT allowed) with PVC fittings and joints ASTM D 2665 shall be solvent welded, for:
 - 1. All below ground (under building slab) sanitary sewer waste, & sewer vent piping.
 - 2. All site sanitary sewer piping shown on mechanical/plumbing site plan.

NOTES: 1. Refer to civil specifications for all site sanitary sewer & storm drainage piping shown on civil documents.
- C. Wrought copper and wrought copper alloy solder-joint drainage fittings for plumbing drainage waste & vents, ASTM B306; Wrought Copper Fittings ASME B16.29, or Cast Copper ASME B16.23:
 - 1. All waste piping 1" in size and smaller.
- D. Cast Iron Pipe: ASTM A74, service weight; Fittings: Cast iron; Joints: Hub-and-spigot, CISPI 301 HSN, NSF listed compression type with ASTM C564 neoprene gaskets or lead and oakum for:
 - 1. All above ground sanitary sewer waste, & sewer vent piping: pipe above slab to be service weight with no-hub couplings as mentioned in section 2.02 below.

2.02 NO-HUB COUPLINGS

- A. Furnish & install hub-less soil pipe couplings designated Heavy Weight (HW) as manufactured by Charlotte Pipe by Ideal Tridon, Fernco, Anaco, or prior approved equal, made of extra wide, heavy duty, corrugated series 304 stainless steel with axially slotted, heavy duty worm drive clamps tightened to 80 in. Lbs. of torque. Flanged gasket to be made of neoprene rubber, meeting the requirements of ASTM C-564, with sealing rubber rings under each stainless steel clamp. Coupling to be ASTM 1540 compliant. Couplings shall have FM1680 approval.

2.03 FLANGES

- A. Flanges in steel pipe shall be 150 pound steel, ANSI B16.5, slip-on type welding flange with raised or flat face to mate with adjacent flanges, valve, fitting, or piece of equipment.
- B. Flange gaskets shall be 1/16 inch non-metallic, ring type, ANSI B16.21.
- C. Flange bolts shall be carbon steel, all threaded type, Nuts shall be carbon steel hexagon type. Steel for bolts and nuts shall conform to ASTM A307, Grade A.

2.04 FLOOR DRAINS

- A. FD (Restrooms and General Use): Floor drains shall have a cast iron body with adjustable 6"x6" square nickel bronze strainer and flashing flange. Drains shall be:

<u>Manufacturer</u>	<u>Hub & Spigot / No hub</u>
Wade	1100-G
Approved Equal: J.R. Smith, Watts, Zurn, Mifab, Josam	

- B. FD2 (Mechanical Rooms - Air Handling Rooms): Floor drains shall have a cast iron body with adjustable 8" round polished bronze strainer, recessed lip, and flashing flange. Drains shall be:

<u>Manufacturer</u>	<u>Hub & Spigot / No hub</u>
J.R. Smith	2005-F37
Josam	30000-E1
Wade	W-1100ER
Zurn	ZN-415-7I
Watts	FD-100-ER7
Mifab	F1100-C-ER7-1

- C. FD3 (Main Mechanical/Equipment Room, Ground Floor.): Floor drains shall have a cast iron body with 12x12 cast iron grate, slotted sediment bucket, and flashing flange. Drains shall be:

<u>Manufacturer</u>	<u>Hub & Spigot</u>
J.R. Smith	2630
Josam	35450
Wade	W-2370
Zurn	Z-566
Mifab	F1480-4

- D. All floor drains shall be equipped with trap primer connections.
- E. All floor drains to have barrier type trap primers in addition to the automatic trap primers. Barrier type trap primers to be SureSeal Waterless Inline Drain Trap Seal as manufactured by Rectorseal or prior approved equal.

2.05 CLEANOUTS

- A. Cleanouts shall be provided where shown on the drawings and shall be the same size as the pipe on which installed except cleanouts on underground piping shall be a maximum of 4". Contractor to provide cleanouts whether indicated on drawings or not (with cast iron boxes and covers marked "CO") every eighty (80) feet (max.) or change in direction as required by International Plumbing Code, current Edition.
- B. Cleanouts in waterproofed floors shall have flashing clamp.
- C. Exterior Cleanouts: Exterior cleanouts shall be as detailed on drawings.
- D. For Exposed Horizontal Piping: Cleanout shall be a cast iron ferrule with countersunk taper thread bronze plug for insertion in end of pipe. Cleanout shall be:

	<u>Hub & Spigot</u>	<u>No-Hub</u>
J.R. Smith	4420	Blind Plug
Josam	58540	Blind Plug
Wade	W-8550-D	Blind Plug
Zurn	Z-1470-7	Blind Plug
Mifab	C1450	

- E. For Exposed Vertical Piping: Cleanout shall be countersunk bronze plug with taper threads for insertion into tapped cast iron cleanout tee. Cleanouts shall be:

	<u>Hub & Spigot</u>	<u>No-Hub</u>
J.R. Smith	4472-U	4470
Josam	58540-15	58540
Wade	W-8590-D	W-8590-D
Zurn	Z-1470-8-VP	Z-1470
Mifab	C1430	C1430

- F. For masonry and steel stud walls: Cleanout shall be countersunk bronze plug tapped for machine screw, tapered threads, shallow stainless steel face-of-wall access cover, and vandal

proof securing screw. Cleanout shall be inserted into tapped cast iron cleanout tee. Cleanout shall be:

	<u>No-Hub</u>
J.R. Smith	4472
Josam	58890
Wade	W-8470-R-75
Zurn	Z-1460-8
Mifab	C1430-RD-3

- G. For piping concealed in pipe chase or shaft: Cleanout shall be a countersunk bronze plug with taper threads for insertion into a tapped cast iron cleanout tee. Locate a 10" x 10" chrome plated flush-with-wall access cover, with vandal proof securing screw adjacent to cleanout plug. Cleanout and cover shall be:

<u>Cleanout</u>	<u>No-Hub</u>
J.R. Smith	4472
Josam	58890
Wade	W-8590-D
Zurn	Z-1470
Jonespec	63000NH
Mifab	C1430
<u>Cover</u>	
J.R. Smith	4735
Josam	58640
Wade	W-8480-S
Zurn	ZANB-1460
Mifab	C1400-S9

- H. For concrete floors: Cleanout shall have cast iron body, adjustable square scoriated nickel bronze cover and rim, securing screw, and countersunk bronze plug with taper threads. Cleanout shall be manufactured by JR Smith, Josam, Wade, Zurn, Mifab or prior approved equal.
- I. For quarry tile or ceramic tile floors: Cleanouts shall have cast iron body, adjustable square scoriated nickel bronze cover and rim, securing screw, and countersunk bronze plug with taper threads. Cleanouts shall be manufactured by JR Smith, Josam, Wade, Zurn, Mifab or prior approved equal.
- J. For resilient tile floors: Cleanout shall have cast iron body, adjustable square nickel bronze cover recessed for tile, securing screws, and countersunk bronze plug. Cleanouts shall be manufactured by JR Smith, Josam, Wade, Zurn, Jonespec, Mifab or prior approved equal.
- K. For carpeted floors: Cleanout shall have cast iron body, adjustable square nickel bronze cover and rim, carpet marker, and countersunk bronze plug with taper threads. Cleanouts shall be manufactured by JR Smith, Josam, Wade, Zurn, Mifab or prior approved equal.
- L. For cleanouts to grade: Cleanout shall have cast iron ferrule and countersunk bronze plug with taper threads. Where not in paved areas, cleanouts shall be set in a 12" x 12" x 6" deep poured concrete pad set flush with grade. Cleanout shall be:

J.R. Smith	4400
Josam	58500
Wade	WL-8550-S
Zurn	Z-1440
Mifab	C1450

2.06 TRAPS

- A. Traps other than those furnished as a part of the plumbing fixture, shall be of the same materials and size as the pipe into which they discharge, unless specified otherwise hereinafter. Where not underground, traps shall be provided with cleanout plugs on the bottom.

2.07 DRAINAGE ACCESSORIES

- A. Backwater valves shall be cast iron with bronze backwater flap, adjustable cast iron body and collar, hub inlet spigot outlet. Backwater valves shall be:

J.R. Smith	7022
Zurn	Z-1095
Jonespec	76000
Mifab	BV-1200-R

- B. Fixed air gaps shall be cast iron with spigot outlet. Fixed air gaps shall be:

J.R. Smith	3955
Josam	1800
Zurn	Z-1025
Wade	W-2490
Mifab	MI-CAG

2.08 DECONTAMINATION TANK

- A. Not used.

2.09 FLOOR SINK

- A. "FS": Floor sink shall be 12" square, cast iron, 6" deep with acid resisting porcelain enameled interior double drainage flange with weepholes, bottom outlet, inside caulk connection, aluminum interval dome strainer, and cast-iron, 3/4 acid resisting grate, sediment bucket, 1/2" trap primer connection. Floor sink shall be Josam 49320A series, Wade or approved equal.
- B. "FS2": Floor sink shall be 8" square, cast iron, 6" deep with acid resisting porcelain enameled interior double drainage flange with weepholes, bottom outlet, inside caulk connection, aluminum interval dome strainer, and cast-iron, 3/4 acid resisting grate, sediment bucket, 1/2" trap primer connection. Floor sink shall be ZURN Z1910, Wade or approved equal.

2.10 SMOKE TEST

- A. Contractor shall perform smoke test on entire sanitary sewer system at completion of project and shall include all associated costs in bid, re: Section 200213.

2.11 SANITARY SEWER MANHOLES

- A. Refer to Civil Engineering Documents.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Horizontal soil and waste piping 2 1/2 inches in size and smaller shall be sloped at a minimum of 1/4 inch per foot. Horizontal soil and waste piping 3", 4", 6" shall be sloped at a minimum of 1/8 inch per foot. Horizontal soil and waste piping 8 inches in size and larger shall be sloped at a minimum of 1/16 inch per foot.
- B. Horizontal vent branches shall be kept above the highest fixture served by the vent branch in order to preclude the possibility of vents being used as waste pipes. Horizontal vent branches shall be sloped to prevent the accumulation of waste or scale therein.
- C. Not used.
- D. On soil, waste and vent piping changes in pipe size shall be made with reducing fittings and changes in pipe direction shall be made with fittings. No bushings allowed.
- E. On storm drainage piping changes in pipe size shall be made with reducing fittings and changes in direction shall be made with fittings. No bushings will be allowed.
- F. Caulked hubs on all drainage and vent piping shall have the open hub end facing against the direction of flow.

- G. During construction all pipe openings, not being worked on, shall be plugged or capped to prevent foreign objects from entering system.
- H. Except for special types, floor drains shall be set flush with the floor at the low points designated on the architectural drawings.
- I. Open hub drains shall be installed as shown on the drawings and have the hub set in the floor with top 1" above the finished floor. Indirect waste piping shall terminate 2" above the top of the hub.
- J. Cleanouts on underground drainage shall have piping extended to the floor and finished with cleanout plug and removable floor plate.
- K. Cleanouts in vertical piping shall be roughed with centerline not more than 1'-6" above the finished floor, but high enough to clear the baseboard.
- L. **STAINLESS STEEL PIPE HANGERS:**
 - 1. Provide stainless steel pipe hangers for all piping located under building slab.
 - a. Piping up to 6" (Outer Diameter) and less shall utilize 1/4" thick stainless steel hanger rods.
 - b. Piping greater than 6" (Outer Diameter) up to 10" (Outer Diameter) shall utilize 3/8" thick stainless steel hanger rods.
 - c. Piping greater than 10" (Outer Diameter) shall utilize 1/2" thick stainless steel hanger rods.
 - 2. Hanger rods to span two (2) steel re-bars with 90 degree bend (2" in length) at ends of hanger rods within slab.
 - 3. Twist hanger rods tightly around top of piping two (2) complete 360 degree turns.
 - 4. Provide hanger rods every 4'-0", at all changes in directions, and at all fittings & joints.
- M. At project completion the contractor shall remove all debris (concrete, dirt, etc.) from all exterior cleanouts & manhole covers, then apply two-part epoxy coating (black) for all exterior cleanouts, manhole covers, and valve covers.
- N. Install all manufacturer's components in accordance with respective manufacturer's recommended installation guidelines.

3.02 JOINTS

- A. Gasketed joints for cast iron pipe shall be made with lubricated neoprene compression gaskets.
- B. Clamped joints for hubless cast iron pipe shall be made with bolted stainless steel clamps and neoprene gasket. Clamps shall be tightened by alternately tightening screws to 60 in. lb. torque.
- C. Threaded joints for steel pipe shall be made with a mixture of graphite and oil applied to male threads only. After cutting, but prior to threading, pipe shall be reamed and have burrs removed.
- D. Soldered joints for type 'L' copper tubing and cast DMV bronze pipe shall be made with 95-5 tin-lead solder and a compatible flux.
- E. Brazed joints for red brass pipe shall be made with BcuP-5 brazing alloy and a compatible flux.
- F. Clamped joints for storm drainage & waste drainage hubless cast iron pipe 6" and larger shall contain tie rods on the vertical to horizontal and horizontal to vertical.

3.03 FLASHING

- A. Vent pipe (in membrane roofs) shall be flashed and made water tight at roof with flashing recommended or provided by roofing manufacturer.

END OF SECTION

9-2-25

SECTION 22 33 00 - WATER HEATERS AND ACCESSORIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Work Included
 - 1. Water Heaters
 - 2. Circulating Pump
 - 3. Tempering Valve

1.03 SUBMITTALS

- A. General: All submittals shall comply with the requirements of Division 1 - GENERAL REQUIREMENTS and Section 20 01 00 - GENERAL PROVISIONS.
- B. Product Data: Data shall be submitted on the following items:
 - 1. Water Heaters
 - 2. Circulating Pump
 - 3. Tempering Valve
- C. Operation and Maintenance Instructions: Data shall be provided for the following items:
 - 1. Water Heaters
 - 2. Circulating Pump
 - 3. Tempering Valve

1.04 QUALITY ASSURANCE

- A. Standards
 - 1. American Society of Heating, Refrigeration, Air Conditioning Engineers (ASHRAE):
 - a. Standard 90 A, Energy Conservation in New Building Design, 1980 Edition.
 - 2. American Society of Mechanical Engineers (ASME):
 - a. Boiler and Pressure Vessel Code, Section IV Low-Pressure, Heating Boilers, 1980 Edition.
 - b. Boiler and Pressure Vessel Code, Section VIII - Unfired Pressure Vessels, 1980 Edition.

PART 2 PRODUCTS

2.01 GENERAL

- A. Refer to the drawings for capacities and electrical characteristics of water heaters.
- B. Water heaters shall be provided with all openings for specified and detailed accessories.
- C. Where heater storage volume is 120 gallons or greater, tank shall be constructed in accordance with ASME Code Section IV for 125 psig working pressure.

2.02 TEMPERATURE AND PRESSURE RELIEF VALVES

- A. Temperature, pressure, and combination relief valves, if not factory installed, shall be automatic type with bronze body, threaded ends and manual test level. The temperature relief setting shall be 210 degrees F and the pressure relief setting shall be equal to the water heater tank working pressure. Relief valves shall be:

Watts

A.W. Cash

Robert Shaw

2.03 ELECTRIC WATER HEATER - TANK TYPE

- A. The heater shall be a glass-lined Custom Xi commercial electric model No. DSE as manufactured by A.O. Smith Corporation, State or approved equal. Heater should be rated at as scheduled on plans and constructed in accordance with ASME Code, shall bear appropriate symbol and be listed with the National Board as requires. Heater shall be listed with Underwriters' Laboratories and approved to the National Sanitation Foundation Standard No. 5. All internal surfaces of the tank shall be glass-lined with an alkaline borosilicate composition that has been fused -to-steel by firing at a temperature of 1600 degree Fahrenheit. Tank shall be cathodically protected with powered anodes. The entire vessel is to be enclosed in a round steel enclosure with baked enamel finish. Water heater shall have an electronic control with large LCD displaying current water heater status; provide real time element status and sensing, low water cutoff and economy mode operation. Shall house 120 volt control circuit transformer, transformer fusing, magnetic contractor(s), element fusing per N.E.C., and commercial grade incoloy sheathed flange mounted elements with prewired terminal leads. Temperature controls include limiting switch which will require resetting manually in the event the temperature reaches 190 degree Fahrenheit. Foam insulation shall meet or exceed the thermal efficiency and/or standby loss requirements of the U.S. Department of Energy and current edition of ASHRAE/IESNA 90.1. Heater shall include a CSA Certified and ASME Rated T&P relief valve and drain valve.
- B. Start-up shall be performed by a factory trained technician, with a written report to the Architect/Engineer.
- C. Refer to plans for size and capacity.
- D. All piping from pop-off to be type "L" copper with soldered joints.
- E. Provide ASME certification rating.
- F. Warranty: For 3 Years, in the event of a tank leak, repair/replace the defective water heater. For 1 Year, in the event of part failure, repair/replace the defective part. Warrant this product against defects in materials or workmanship. Provide ASME certification rating.

2.04 WATER TEMPERING VALVES

- A. General: High-Low type, manually adjustable, thermostatically controlled water tempering valve; bronze body; and adjustable temperature setting.
- B. System Water Tempering Valves: Piston or discs controlling both hot- and cold-water flow, capable of limited antiscald protection. Include threaded inlets and outlet.
- C. Finish: rough bronze.
- D. Integral combination checkstops with strainers and wall support.
- E. Available Manufacturers: Leonard model XL-32A-LF-BDT-IT, lawler, or prior approved equal.
- F. Water Tempering Valves to be lead-free.
- G. Water tempering valve to be ASSE 1017 compliant.

2.05 DOMESTIC WATER THERMAL EXPANSION TANK

- A. Furnish and install, as shown on the plans, ASME Precharged steel Thermal Expansion Tank with a fixed bladder. The tank shall have a top NPT stainless system connection and a .301" - 32 charging valve connection (standard tire valve) to facilitate the on-site charging of the tank to meet system requirements. The tank must be constructed in accordance with Section VIII of the ASME Boiler and Pressure Vessel Code, stamped for 150 psi working pressure. Unit shall be designed and constructed per ASME Section VII. Manufacturer: Wessels TTA Series.
- B. Thermal expansion tank to limit the pressure of the water being heated to no more than 80 pounds per square inch as required per the International Plumbing Code (current edition)

2.06 DOMESTIC HOT WATER CIRCULATION PUMPS

- A. Domestic hot water circulation pump shall be the in-line centrifugal type designed for 125 psi working pressure with stainless steel body and impeller, mechanical seals and stainless steel impeller shaft. The pump motor shall be the ECM permanent magnet technology design with ceramic bearings, built-in thermal over-load protectors, built in timer, and shall operate at 1750 RPM. Pump shall have the capacities as shown on the drawings. Pump shall be:

Taco

0034ePlus

PART 3 EXECUTION

3.01 INSTALLATION

- A. Hot water heaters to be installed over auxiliary drain pan per International Plumbing Code (2021 Ed.) Install water heaters to be installed in strict accordance with manufacturer's recommendations.
- B. Floor mounted hot water heaters to be installed on 6" thick reinforced housekeeping pad with chamfered edges.
- C. Temperature control valves shall be installed in accordance with manufacturers requirements.
- D. Temperature, pressure, and combination relief valves shall have discharge piped full size to exterior wall & turn down (terminate no less than 6" and no more than 12" above finished grade). If water heater is not installed by exterior wall, pipe to nearest floor sink (indirect waste receptor).

3.02 OPERATING MANUAL (DOMESTIC HW HEATERS)

- A. Instructions for installation, operation and maintenance of the water heater shall be contained in a manual provided with each boiler unit. Provide four (4) manuals with the submittal process for use by the installing contractor during the installation process.
- B. A wiring diagram corresponding to the water heater shall be affixed to the water heater near the electrical panel.

3.03 MARKING

- A. All water heaters shall bear the following, or equal wording on a visible decal or label by the manufacturer:
"There shall be installed at time of heater installation a combination temperature and pressure relief valve, selected and located in conformance with the requirements of ANSI Z21.22."

END OF SECTION

9-2-25

SECTION 22 4000 - PLUMBING FIXTURES AND TRIM

PART 1 GENERAL

1.01 GENERAL

- A. Plumbing Fixtures and Trim.

1.02 RELATED WORK

- A. Section 20 01 00: General Provisions
- B. Section 22 05 23: Plumbing System Valves
- C. Section 22 10 00: Domestic Water System
- D. Section 22 33 00: Water Heaters and Accessories
- E. Section 22 13 00: Sanitary Waste and Vent Drainage System

1.03 SUBMITTALS

- A. Submit manufacturer's product data and installation instruction complete with rough-in sheets.

1.04 GENERAL REQUIREMENTS

- A. Plumbing Contractor shall furnish and install plumbing fixtures as shown on the accompanying drawings and in accordance with the approved rough in drawings. This will include service sinks, lavatories, water closets, urinals, etc., with all brass in connections with supply with tubing, traps, escutcheons, stop and basin cocks, etc. All fixtures shall be new and must be delivered to the building properly crated and in perfect condition.
- B. All brass must be best quality. All brass pipe to be seamless brass tubing and all fixture traps shall be heavy with C.O. plugs. Nipples shall be extra heavy. Lightweight goods will not be accepted.
- C. All exposed metal on fixtures shall be C.P. or Chromard. All "P" traps shall be complete with cleanout plug.
- D. Plumbing contractor shall submit in his fixture brochure for approval, a rough in sheet of each fixture and indicate any variation required for the fixtures. Fixtures are to be roughed in accordance with these approved rough-in sheets and anchored so that piping cannot be moved.
- E. All plumbing fixtures, materials, and units shall conform to applicable standards (ANSI/NSK, ASME, ASSE, ASTM, FS, UL, etc.) as required International Plumbing Code, Current Edition.

1.05 JOB CONDITIONS

- A. Check millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

1.06 GENERAL REQUIREMENTS AND JOB CONDITIONS

- A. Plumbing Contractor shall furnish and install plumbing fixtures as shown on the accompanying drawings and in accordance with the approved rough in drawings. This will include service sinks, lavatories, water closets, urinals, etc., with all brass in connections with supply with tubing, traps, escutcheons, stop and basin cocks, etc. All fixtures shall be new and must be delivered to the building properly crated and in perfect condition.
- B. All brass must be best quality. All brass pipe to be seamless brass tubing and all fixture traps shall be heavy with C.O. plugs. Nipples shall be extra heavy. Lightweight goods will not be accepted.
- C. All exposed metal on fixtures shall be C.P. or Chromard. All "P" traps shall be complete with cleanout plug.
- D. Plumbing contractor shall submit in his fixture brochure for approval, a rough in sheet of each fixture and indicate any variation required for the fixtures. Fixtures are to be roughed in accordance with these approved rough-in sheets and anchored so that piping cannot be moved.
- E. Check millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.
- F. Rough-in locations shall be carefully spotted to result in a symmetrical pattern with sufficient spacing to accommodate full escutcheons.

- G. All fixtures shall have supplies with stops. Stops shall be chrome plated brass. Trim shall be polished, chrome plated brass, same manufacturer as fixture unless otherwise indicated. All pipe, fittings, etc. in connection with supply or drain trim shall be chrome plated. In cases where fixtures may have hot and cold water trim without hot water service, connect cold water to both trim inlets.
- H. Trap separately each fixture and piece of equipment requiring connection to drainage, unless otherwise shown on drawings. Place traps as near to the fixture as possible. No fixture shall be double trapped. Unless indicated otherwise, drain "P" traps shall be polished, chrome plated cast brass with cleanout plug and 17 gauge tubular outlet to wall. For floor drains, hub drains or other similar devices with under floor traps, drain "P" traps shall be same material as the branch piping system.
- I. All plumbing fixtures, materials, and units shall conform to all applicable standards (ANSI/NSF, ASME, ASSE, ASTM, etc.) as required by the International Plumbing Code, Current Edition.
- J. All low water consumption fixtures and flush valve to be provided by the same manufacturer.

PART 2 PRODUCTS

2.01 PLUMBING FIXTURES

- A. FIXTURES: Refer to schedule on drawings.
- B. All plumbing fixtures are to be lead-free.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install each fixture in accordance with rough-in drawings as per manufacturer's recommendations. At completion thoroughly clean plumbing fixtures and equipment. Anchor fixtures rigidly; anchor piping in walls so that piping cannot be moved.
- B. Provide chrome plated rigid or flexible supplies to fixtures with stops, reducers and escutcheons.
- C. Solidly attach floor water closets to floor with lag screws and finishing caps.
- D. Existing fixtures on project in remodeled areas, not shown refused and/or relocated, shall be removed and turned over to the Owner, capping off all existing services behind finished surfaces.
- E. Install each fixture with trap, easily removable for servicing and cleaning.
- F. Mount fixtures to the following heights above finished floor (unless otherwise noted on architect's elevation drawings, ARCHITECTURAL DRAWINGS TO GOVERN FIXTURE HEIGHTS):
 - 1. Water Closets:
 - a. Standard 15" to top of bowl rim
 - b. Handicapped 18" to top of seat
 - 2. Urinal:
 - a. Standard 22" to top of bowl rim
 - b. Handicapped 17" to top of bowl rim
 - 3. Lavatories:
 - a. Handicapped 32" to top of basin rim
 - 4. Water Closet Flush Valves:
 - a. Standard 11" min. above bowl rim
- G. Provide stop valves on all hot and cold water supplies to all fixtures.
- H. Furnish fixture carriers to suit wall construction (and drainage fittings where necessary) on wall hung water closets, wall hung urinals and lavatories. Carriers to be anchored securely to floor.
- I. Install all fixtures according to manufacturer's recommendation.
- J. Mount wall hung water closets with rim at height required by applicable codes.
- K. All exposed screws and fasteners on all plumbing penel fixture including floor drains, cleanout covers, access panels on equipment, etc. shall be vandal proof and tamper resistant.

- L. Provide insulation on hot water, cold water and sanitary piping below handicapped lavatories.
- M. At each toilet on plan provided with a floor drain (or drains), provide a trap primer assembly as specified herein at the handicapped water closet installation or sink/lavatory and extend a trap primer supply line to floor drain or trap connection in accordance with the manufacturer's recommendations.
- N. All flush valves installed on handicapped water closet (ADA) shall be installed with handle to wide side of toilet. Handles on all tanks (applicable to tank water closets) shall be installed with handle to wide side of toilet.
- O. Contractor shall provide copper plated bracket between wall stubs to anchor water piping for flush valves for both water closets and urinals. Contractor shall spot solder water pipe to bracket.
- P. Contractor to provide offset in vertical flush valve piping as not to conflict with installation if grab bars.
- Q. All hardware utilized to secure plumbing fixtures is to be stainless steel. Submit product cut sheet to A/E for review prior to installation.

3.2 FIXTURE ROUGH-IN SCHEDULE

- A. Rough-in fixture piping and size connections shall be in accordance with the following table of minimum sizes for particular fixtures unless noted different on the drawings:

=====

WATER PIPE SIZING TABLE

=====

UNLESS SHOWN OTHERWISE, DOMESTIC WATER LINES SHALL RUN CONCEALED OVERHEAD AS DESIGNATED IN PLUMBING FIXTURE SCHEDULE AND BE SIZED ACCORDING TO TABLE BELOW. PLANS AND RISER DIAGRAMS DO NOT NECESSARILY SHOW ALL PIPING RUNS. INSTALL A FACTORY SHOCK ABSORBER AT TOP OF EACH FIXTURE GROUP AND ALSO AT WATER HEATERS.

=====

<u>NUMBER OF FIXTURES</u>	<u>PIPE SIZE (IPS)</u>
2 or Less	1/2"
3 to 5	3/4"
6 to 10	1"
11 to 15	1-1/4"
16 to 28	1-1/2"

**FLUSH VALVE WATER CLOSET IS EQUIVALENT TO SIX (6) FIXTURES*

- B. SIZES INDICATED ABOVE ARE MINIMUM SIZES TO BE USED UNLESS OTHERWISE SPECIFIED DIFFERENT.

END OF SECTION

9-2-25

SECTION 23 0503 - PIPING FOR HVAC SYSTEM

PART I GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division I Specification Sections, apply to this section.

1.2 SUMMARY:

- A. Work Included:
 - 1. Chilled Water Piping
 - 2. Heating Hot Water Piping
 - 3. Makeup Water Piping
 - 4. Misc. Piping as noted within.

1.3 DEFINITIONS:

- A. HVAC Water Piping: Refers to chilled water piping, heating hot water piping, makeup water piping, etc., this does NOT apply to Steam & Steam Condensate Piping.

1.4 SUBMITTALS:

- A. General: All submittals shall comply with the requirements of Division 200100- General Provisions.
- B. Product Data: Data shall be submitted on the following items:
 - 1. Manufacturer's notarized certificates of conformance to specified standards for pipe, fittings, and flanges.
- C. Certificates: provide copies of certificates for the following:
 - 1. Welder's Qualifications.

1.5 QUALITY ASSURANCE

- A. Standards:
 - 1. American Standards Institute (ANSI):
 - a. Standard B16.1, Cast Iron Pipe Flanges and Flanged Fittings, 25, 125, and 800 pound.
 - b. Standard B16.3, Malleable Iron Screwed Fittings, 150 and 300 pounds.
 - c. Standard B16.5, Steel pipe Flanges, Flanges Valves and Fittings for Class 150, 300, 400, 600, 900, 1500, and 2500.
 - d. ANSI B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
 - e. Standard B16.21, Nonmetallic Flat gaskets for Pipe Flanges.
 - f. Standard B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
 - g. Standard B31.1, Power Piping and Addenda.
 - h. Standard C606 - Standard for Grooved and Shouldered Joints.
 - 2. American Society for Testing and Materials (ASTM):
 - a. Standard A47, Ferritic Malleable Iron Castings.
 - b. Standard A53, Pipe Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
 - c. Standard A135, Electric Resistance Welded Steel Pipe.
 - d. Standard A183, Carbon Steel Track Bolts and Nuts.
 - e. Standard A234, Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.

- f. Standard A307, Carbon Steel Externally Threaded Standard Fasteners.
 - g. Standard A312, Seamless and Welded Austenitic Stainless Steel Pipe.
 - h. Standard A351, Castings, Austenitic-Ferretic for Pressure Containing Parts.
 - i. Standard ASTM A403, Wrought Austenitic Stainless Steel Piping Fittings.
 - j. Standard ASTM A513, Electro-Resistance Welded Carbon and Alloy Steel Mechanical Tubing.
 - k. Standard A536, Ductile Iron Castings.
 - l. Standard A743, Castings, Iron-Chromium, Iron-chromium-Nickel, and Nickel Base Corrosion Resistant for General Applications.
 - m. Standard B88, Specification for Seamless Copper Water Tube.
 - n. Standard B280, Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
- B. Qualifications of Welders
- 1. All welders employed for the work shall be qualified under the requirements of ANSI B31.9.0, Section 127.5.
 - 2. Evidence of Welder's qualifications shall be submitted to the engineer before any welds are made.
- C. Qualifications of manufacturers
- 1. 2-1/2" and larger pipe & fittings, imported pipe is acceptable, Chinese & Taiwanese pipe and fittings are not acceptable. All 2" pipe & fittings (T&C) and smaller to be domestic, no exception, manufacturers to be Wheatland Tube & Textube. All copper piping to be a product of the United States of America. Manufacturer's of copper pipe to be Cerro, Reading, & Mueller. Contractor to provide submittals of pipe as noted within this specification.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS (SEE PIPE & FITTINGS SCHEDULE)

<u>SERVICE</u>	<u>PIPE MATERIAL TYPE</u>
Heating Hot Water	2, 16
Chilled Water	2, 16
Cold Water Make-up	8
Pump Drains	8
Condensate Drains	8
Relief Valve Discharge	15

<u>SERVICE</u>	<u>PIPE MATERIAL TYPE</u>
Chemical feed for Chilled Water, & Heating Hot Water Systems	1, 8
Miscellaneous Drains	8
(Not Listed Above)	

<u>PIPE AND FITTING SCHEDULE</u>			
<u>MATL TYPE</u>	<u>PIPE SIZE</u>	<u>PIPE TYPE</u>	<u>FITTING TYPE</u>

1	2" & smaller	ASTM A53, Sch 40 Black Steel, Screwed End	ANSI B16.3 Class 150 Black Malleable Iron, Screwed
2.	2-1/2" thru 10" Incl.	ASTM A53, Sch 40 Black Steel, Butt Welded	ASTM A234, Standard Wt. Butt Welding Type
3	12" & Larger	ASTM A53, Std. Wt. Black Steel, Seamless	ASTM A234, Standard Wt. Butt Welding Type
4	2" & Smaller	ASTM A53, Sch 80 Black Steel, Screwed	ANSI B16.3, Class 300 Black Malleable Iron Screwed
5	2-1/2" thru 14" Incl.	ASTM A53, Sch 80 Black Steel, Butt Welded	ASTM A234, Extra Strong Butt Welding Type
6	2-1/2" and Under	ASTM A53, Sch 40 Galv. Steel, Screwed	ANSI B16.3, Class 150 Galv. Malleable Iron, Screwed
7	All Sizes	ASTM A312, Sch 40 Type 316 Stainless Steel	ASTM A403, Class 150 Type 316 Stainless Steel, Screwed
8	All Sizes	ASTM B88, Type "L" Hard-Drawn Copper	ANSI B16.22, Wrought Copper Solder Joint
9	All Sizes	ASTM B280, Type ACR Rigid Drawn Tempered Tube	ANSI B16.22, Wrought Copper Silver Brazed Joint
10	2" & Smaller	ASTM A53, Grade B, Std. Wt. Black Steel Butt Welded	ANSI B16.3, Class 150 Black Malleable Iron, Screwed
11	2-1/2" & Larger	ASTM A53, Grade B, Std. Wt. Black Steel Butt Welded	ASTM A234, Std. Wt. Butt Welding Type
12	2" to 6"	ASTM B88, Type Hard Drawn Copper, Grooved	ANSI B16.22 or ANSI B16.18 Wrought Copper or Bronze Sand Casting, Grooved
13	All Sizes	ASTM A53, Std. Wt. Black Steel, Seam- less, Cut or Roll Grooved End	ASTM A536 or ASTM A234, Ductile Iron or Steel, Grooved
14	All Sizes	ASTM A53, Sch Black Steel, Seam- less Roll Grooved End	ASTM A234 or ASTM A536, Ductile Iron or Steel, Grooved
15.	All Sizes	ASTM B88, Type "L" Hard-Drawn Copper	ANSI B16.22, Wrought Copper Silver Brazed Joint
16.	2" & Smaller	ASTM B88, Type "L" Hard-Drawn Copper	ANSI B16.22, Wrought Copper Silver Brazed Joint

2.2 FLANGES

- A. Flanges shall be faced true and provided with 1/16" ring type gasket conforming to ANSI B16.21. Flanges will have raised or flat face to mate with adjacent flanges or valves, fittings and equipment.
1. Flanges in threaded pipe lines shall be 125 or 250 lbs. cast iron screwed flanges conforming to ANSI B16.1.
 2. Flanges in welded pipe lines shall be 150 or 300 lbs. steel slip-on type welding flanges conforming to ANSI B16.5.

3. Flange bolts shall be carbon steel, all threaded type, and nuts shall be carbon steel hexagon type. Steel for bolts and nuts shall conform to ASTM A 307, Grade A for use with steel flanges and Grade B for use with cast iron flanges.
 4. Flange class shall be selected to match valve or equipment connection requirements.
- B. Unions in steel pipe shall be 150 lbs. malleable iron type, screwed, Fed. Spec. WW-U- 531E. Unions in copper tubing shall be wrought or cast bronze, Fed. Spec. WW-U- 516C, solder and joints.
1. Unions provided between copper and ferrous pipe connections shall be the insulated type separate dissimilar metal connections in piping systems and prevent galvanic corrosion. Temperature rating shall be equal to or exceed the maximum temperature of respective system in which the union is installed.

2.3 GROOVED COUPLINGS

- A. Not used.

2.4 ASPHALT MASTIC

- A. Asphalt mastic for underground piping shall
- | | |
|---------------|-----------|
| be: Foster | 60-25 |
| Insul-Coustic | IC-320 |
| Lison-Oil Co. | Seal Kote |

PART 3 EXECUTION

3.1 PIPE INSTALLATION

- A. Pipes shall have burrs removed by reaming.
- B. Changes in direction of piping shall be made with fittings.
- C. Changes in pipe sizes in horizontal pipelines shall be made with eccentric reducing couplings, except reducing tees and reducing elbows will be allowed for connections for pressure gauges and gauge cocks, for thermometers and test wells, and for pipe mounted insertion-type temperature control devices.
 1. In chilled water & heating hot water lines , eccentric reducing couplings shall be installed with the bottom of the pipe remaining at the same elevation.
 2. Reducing tees, reducing elbows, and concentric reducing couplings will be allowed for changing pipe sizes in vertical risers, except in pump suction lines eccentric reducing couplings only will be allowed.
- D. Above ground hot water and chilled water horizontal supply and return lines shall be installed level.
- E. Not used.
- F. Open ends of pipe lines shall be plugged during installation to keep dirt and foreign material out of the system.
- G. All elbows 2-1/2" and larger at pump suction connections shall be the long radius type.
- H. Not used.
- I. Not used.
- J. Branch lines for chilled water & heating hot water piping shall take off from top of mains using swing joints.
- K. Not used.
- L. Special Cleaning: Contractor shall be responsible for cleaning and purging all lines (chilled water, etc.) prior to system start up. Contractor shall provide a temporary purge pump and strainers with required connections (including valves), field located to provide continuous loop, to lines to remove all debris, slag, etc. from lines. This shall be done on both new under ground lines and above ground lines. Cleaning may be done in

sections. Once cleaning is complete, contractor to provide and test random number of samples (minimum of 5 for both underground and above ground) to verify water is free of debris down to 500 microns. Provide proof of cleaning to architect/engineer on contractor's company letterhead.

3.2 PIPE JOINTS

- A. Screw joints for Steel Pipe: After cutting and before threading, pipe shall be reamed and shall have burrs removed. Screw joints shall be made with tapered threads. Screw joints shall be made up with graphite and oil applied to male threads only. Caulking of threaded joints to stop or prevent leaks will not be permitted.
- B. Welded joints shall be fusion welded. Changes in direction of piping shall be made with welded fittings only. Mitering or notching pipe to form elbows and tees will not be permitted.
 - 1. Branch take-offs at 90-degrees from mains shall be made with welding tee fittings, except where main size is larger than 2 inches factory fabricated forged steel shaped fittings may be used in lieu of welding tees if the main is two pipe sizes or more larger than the branch takeoff; shaped fittings shall be weldolet for branch sizes 2-1/2" and larger, and threadolet for branch sizes 2" and smaller.
 - 2. Branch take-offs at 45-degrees to mains shall be made with factory fabricated latrolets.
 - 3. Defective welds shall be removed and replaced at no additional cost to the owner. Repairing of defective welds by adding new material over the defects or by peening will not be permitted.
- C. Copper tubing shall be cut square and burrs shall be removed. Both inside and outside of tubing shall be cleaned with steel wool before joining.
 - 1. Joints in copper tubing for water service shall be made with a non-corrosive paste flux and solid string lead free solder composed of 95% tin and 5% antimony. 50- 50 solder will not be permitted.
 - 2. Joints in copper tubing for refrigerant piping shall be silver brazed with silver solder having a melting point in excess of 1000-degrees F.
- D. Grooved mechanical pipe joints: Grooved mechanical pipe joints not used.

END OF SECTION

9-2-25

SECTION 23 05 14 - VARIABLE FREQUENCY DRIVE

PART 1 GENERAL

1.1 DESCRIPTION

- A. This specification is to cover a complete Adjustable Frequency motor Drive (AFD) consisting of a pulse width modulated (PWM) inverter designed for use on a standard NEMA Design B induction motor.
- B. The drive manufacturer shall supply the drive and all necessary controls as herein specified. The manufacturer shall have been engaged in the production of this type of equipment for a minimum of twenty years.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. Institute of Electrical and Electronic Engineers (IEEE)
 - a) Standard 519-1992, IEEE Guide for Harmonic Content and Control.
 - 2. Underwriters laboratories
 - a) UL508C
 - 3. National Electrical Manufacturer's Association (NEMA)
 - a) ICS 7.0, AC Adjustable Speed Drives
 - 4. IEC 16800 Parts 1 and 2
- B. Qualifications:
 - 1. AFDs and options shall be UL listed as a complete assembly. AFD's that require the customer to supply external fuses for the AFD to be UL listed are not acceptable. The base AFD shall be UL listed for 100 KAIC without the need for input fuses.
 - 2. CE Mark – The AFD shall conform to the European Union ElectroMagnetic Compatibility directive, a requirement for CE marking. The AFD shall meet product standard EN 61800-3 for the First Environment restricted level.
 - 3. Acceptable Manufactures
 - a) ABB ACH Series, Honeywell or prior approved equal.
 - b) Engineer approved within 2 weeks of bid. Approval does not relieve supplier of specification requirements.
 - c) AFDs that are manufactured by a third party and "brand labeled" shall not be acceptable.
 - 4. The AFD manufacturer shall have available a comprehensive, HVAC Drive Computer Based Training (CBT) product. The CBT product shall include detailed, interactive sections covering AFD unpacking, proper mechanical and electrical installation, and programming. The CBT product shall allow the user to provide just-in-time training to new personnel or refresher training for maintenance and repair personnel on the user's site. The CBT product shall be repeatable, precise and shall include record keeping capability. The CBT product shall record answers to simulations and tests by student ID. The CBT product must be professionally produced and have interactive sections, student tests, and include video clips of proper wiring and installation.

1.03 SUBMITTALS

- A. Submittals shall include the following information:
 - 1. Outline dimensions, conduit entry locations and weight.
 - 2. Customer connection and power wiring diagrams.

3. Complete technical product description include a complete list of options provided
4. Compliance to IEEE 519 – harmonic analysis for particular jobsite including total harmonic voltage distortion and total harmonic current distortion (TDD).
 - a. The AFD manufacturer shall provide calculations; specific to this installation, showing total harmonic voltage distortion is less than 5%. Input line filters shall be sized and provided as required by the AFD manufacturer to ensure compliance with IEEE standard 519. All AFD's shall include a minimum of 5% impedance reactors, no exceptions.

PART 2 – PRODUCTS

2.01 ADJUSTABLE FREQUENCY DRIVES

- A. The AFD package as specified herein shall be enclosed in a UL Listed Type 12 (dust tight) & Type 3R (for exterior installations) enclosure, completely assembled and tested by the manufacturer in an ISO9001 facility. The AFD tolerated voltage window shall allow the AFD to operate from a line of +30% nominal, and -35% nominal voltage as a minimum.
 1. Compliance to IEEE 519 – harmonic analysis for particular jobsite including total harmonic voltage distortion and total harmonic current distortion (TDD).
 - a. The AFD manufacturer shall provide calculations; specific to this installation, showing total harmonic voltage distortion is less than 5%. Input line filters shall be sized and provided as required by the AFD manufacturer to ensure compliance with IEEE standard 519. All AFD's shall include a minimum of 5% impedance reactors, no exceptions.
 2. Environmental operating conditions: 0 to 40°C continuous. AFD's that can operate at 40° C intermittently (during a 24 hour period) are not acceptable and must be oversized. Altitude 0 to 3300 feet above sea level, less than 95% humidity, non-condensing.
 3. Enclosure shall be rated UL type 12 and shall be UL listed as a plenum rated AFD. AFD's without these ratings are not acceptable.
- B. All AFDs shall have the following standard features:
 1. All AFDs shall have the same customer interface, including digital display, and keypad, regardless of horsepower rating. The keypad shall be removable, capable of remote mounting and allow for uploading and downloading of parameter settings as an aid for start-up of multiple AFDs.
 2. The keypad shall include Hand-Off-Auto selections and manual speed control. The drive shall incorporate “bumpless transfer” of speed reference when switching between “Hand” and “Auto” modes. There shall be fault reset and “Help” buttons on the keypad. The Help button shall include “on-line” assistance for programming and troubleshooting.
 3. There shall be a built-in time clock in the AFD keypad. The clock shall have a battery back up with 10 years minimum life span. The clock shall be used to date and time stamp faults and record operating parameters at the time of fault. If the battery fails, the AFD shall automatically revert to hours of operation since initial power up. The clock shall also be programmable to control start/stop functions, constant speeds, PID parameter sets and output relays. The AFD shall have a digital input that allows an override to the time clock (when in the off mode) for a programmable time frame. There shall be four (4) separate, independent timer functions that have both weekday and weekend settings.

4. The AFD's shall utilize pre-programmed application macro's specifically designed to facilitate start-up. The Application Macros shall provide one command to reprogram all parameters and customer interfaces for a particular application to reduce programming time. The AFD shall have two user macros to allow the end-user to create and save custom settings.
5. The AFD shall have cooling fans that are designed for easy replacement. The fans shall be designed for replacement without requiring removing the AFD from the wall or removal of circuit boards. The AFD cooling fans shall operate only when required. To extend the fan and bearing operating life, operating temperature will be monitored and used to cycle the fans on and off as required.
6. The AFD shall be capable of starting into a coasting load (forward or reverse) up to full speed and accelerate or decelerate to setpoint without safety tripping or component damage (flying start).
7. The AFD shall have the ability to automatically restart after an over-current, over-voltage, under-voltage, or loss of input signal protective trip. The number of restart attempts, trial time, and time between attempts shall be programmable.
8. The overload rating of the drive shall be 110% of its normal duty current rating for 1 minute every 10 minutes, 130% overload for 2 seconds. The minimum FLA rating shall meet or exceed the values in the NEC/UL table 430-150 for 4-pole motors.
9. The AFD shall have an integral 5% impedance line reactors to reduce the harmonics to the power line and to add protection from AC line transients. The 5% impedance may be from dual (positive and negative DC bus) reactors, or 5% AC line reactors. AFD's with only one DC reactor shall add AC line reactors.
10. The input current rating of the AFD shall be no more than 3% greater than the output current rating. AFD's with higher input current ratings require the upstream wiring, protection devices and source transformers to be oversized per NEC 430-2.
11. The AFD shall include a coordinated AC transient protection system consisting of 4-120 joule rated MOV's (phase to phase and phase to ground), a capacitor clamp, and 5% impedance reactors.
12. The AFD shall be capable of sensing a loss of load (broken belt / broken coupling) and signal the loss of load condition. The drive shall be programmable to signal this condition via a keypad warning, relay output and/or over the serial communications bus. Relay outputs shall include programmable time delays that will allow for drive acceleration from zero speed without signaling a false underload condition.
13. If the input reference (4-20mA or 2-10V) is lost, the AFD shall give the user the option of either (1) stopping and displaying a fault, (2) running at a programmable preset speed, (3) hold the AFD speed based on the last good reference received, or (4) cause a warning to be issued, as selected by the user. The drive shall be programmable to signal this condition via a keypad warning, relay output and/or over the serial communication bus.
14. The AFD shall have programmable "Sleep" and "Wake up" functions to allow the drive to be started and stopped from the level of a process feedback signal.

C. All AFDs to have the following adjustments:

1. Three (3) programmable critical frequency lockout ranges to prevent the AFD from operating the load continuously at an unstable speed.
2. Two (2) PID Setpoint controllers shall be standard in the drive, allowing

pressure or flow signals to be connected to the AFD, using the microprocessor in the AFD for the closed loop control. The AFD shall have 250 ma of 24 VDC auxiliary power and be capable of loop powering a transmitter supplied by others. The PID setpoint shall be adjustable from the AFD keypad, analog inputs, or over the communications bus. There shall be two parameter sets for the first PID that allow the sets to be switched via a digital input, serial communications or from the keypad for night setback, summer/winter setpoints, etc. There shall be an independent, second PID loop that can utilize the second analog input and modulate one of the analog outputs to maintain setpoint of an independent process (ie. valves, dampers, etc.). All setpoints, process variables, etc. to be accessible from the serial communication network. The setpoints shall be set in Engineering units and not require a percentage of the transducer input.

3. Two (2) programmable analog inputs shall accept current or voltage signals.
4. Two (2) programmable analog outputs (0-20ma or 4-20 ma). The outputs may be programmed to output proportional to Frequency, Motor Speed, Output Voltage, Output Current, Motor Torque, Motor Power (kW), DC Bus voltage, Active Reference, and other data.
5. Six (6) programmable digital inputs for maximum flexibility in interfacing with external devices, typically programmed as follows:

There shall be a run permissive circuit for damper or valve control. Regardless of the source of a run command (keypad, input contact closure, time-clock control, or serial communications) the AFD shall provide a dry contact closure that will signal the damper to open (AFD motor does not operate). When the damper is fully open, a normally open dry contact (end-switch) shall close. The closed end-switch is wired to an AFD digital input and allows AFD motor operation. Two separate safety interlock inputs shall be provided. When either safety is opened, the motor shall be commanded to coast to stop, and the damper shall be commanded to close. The keypad shall display "start enable 1 (or 2) missing". The safety status shall also be transmitted over the serial communications bus. All digital inputs shall be programmable to initiate upon an application or removal of 24VDC.
6. Three (3) programmable digital Form-C relay outputs. The relays shall include programmable on and off delay times and adjustable hysteresis. Default settings shall be for run, not faulted (fail safe), and run permissive. The relays shall be rated for maximum switching current 8 amps at 24 VDC and 0.4 A at 250 VAC; Maximum voltage 300 VDC and 250 VAC; continuous current rating 2 amps RMS. Outputs shall be true form C type contacts; open collector outputs are not acceptable.
7. Seven (7) programmable preset speeds.
8. Two independently adjustable accel and decel ramps with 1 – 1800 seconds adjustable time ramps.
9. The AFD shall include a motor flux optimization circuit that will automatically reduce applied motor voltage to the motor to optimize energy consumption and audible motor noise.
10. The AFD shall include a carrier frequency control circuit that reduces the carrier frequency based on actual AFD temperature that allows the highest carrier frequency without derating the AFD or operating at high carrier frequency only at low speeds.
11. The AFD shall include password protection against parameter changes.

- D. The Keypad shall include a backlit LCD display. The display shall be in complete English words for programming and fault diagnostics (alpha-numeric codes are not acceptable). The keypad shall utilize the following assistants:
1. Start-up assistants.
 2. Parameter assistants
 3. Maintenance assistant
 4. Troubleshooting assistant
- E. All applicable operating values shall be capable of being displayed in engineering (user) units. A minimum of three operating values from the list below shall be capable of being displayed at all times. The display shall be in complete English words (alpha-numeric codes are not acceptable):
- Output Frequency
 - Motor Speed (RPM, %, or Engineering units)
 - Motor Current
 - Calculated Motor Torque
 - Calculated Motor Power (kW)
 - DC Bus Voltage
 - Output Voltage
- F. The AFD shall include a fireman's override input. Upon receipt of a contact closure from the fireman's control station, the AFD shall operate at an adjustable preset speed. The mode shall override all other inputs (analog/digital, serial communication, and all keypad commands) and force the motor to run at the adjustable, preset speed. "Override Mode" shall be displayed on the keypad. Upon removal of the override signal, the AFD shall resume normal operation.
- G. Serial Communications
1. The AFD shall have an RS-485 port as standard. The standard protocols shall be BACnet, Modbus, Johnson Controls N2 bus, and Siemens Building Technologies FLN. Optional protocols for LonWorks, Profibus, Ethernet, and DeviceNet shall be available. Each individual drive shall have the protocol in the base AFD. The use of third party gateways and multiplexers is not acceptable. All protocols shall be "certified" by the governing authority. Use of non-certified protocols is not allowed.
 2. The BACnet connection shall be an RS485, MSTP interface operating at 9.6, 19.2, 38.4, or 76.8 Kbps. The connection shall be tested by the BACnet Testing Labs (BTL) and be BTL Listed. The BACnet interface shall conform to the BACnet standard device type of an Applications Specific Controller (B-ASC). The interface shall support all BIBBs defined by the BACnet standard profile for a B-ASC including, but not limited to:
 - a. Data Sharing – Read Property – B.
 - b. Data Sharing – Write Property – B.
 - c. Device Management – Dynamic Device Binding (Who-Is; I-AM).
 - d. Device Management – Dynamic Object Binding (Who-Has; I-Have).
 - e. Device Management – Communication Control – B.
 - f. If additional hardware is required to obtain the BACnet interface, the AFD manufacturer shall supply one BACnet gateway per drive. Multiple AFDs sharing one gateway shall not be acceptable.
 3. Serial communication capabilities shall include, but not be limited to; run-stop control, speed set adjustment, proportional/integral/derivative PID control adjustments, current limit, accel/decel time adjustments, and lock and unlock the keypad. The drive shall have the capability of allowing the

DDC to monitor feedback such as process variable feedback, output speed / frequency, current (in amps), % torque, power (kW), kilowatt hours (resettable), operating hours (resettable), and drive temperature. The DDC shall also be capable of monitoring the AFD relay output status, digital input status, and all analog input and analog output values. All diagnostic warning and fault information shall be transmitted over the serial communications bus. Remote AFD fault reset shall be possible. The following additional status indications and settings shall be transmitted over the serial communications bus – keypad “Hand” or “Auto” selected, bypass selected, the ability to change the PID setpoint, and the ability to force the unit to bypass (if bypass is specified). The DDC system shall also be able to monitor if the motor is running in the AFD mode or bypass mode (if bypass is specified) over serial communications. A minimum of 15 field parameters shall be capable of being monitored.

4. The AFD shall allow the DDC to control the drive's digital and analog outputs via the serial interface. This control shall be independent of any AFD function. For example, the analog outputs may be used for modulating chilled water valves or cooling tower bypass valves. The drive's digital (relay) outputs may be used to actuate a damper, open a valve or control any other device that requires a maintained contact for operation. In addition, all of the drive's digital and analog inputs shall be capable of being monitored by the DDC system.
 5. The AFD shall include an independent PID loop for customer use. The independent PID loop may be used for cooling tower bypass value control, chilled water value control, etc. Both the AFD control PID loop and the independent PID loop shall continue functioning even if the serial communications connection is lost. The AFD shall keep the last good set-point command and last good DO & AO commands in memory in the event the serial communications connection is lost.
- H. EMI / RFI filters. All AFD's shall include EMI/RFI filters. The onboard filters shall allow the AFD assemble to be CE Marked and the AFD shall meet product standard EN 61800-3 for the First Environment restricted level.
- I. All AFD's through 50HP shall be protected from input and output power mis-wiring. The AFD shall sense this condition and display an alarm on the keypad.
- J. OPTIONAL FEATURES – Optional features to be furnished and mounted by the drive manufacturer. All optional features shall be UL Listed by the drive manufacturer as a complete assembly and carry a UL508 label.
1. A complete factory wired and tested bypass system consisting of an output contactor and bypass contactor. Overload protection and shall be provided in both drive and bypass modes.
 2. Door interlocked, padlockable circuit breaker that will disconnect all input power from the drive and all internally mounted options.
 3. Fused AFD only disconnect (service switch). Fast acting fuses exclusive to the AFD – fast acting fuses allow the AFD to disconnect from the line prior to clearing upstream branch circuit protection, maintaining bypass capability. Bypass designs, which have no such fuses, or that incorporate fuses common to both the AFD and the bypass will not be accepted. Three contactor bypass schemes are not acceptable.
 4. The drive / bypass shall provide single-phase motor protection in both the AFD and bypass modes.
 5. The following operators shall be provided:
 - a. Bypass Hand-Off-Auto
 - b. Drive mode selector

- c. Bypass mode selector
 - d. Bypass fault reset
6. The following indicating lights (LED type) shall be provided. A test mode or push to test feature shall be provided.
 - a. Power-on (Ready)
 - b. Run enable (safeties) open
 - c. Drive mode select damper opening
 - d. Bypass mode selected
 - e. Drive running
 - f. Bypass running
 - g. Drive fault
 - h. Bypass fault
 - i. Bypass H-O-A mode
 - j. Automatic transfer to bypass selected
 - k. Safety open
 - l. Damper opening
 - m. Damper end-switch made
 7. The following relay (form C) outputs from the bypass shall be provided:
 - a. System started
 - b. System running
 - c. Bypass override enabled
 - d. Drive fault
 - e. Bypass fault (motor overload or underload (broken belt))
 - f. Bypass H-O-A position
 8. The digital inputs for the system shall accept 24V or 115VAC (selectable). The bypass shall incorporate internally sourced power supply and not require an external control power source.
 9. Customer Interlock Terminal Strip – provide a separate terminal strip for connection of freeze, fire, smoke contacts, and external start command. All external safety interlocks shall remain fully functional whether the system is in Hand, Auto, or Bypass modes (not functional in Fireman's Override 2). The remote start/stop contact shall operate in AFD and bypass modes.
 10. Dedicated digital input that will transfer motor from AFD mode to bypass mode upon dry contact closure for fireman's override. Two modes of operation are required.
 - a. One mode forces the motor to bypass operation and overrides both the AFD and bypass H-O-A switches and forces the motor to operate across the line (test mode). The system will only respond to the digital inputs and motor protections.
 - b. The second fireman's override mode remains as above, but will also defeat the overload and single-phase protection for bypass and ignore all keypad and digital inputs to the system (run until destruction).
 11. The AFD shall include a "run permissive circuit" that will provide a normally open contact whenever a run command is provided (local or remote start command in AFD or bypass mode). The AFD system (AFD or bypass) shall not operate the motor until it receives a dry contact

closure from a damper or valve end-switch. When the AFD system safety interlock (fire detector, freezestat, high static pressure switch, etc) opens, the motor shall coast to a stop and the run permissive contact shall open, closing the damper or valve.

12. Class 20 or 30 (selectable) electronic motor overload protection shall be included.
13. There shall be an internal switch to select manual or automatic bypass.
14. There shall be an adjustable current sensing circuit for the bypass to provide loss of load indication (broken belt) when in the bypass mode.

PART 3 – EXECUTION

3.01 INSTALLATION: In accordance with the general conditions, contractor is responsible for dividing the work among the subcontractors and suppliers and for delineating the work to be performed by specific trades. The following are suggestions as to how the work may be divided. This is not a complete list of all the work:

- A. Installation shall be the responsibility of the electrical contractor. The contractor shall install the drive in accordance with the recommendations of the AFD manufacturer as outlined in the installation manual.
- B. Power wiring shall be completed by the electrical contractor. The contractor shall complete all wiring in accordance with the recommendations of the AFD manufacturer as outlined in the installation manual.

3.02 START-UP

- A. Certified factory start-up shall be provided for each drive by a factory authorized service center. A certified start-up form shall be filled out for each drive with a copy provided to the owner, and a copy kept on file at the manufacturer.

3.03 PRODUCT SUPPORT

- A. Factory trained application engineering and service personnel that are thoroughly familiar with the AFD products offered shall be locally available at both the specifying and installation locations. A 24/365 technical support line shall be available on a toll-free line.
- B. A computer based training CD or 8-hour professionally generated video (DVD format) shall be provided to the owner at the time of project closeout. The training shall include installation, programming and operation of the AFD, bypass and serial communication. Provide copy in O&M manuals.

3.04 WARRANTY

- A. Warranty shall be 24 months from the date of substantial completion. The warranty shall include all parts, labor, travel time and expenses. There shall be 365/24 support available via a toll free phone number.

3.05 SCHEDULE

- A. Provide VFD's for all air handling units, and as noted on drawings & schedules.
- B. Provide shaft grounding rings for all motors that are to be controlled by variable frequency drives.

END OF SECTION

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SECTION 23 0523 - VALVES FOR HVAC SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division I Specification Sections, apply to this section.

1.2 SUMMARY

- A. Work Included:
 - 1. Valves for Chilled Water System
 - 2. Valves for Heating Hot Water System
 - 3. Valves for Makeup Water
 - 4. Miscellaneous Valves

1.3 SUBMITTALS

- A. General: All submittals shall comply with the requirements of Division 200100- General Provisions.
- B. Product Data: Data shall be submitted on the following items:
 - 1. Valves

1.4 QUALITY ASSURANCE

- A. Standards:
 - 1. American Society for Testing and Materials (ASTM):
 - a. Standard A536, Ductile Iron Castings.
 - b. Standard A126, Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
 - c. Standard A197, Specification for Cupola Malleable Iron.
 - d. Standard B61, Specification for Steam or Valve Bronze Castings.
 - e. Standard B62, Specification for Composition Bronze or ounce Metal Castings.
 - d. Standard B162, Specification for Nickel plate, Sheet, and Strip.
 - f. Standard B584, Specification for Copper Alloy Sand Casting for General Application.
 - 2. American society of mechanical Engineers (ASME):
 - a. Boiler and Pressure Vessel Code, Section 1, Rules for construction of Power Boilers.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Valves shall have name or trademark of manufacturer and working pressure cast or stamped on valve body.
- B. Gate Valves, globe valves, and swing check valves shall be the product of a single manufacturer.
- C. All valves requiring packing shall be designed and constructed to allow repacking under pressure.
- D. Valve discs shall be the manufacturer's standard material for the service in which the valve is used unless otherwise indicated under the individual type valve specification.
- E. Malleable iron hand wheels shall conform to ASTM A197.

2.2 GATE VALVES

- A. Type GV1 - Valves 2" and smaller shall be class 125 rising stem type. Body and bonnet shall be ASTM B62 cast bronze with threaded ends, inside screwed bonnet, solid

wedge disc, brass packing gland, teflon impregnated packing, malleable iron handwheel. Valves shall be:

Kitz #24

- B. Type GV2 - Valves 2" and smaller shall be class 150 rising stem type. Body and bonnet shall be ASTM B62 cast bronze with threaded ends, inside screwed bonnet, solid wedge disc, brass packing gland, teflon impregnated packing, malleable iron handwheel. Valves shall be:

Kitz #25, #42T

- C. Type GV3 - Valves 2" and smaller shall be class 200 rising stem type. Body and bonnet shall be ASTM B61 cast bronze with threaded ends, union bonnet bonnet, solid wedge disc, brass packing gland, teflon impregnated packing, malleable iron handwheel. Valves shall be:

Kitz #37

- D. Type GV4 - Valves 2-1/2" through 16" shall be class 125 outside screw and yoke rising stem type. Body and bonnet shall be ASTM A126 cast bronze with flanged ends, bronze trim, solid wedge disc, two piece packing gland, teflon impregnated packing, malleable iron handwheel. Valves shall be:

Kitz #72

- E. Type GV5 - Valves 2-1/2" through 12" shall be class 250 outside screw and yoke rising stem type. Body and bonnet shall be ASTM A126 cast bronze with flanged ends, bronze trim, solid wedge disc, two piece packing gland, teflon impregnated packing, malleable iron handwheel. Valves shall be:

Kitz

2.3 BUTTERFLY VALVES

- A. Type BF1 - Lug Style Gear Operated Butterfly Valves shall be acceptable (250 PSI, ductile iron body, extended neck, molded seat liner, bi-directional, Kitz or Nibco).

2.4 BALL VALVES

- A. Type BL1 - Valves 2" and smaller shall be class 600 PSIG WOG, two piece, quarter turn type. Body shall be ASTM B584 cast bronze with threaded ends, conventional port, chrome plated brass ball, replaceable teflon seats, brass packing gland, steel lever handle and vinyl handle cover. Valves shall be:

Kitz #68

- B. Type BL2 - Valves 2" and smaller shall be class 400 PSIG WOG, three piece, quarter turn type. Body shall be ASTM B62 bronze with threaded ends, full port, chrome plated brass ball, replaceable teflon seats, brass packing gland, steel lever handle and vinyl handle cover. Valves shall be:

Kitz #62

2.5 GLOBE VALVES

- A. Type GB1 - Valves 2" and smaller shall be class 125 rising stem type. Body and bonnet shall be ASTM B62 cast bronze with threaded ends, inside screwed bonnet, solid wedge disc, brass packing gland, teflon impregnated packing, malleable iron handwheel. Valves shall be:

Kitz #11

- B. Type GB2 - Valves 2" and smaller shall be class 150 rising stem type. Body and bonnet shall be ASTM B62 cast bronze with threaded ends, inside screwed bonnet, solid wedge disc, brass packing gland, teflon impregnated packing, malleable iron handwheel. Valves shall be:

Kitz #9

- C. Type GB3 - Valves 2" and smaller shall be class 200 rising stem type. Body and bonnet shall be ASTM B61 cast bronze with threaded ends, union bonnet bonnet, solid wedge disc, brass packing gland, teflon impregnated packing, malleable iron handwheel. Valves shall be:

Kitz #17

- D. Type GB4 - Valves 2-1/2" through 16" shall be class 125 outside screw and yoke rising stem type. Body and bonnet shall be ASTM A126 cast bronze with flanged ends, bronze trim, solid wedge disc, two piece packing gland, teflon impregnated packing, malleable iron handwheel. Valves shall be:

Kitz #76

- E. Type GB5 - Valves 2-1/2" through 8" shall be class 250 outside screw and yoke rising stem type. Body and bonnet shall be ASTM A126 cast bronze with flanged ends, bronze trim, solid wedge disc, two piece packing gland, teflon impregnated packing, malleable iron handwheel. Valves shall be:

Crane Grinnel
Hammond
Lunkenheimer
Milwaukee
Nibco

2.6 PLUG VALVES

- A. Type PV1 - Valves 2" and smaller shall be class 175 WOG lubricated short pattern type. Body shall be ASTM A126 cast iron with threaded ends, teflon coated full port steel plug, and wrench operator. Valves shall be:

Powell Rockwell
Walworth

- B. Type PV2 - Valves 2-1/2" through 4" shall be class 175 WOG lubricated short pattern type. Body shall be ASTM A126 cast iron with threaded ends, teflon coated full port steel plug, and wrench operator. Valves shall be:

Powell
Rockwell
Walworth

- C. Type PV3 - Valves 6" through 12" shall be class 200 WOG lubricated short pattern type. Body shall be ASTM A126 cast iron with flanged ends, teflon coated full port steel plug, wrench operator. Valves shall be:

Powell Rockwell
Walworth

- D. Type PV4 - Valves 3" through 12" shall be class 175 WOG lubricated short pattern type. Body shall be ASTM A126 cast iron with grooved ends, teflon coated ductile iron plug, wrench operator. Plug port shall be minimum 81% free opening. Valves shall be:

Victaulic

2.7 METERED BALANCING VALVES

- A. Type MB1 - Valves 4" and smaller shall be 175 psif WOG combination balancing and shut-off type. Valve body shall be bronze ASTM B62 with threaded ends, bronze ball or plug disc, bronze trim, integral meter connection taps with shut-off cocks, and calibrated nameplate and flow indicator. Error of flow indicator and meter reading shall be maximum of 2% of full scale. Valves shall be:

Bell & Gossett	Circuit Setter
Illinois	6000 Series
Sarco	Balanced Master
Taco	Circuit Setter

- B. Meter kits shall be provided for all makeup water lines (closed loop systems, cooling towers, etc.) and shall be of the digital pulse type meter type and shall be compatible to Building Energy Management System

2.8 CHECK VALVES

- A. Type CV1 - Valves 2" and smaller shall be class 125 horizontal swing type. Body and cap shall be ASTM B62 cast bronze with threaded ends, inside screw cap, and

bronze disc. Valves shall be:

Kitz #04

- B. Type CV2 - Valves 2" and smaller shall be class 150 horizontal swing type. Body and cap shall be ASTM B62 cast bronze with threaded ends, inside screw cap, and bronze disc. Valves shall be:

Kitz #29

- C. Type CV3 - Valves 2" and smaller shall be class 200 Y-pattern swing type. Body and cap shall be ASTM B61 cast bronze with threaded ends, inside screw cap, and bronze disc. Valves shall be:

Kitz #19

- D. Type CV4 - Valves 2-1/2" thru 4" shall be class 125 horizontal swing type. Body and cap shall be ASTM B126 cast iron with flanged ends, bolted cap, and bronze or cast iron disc. Valves shall be:

Kitz #78

- E. Type CV5 - Valves 2-1/2" thru 12" shall be class 250 horizontal swing type. Body and cap shall be ASTM B126 cast iron with flanged ends, bolted cap, and bronze or cast iron disc. Valves shall be:

Crane Grinnell

Hammond

Lunkenheimer

Milwaukee

Nibco

- F. Type CV6 - Valves 3" to 24" shall be class 125 silent globe type. Body shall be ASTM A48 cast iron with flanged ends, Bronze trim, and stainless steel spring. Valve design shall provide an open area in the body equal to not less than 110% of the corresponding pipe area. Valve shall be:

APCO CPV

Grinnell

Kelflex

Metraflex

Nibco

- G. Type CV7 - Valves 2-1/2" through 12" shall be 300 psig silent globe butterfly type. body shall be ASTM A536 ductile iron, ASTM A220 pearlitic malleable iron, or ASTM A47 malleable iron with grooved ends, bronze alloy, ductile iron or stainless steel disc, stainless steel spring, stainless steel hinge pin, and EPDM o-ring seals. Valves shall be:

Grinnell

Victaulic

2.9 MISCELLANEOUS VALVES

- A. Hose end drain valves shall be class 125 angle type. Body and bonnet shall be cast bronze with threaded inlet, hose end outlet, inside screw, solid wedge disc, and malleable iron handwheel. Valve shall be:

Nibco

2.10 APPROVED MANUFACTURERS

- A. Crane, Grinnell, Milliken, Hammond, Milwaukee, Nibco, Kitz, Demco, Keystone, Victaulic, Powell, Rockwell, Walworth, Illinois, Bell & Gossett, Sarco, Taco, APCO, CPV, Kelflex, Metraflex.

PART 3 - EXECUTION

3.1 VALVE SERVICE

- A. Valve Types specified hereinbefore shall be used on the systems and services as outlined below and shown on the drawings.

B. Valves 2" and smaller:

SYSTEM	SHUT-OFF SERVICE	BALANCING SERVICE	CHECK SERVICE
CHILLED WATER	BL1	GB1, PV1	CV1
HEATING HOT WATER	BL1	GB1, PV1	CV2
MAKE-UP WATER	BL1	GB1	CV1

C. Valves 2-1/2" and larger:

SYSTEM	SHUT-OFF SERVICE	BALANCING SERVICE	CHECK SERVICE
CHILLED WATER	BF1	GB4 PV3	CV4
HEATING HOT WATER	BF1	GB4 PV3	CV4
MAKE-UP WATER	GV4	GB4	CV4

3.2 INSTALLATION

- A. All valves in horizontal lines shall be installed with the stem horizontal or above. Valve handwheels shall be oriented when installed to provide accessibility for operations.
- B. Flanged gate valves shall be installed between ASA 150 lb. raised-face steel slip-on weld flanges.
- C. non-slam check valves shall be installed between ASA 150 lb. flat face steel slip-on weld flanges.
- D. All valves 2-1/2" and larger to have flanged connections. All valves 2" and smaller to have threaded connections.
- E. Where indicated on the drawings or valve located over 8" A.F.F., valves shall be provided with chain operator and valve shall include manufacturer's standard cast iron chain wheel with roller guides and with link chains with connecting ends; chain length shall be such that the bottom of the chain loop is 5'0" above finished floor on the building.
- F. Contractor shall provide T-wrench operator for valves located in pits over 3'0" in depth
- G. Provide three (3) wrenches for each size plug valve.
- H. Provide isolation valves on supply & return lines of all pieces of mechanical equipment, branch piping, etc.

END OF SECTION

9-2-25

SECTION 23 0590 - CONTRACTOR COORDINATION WITH TESTING, ADJUSTING & BALANCING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.2 SUMMARY

- A. Perform all Work required to prepare the building HVAC systems for testing, adjusting, and balancing (TAB) Work indicated by the Contract Documents, including the following:
 - 1. Preparation of air systems for testing, adjusting and balancing.
 - 2. Preparation of hydronic and steam systems for testing, adjusting and balancing.
 - 3. Providing materials and labor to assist TAB Firm in meeting testing, adjusting and balancing requirements.
- B. Testing, adjusting and balancing of the air conditioning systems and related ancillary equipment will be performed by a technically qualified TAB Firm. The preparation for and corrections necessary for the testing, adjusting and balancing of these systems, as described herein, are the responsibility of this Contractor.
- C. Make any changes or replacements to the sheaves, belts, dampers and valves required for correct balance as advised by the TAB Firm, at no additional cost to the Owner.

1.3 REFERENCE STANDARDS

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
- C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:
 - 1. AABC: National Standards for Testing and Balancing Heating, Ventilating and Air Conditioning Systems.
 - 2. AABC: Testing and Balancing Procedures.
 - 3. ASHRAE HVAC Applications Chapter 37: Testing, Adjusting and Balancing.
 - 4. ANSI/ASHRAE Standard 111: Practices for Measurement, Testing, Adjusting and Balancing of Buildings, Heating, Ventilation, Air Conditioning and Refrigeration Systems.

1.4 QUALITY ASSURANCE

- A. Provide and coordinate the services of qualified, responsible Subcontractors, suppliers and personnel as required to correct, repair, and/or replace any and all deficient items or conditions found during the course of this project, including during the testing, adjusting and balancing period.
- B. In order that systems may be properly tested, adjusted, and balanced, the Contractor shall operate systems at Contractor's expense for the length of time necessary to properly verify the systems' completion and readiness for TAB.
- C. Project Contract completion schedules shall allow for sufficient time to permit the completion of TAB services prior to Owner occupancy. Allow adequate time for the testing and balancing activities during the construction period and prior to Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL

- A. None used.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Contractor shall be responsible to prepare the building heating, ventilating, and air conditioning systems ready for TAB when scheduled.
- B. Operational readiness requires that construction status of the building will permit the closing of doors, windows, ceilings installed, etc., to obtain simulated or projected operating conditions.
- C. Notification of System Readiness:
 - 1. Upon completion of the system installation Work, the Contractor shall notify the Owner and TAB Firm in writing, certifying that the Work has been accomplished and that the air conditioning systems are in operational readiness for testing, adjusting, and balancing.
 - 2. TAB Firm shall notify the Contractor of TAB Firm's readiness for balancing.
 - 3. Should the TAB Firm be notified as described above, and the TAB Work commenced and the systems are found NOT to be in readiness or a dispute occurs as to the readiness of the systems, the Contractor shall request an inspection be made by a duly appointed representative of the Owner, Architect, TAB Firm and the Contractor. This inspection will establish to the satisfaction of the represented parties whether or not the systems meet the basic requirements for TAB services. Should the inspection reveal the TAB services notification to have been premature, all cost of the inspection and wasted Work accomplished by the TAB Firm shall be the responsibility of the Contractor.

3.2 INSTALLATION

- A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
- B. All installation shall be in accordance with manufacturer's published recommendations.
- C. Allow sufficient time for the TAB Firm to perform TAB Firm's Work within the Project schedule. Complete installation Work by system or floor, whichever is the most efficient for scheduling. Develop the Project schedule in close coordination with the TAB Firm.
- D. The Drawings and Specifications indicate valves, dampers and miscellaneous adjustment devices for the purpose of adjustment to obtain optimum operating conditions. Install these devices in a manner that will leave the devices accessible and readily able to be adjusted. Immediately correct any malfunction encountered that the TAB Firm reports so that the balancing Work can proceed with minimal delay.
- E. Contractor shall promptly correct deficiencies of materials and workmanship identified as delaying completion of TAB Work.

3.3 SYSTEMS VERIFICATION

- A. Air Distribution Systems:
 - 1. Verify installation for conformity to the Contract Documents. All supply, return, and exhaust ducts shall be terminated and pressure tested for leakage as required by the Contract Documents.
 - 2. All volume, smoke and fire/smoke dampers are properly located and functional. Dampers serving requirements of minimum and maximum outside, return, and relief air shall provide tight closure and full opening, smooth and free operation.
 - 3. All supply, return, exhaust and transfer grilles, registers, diffusers and terminal devices are installed and airflow at each device shall be verified.
 - 4. Air handling systems, units and associated apparatus, such as heating and cooling coils, filter sections, access doors, etc., shall be sealed or blanked-off to eliminate excessive uncontrolled bypass or leakage of air.
 - 5. All fans (supply, return and exhaust) operating and verified for freedom from vibration, with proper fan rotation and belt tension. Heater elements in motor starters are of proper size and rating. Record motor amperage and voltage on each phase at Start-up and running, and verify they do not exceed nameplate ratings.
 - 6. All single and/or double duct variable and constant volume terminal units ("mixing boxes") shall be installed and functional (i.e. controls functioning).
 - 7. Duct systems and air handling units and coils are clean and free of debris.

8. Air systems are pressure independent and can be tested by floor, riser, system, etc. but once the all systems are installed, the total flows and system tracking will require final testing, adjusting and balancing.
- B. Water Circulating Systems:
1. Check and verify pump alignment and rotation.
 2. Open all valves to their full open position, close bypass stop valves. Set mixing valves to full-flow through systems components. After the system is flushed and checked for proper operation, remove and clean all strainers. Repeat the operation until circulating water is clean.
 3. Record the amperage of each pump motor on each phase and voltage after reaching rated speed. Readings shall not exceed nameplate rating.
 4. Verify that the electrical heater elements are of the proper size and rating.
 5. All water circulating systems shall be full and free of air. Expansion tanks shall be set for proper water level and all air vents shall be installed at high points of systems and operating freely. Systems shall be cleaned and flushed. Chemicals shall be added to closed systems to treat piping and inhibit corrosion.
 6. Check and set operating temperatures and other parameters of the heat exchangers and control devices to the design requirements.
 7. Installation and system verification of steam, condenser water, hot water, and chilled water systems must be 100 percent complete prior to balancing.
- C. Building Automation System (BAS):
1. Verify that all control components are installed in accordance with the Contract Documents and that all control components are functional, including all electrical interlocks, damper sequences, air and water resets, fire and freeze stats, high and low temperature thermostats, safeties, etc.
 2. Verify that all controlling instruments are calibrated and set for design operating conditions with the exception of room thermostats or sensors, which shall be calibrated at the completion of TAB services with cooperation between the TAB Firm and BAS Provider.
 3. BAS Provider shall thoroughly check all controls, sensors, operators, sequences, etc. before notifying the TAB Firm that the building automation system is operational. The BAS Provider shall provide technical support, including technicians and necessary computers, to the TAB Firm for a complete check of these systems.
 4. BAS Provider shall assist the Contractor with functional performance testing and point-to-point testing back to the main graphics.
 5. BAS Provider, if requested by Owner, shall set-up controls on sample fan powered or non-fan powered terminal units at TAB Firm's office.
 6. BAS Provider, if requested by Owner, shall set-up controls on sample computer at TAB Firm's office.

END OF SECTION

9-2-25

SECTION 23 0593 - TESTING AND BALANCING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. All division 23 specification sections, drawings, and general provisions of the contract apply to work of this section, as do other documents referred to in this section.

1.2 SCOPE OF WORK

- A. The **CONTRACTOR** shall obtain the services of an independent Test and Balance (TAB) Company which specializes in the testing and balancing of heating, ventilating and air conditioning (HVAC) systems to test, adjust and balance all HVAC systems in the building(s). *The project shall not be accepted until approved Testing and Balancing Report has been submitted and approved.*
- B. The work included in this section consists of furnishing labor, instruments, and tools required in testing, adjusting and balancing the HVAC systems, as described in these specifications or shown on accompanying drawings. Services shall include checking equipment performance, taking the specified measurements, and recording and reporting the results. The testing, adjusting and balancing agency shall act as a reporting agency; that is, list and report each piece of equipment as to identification number, manufacturer, model number, serial number, proper location, specified performance, and report actual performance of all equipment as found during testing. The report is intended to be used during the life of the building as a ready reference indicating original conditions, equipment components, etc.
- C. Representatives of the Test and Balance Company shall visit the job site at 60% and 90% completion of installation of the HVAC equipment, piping and ductwork to review the installation. After each site visit, the Test and Balance Company shall report to the Architect any items that are not installed properly, are missing from the installation or items that are required to enable him to perform the testing and balancing of the HVAC systems as per normal standard practice. After review, the Architect shall instruct the Contractor to implement the recommendations at no additional cost to the Owner if these items were specified in the original scope of the project.
- D. Upon completion of the HVAC system installation, the Test and Balance Company shall perform all required testing and balancing with the full cooperation of the Contractor and his Sub-contractors. The Contractor shall make changes and/or adjustments to the HVAC system components that are required by the Test and Balance Company to accomplish proper balancing. The TAB agency shall not supply or install any materials or balancing devices such as pulleys, drives, belts, etc. All of this work is by the Contractor and shall be performed at no additional cost to the Owner.
- E. The test and balance report shall be submitted to the Architect for review by his Mechanical Engineer. If the Mechanical Engineer agrees with the report, he shall sign it and return it to the Architect. If he does not concur with the report, he shall meet with the Test and Balance Company to determine what needs to be done to obtain a properly balanced system.
- F. After the Mechanical Engineer signs the testing and balancing report, the Test and Balance Company shall supply four (4) copies of the final and complete report to the Architect for inclusion in the Operation and Maintenance Manuals.
 - 1. Report to in format of sample report located at the end of this specification section. For all items that are not applicable the contractor shall note as "NOT

APPLICABLE”.

- G. The items requiring testing, adjusting, and balancing include (but are not restricted to) the following:

AIRSYSTEMS:

Supply Fan
AHU
Exhaust Fans
Zone branch and main ducts
Diffusers, Registers, Grilles and Dampers
Coils (Air Temperatures)
Valves
Vibration Isolators
VAV Boxes
Fan Coil Units
Outside Air Units

HYDRONICSYSTEMS:

Pumps
System Mains and Branches
Chillers
Boilers
Coils
Control Valves

- H. The Contractor will provide the services of a qualified test and balance contractor. The qualifications of the TAB contracting firm shall be submitted, along with the specific qualifications of the lead site technician who will remain on site during all TAB work, within 30 days of notice to proceed. Recent projects shall be listed and described for both the company and the lead technician. Names and telephone numbers of the project contractors and facility managers will be provided.
- I. The owner must approve in writing the qualifications of both the company and the lead technician.
- J. At the time of final inspection, the TAB agency shall be required to recheck, in the presence of the owner's representative & mechanical engineer, specific and random elections of data, temperatures, air quantities, and air motion recorded in the certified report. Points and areas for recheck shall be selected by the owner's representative & mechanical engineer at time of recheck. Measurements and test procedures shall be the same as approved for the initial work for the certified report. Selections for recheck, specific plus random, shall not exceed 10% of the total number tabulated in the report.

1.3 DEFINITIONS, REFERENCES, STANDARDS

- A. All work shall be in accordance with the latest edition of the Associated Air Balance Council (AABC) National Standards. If these contract document set forth

more stringent requirements than the AABC National Standards, these contract documents shall prevail.

1.4 QUALIFICATIONS

- A. Agency Qualifications: The TAB Agency shall be a current member of the AABC, NEBB certification alone not acceptable.

1.5 SUBMITTALS

- A. Qualifications: The TAB agency shall submit a company resume listing personnel and project experience in air and hydronic system balancing and a copy of the agency's test and balance engineer (TBE) certificate.
- B. Procedures and Agenda: The TAB agency shall submit the TAB procedures and agenda proposed to be used.
- C. Sample Forms: The TAB agency shall submit sample forms, which shall include the minimum data required by the AABC National Standards.

1.6 TAB PREPARATION AND COORDINATION

- A. Shop drawings, submittal data, up-to-date revisions, change orders, fan curves, pump curves and other data required for planning, preparation, and execution of the TAB work shall be provided when available and no later than 30 days prior to the start of TAB work.
- B. System installation and equipment startup shall be complete prior to the TAB agency's being notified to begin, except that duct leak testing shall be done during construction.
- C. The building control system (BCS) contractor shall provide and install the control system, including all temperature, pressure and humidity sensors. These shall be calibrated for accurate control. If applicable, the BCS contractor shall install all necessary computers and computer programs, and make these operational. Assistance shall be provided as required for reprogramming, coordination, and problem resolution.
- D. All test points, balancing devices, identification tags, etc., shall be accessible and clear of insulation and other obstructions that would impede TAB procedures.
- E. Qualified installation or startup personnel shall be readily available for the operation and adjustment of the systems. Assistance shall be provided as required for coordination and problem resolution.
- F. If, upon commencing the work, the TAB contractor finds that the systems are not ready, or if a dispute occurs as to the readiness of the systems, the TAB contractor may request an inspection to be made by the Designer's Mechanical Engineer. This inspection shall establish to the satisfaction of the represented parties whether or not the systems meet the basic requirements for testing and balancing. Items that are determined to be not ready for testing and balancing shall be completed by the Mechanical Contractor and placed in operational readiness before TAB services are again requested.

1.7 REPORTS

- A. Final TAB Report - The TAB agency shall submit the final TAB report for review by the Architect. On plans provided, all outlets, devices, HVAC equipment, etc., shall be identified (including manufacturer, model number, serial number, motor manufacturer, HP, drive type, fan and motor sheaves and belt number), along with a numbering system corresponding to report unit identification. The TAB agency shall submit an AABC "National Project Performance Guaranty" assuring that the project systems were tested,

adjusted and balanced in accordance with the project specifications and AABC National Standards.

- B. Submit 4 copies of the Final TAB Report to the Architect for inclusion in the Operation and Maintenance Manuals.

PART 2 - INSTRUMENTATION

- A. All instruments used for measurements shall be accurate and calibrated.
- B. Calibration and maintenance of all instruments shall be in accordance with the requirements of AABC National Standards.

PART 3 - EXECUTION

3.1 GENERAL

- A. The specified systems shall be reviewed and inspected for conformance to design documents. Testing, adjusting and balancing on each identified system shall be performed. The accuracy of measurements shall be in accordance with AABC National Standards. Adjustment tolerances shall be + or - 10% unless otherwise stated.
- B. Equipment settings, including manual damper quadrant positions, valve indicators, fan speed control levers, and similar controls and devices shall be marked to show final settings.
- C. All information necessary to complete a proper TAB project and report shall be per AABC standards unless otherwise noted. The descriptions of work required, as listed in this section, are a guide to the minimum information needed.
- D. TAB contractor shall cut insulation, ductwork and piping for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. Upon completion, patch insulation, ductwork and housings using materials identical to those removed. Seal insulation to reestablish integrity of the vapor barrier.
- E. TAB work shall include additional inspection and adjustment of components during the season following the initial balance to include re-balance of any items influenced by seasonal changes or as directed by the Owner.

3.2 AIR SYSTEMS

- A. The TAB agency shall verify that all ductwork, splitters, extractors, dampers, grilles, registers, and diffusers have been installed per design, are functional and set full open. Any leakage in the ductwork shall be repaired prior to the test. The TAB agency shall perform the following TAB procedures in accordance with the AABC National Standards:

For supply fans:

- 1. Fan speeds - Test and adjust fan RPM to achieve design CFM requirements.

*Prior to replacing pulley's & sheaves at supply fan, TAB contractor to measure total air flow of supply fan with respective variable speed drive (VFD) set @ 30Hz. TAB contractor to dial up on VFD until total specified total air flow is achieved. Provide frequency of VFD at maximum air flow on TAB report.

- 2. Current and Voltage - Test and record motor voltage and amperage, and compare data with the nameplate limits to ensure fan motor is not in or above the service factor.

3. Pitot-Tube Traverse - Perform a Pitot-tube traverse of main supply and return ducts, as applicable to obtain total CFM. If a Pitot-tube traverse is not practical, an explanation of why a traverse was not made must appear on the appropriate data sheet.
4. Outside Air - Test and adjust the outside air on applicable equipment using a Pitot-tube traverse. If a traverse is not practical, an explanation of why a traverse was not made must appear on the appropriate data sheet. If a traverse is not practical use the mixed- air temperature method if the inside and outside temperature difference is at least 20 degrees Fahrenheit or use the difference between Pitot-tube traverses of the supply and return air ducts.
5. Static Pressure - Test and record system static pressure, including the static pressure profile of each supply fan.

For exhaust fans:

1. Fan speeds - test and adjust fan RPM to achieve design CFM requirements.
2. Current and Voltage - Test and record motor voltage and amperage, and compare data with the nameplate limits to ensure motor is not in or above the service factor.
3. Pitot-Tube Traverse - Perform a Pitot-tube traverse of main exhaust ducts to obtain total CFM. If a Pitot-tube traverse is not practical, an explanation of why a traverse was not made must appear on the appropriate data sheet.
4. Static Pressure - Test and record system static pressure, including the static pressure profile of each exhaust fan.

For zone, branch and main ducts:

1. Adjust ducts to within design CFM requirements. As applicable, at least one zone balancing damper shall be completely open. Multi- diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.

For diffusers, registers and grilles:

1. Tolerances - Test, adjust, and balance each diffuser, grille, and register to within 10% of design requirements. Minimize drafts. Include required CFM, initial test CFM and final CFM.
2. Identification - Identify the type, location, and size of each grille, diffuser, and register. This information shall be recorded on air outlet data sheets.

For coils:

1. Air Temperature - Once air flows are set to acceptable limits, take wet bulb and dry bulb air temperatures on the entering and leaving side of each cooling coil. Dry-bulb temperature shall be taken on the entering and leaving side of each heating coil.

For VAV systems:

1. Identify the type, location, and size of each terminal box. This information shall be recorded on terminal box data sheets.
2. Test, adjust and record the maximum and minimum box air quantities for each VAV box.

3. Set volume regulators on all terminal boxes to meet design maximum and minimum CFM requirements.
4. Test and record entering and leaving air temperature of hot water coils with full heating air flow and water flow.
5. Insure the entering static pressure is sufficient for normal, proper box operation.

3.3 HYDRONIC SYSTEMS

- A. The TAB agency shall, as applicable, verify that all hydronic equipment, piping, and coils have been filled and purged; that strainers have been cleaned; and that all balancing valves (except bypass valves) are set full open. Examine water in system and determine if it has been treated and cleaned. As applicable, it shall check air vents and expansion or compression tank for proper operation. The TAB agency shall perform the following testing and balancing functions in accordance with the AABC National Standards:

For pumps:

1. Test and adjust chilled water, hot water, and condenser water pumps to meet design GPM requirements. Check pump rotation and verify impeller size. Check pumps for proper operation. Pumps shall be free of vibration and cavitation. Record appropriate gauge readings for final TDH and Block-Off/Dead head calculations. List pump N.P.S.H. (as applies).
2. Current and Voltage - Test and record motor voltage and amperage, and compare data with the nameplate limits to ensure pump motor is not in or above the service factor.

For system mains and branches:

1. Adjust water flow in pipes to within design GPM requirements. As applicable, at least one branch balancing valve shall be completely open.

For chillers:

1. Verify that chillers have been started by others and are in operation.
Test and adjust chiller water flows to within 10% of design requirements by observing differential pressure gauge and setting balance valves.
2. Current and Voltage - Test and record motor voltage and amperage, and compare data with the nameplate limits to ensure compressor motor is not in or above the service factor.
3. Test and record entering and leaving temperature and pressure profiles of chillers.

For boilers:

1. Verify that boilers have been filled and started by others, and are in operation.
2. Current and Voltage - As applicable, test and record motor voltage and amperage, and compare data with the nameplate limits to ensure motor is not in or above the service factor.
3. Test and adjust water flow through water boilers.
4. Test and record entering and leaving temperature and pressure profiles of water or steam boilers.

For coils:

1. Tolerances - Test, adjust, and balance all chilled-water and hot- water coils within 10% of design requirements.
2. Verification - Verify the type, location, final pressure drop and GPM of each coil. This information shall be recorded on coil data sheets.

For control valves:

1. Check operation of automatic valves.
2. Test and record pressure drop and flow across control valves at full flow.

3.4 SOUND TESTING

- A. The TAB agency shall conduct sound testing in the following areas per AABC National Standards and to the criteria listed, using sound meter with octave band analyzer:

<u>TESTAREA</u>	<u>NUMBER OF LOCATIONS</u>	<u>ACCEPTABLE LEVEL</u>
General Offices	6	30-35
Executive Offices	1	25-30
Computer/Equipment Rooms	2	40-45
Schools/Classrooms	3	25-30

- B. All measurements are to be in accordance with AABC. Contractor shall utilize a sound meter with octave band analyzer.
- C. Provide cut sheet of all sound measurement devices to mechanical engineer for approval.

3.5 ADDITIONAL TAB SERVICES

- A. Verification of HVAC Controls:

The TAB agency shall be assisted by the building control systems contractor in verifying the operation and calibration of all HVAC and temperature control systems. The following tests shall be conducted:

1. Verify that all control components are installed in accordance with project requirements and are functional, including all electrical interlocks, damper sequences, air and water resets, fire and freeze stats, and other safety devices.
2. Verify that all controlling instruments are calibrated and set for design operating conditions.

- B. Temperature Testing:

To verify system control and operation, a series of three temperature tests shall be taken at approximately two hour intervals in each separately controlled zone. The resulting temperatures shall not vary more than two degrees Fahrenheit from the thermostat or control set point during the tests. Outside temperature and humidity shall also be recorded during the testing periods.

- C. TAB Report Verification:

At the time of final inspection, the TAB agency may be required to recheck, in the presence of the owner's representative, specific and random selections of data, air quantities, and air motion recorded in the certified report. Points and areas for

recheck shall be selected by the owner's representative. Measurements and test procedures shall be the same as approved for the initial work for the certified report. Selections for recheck, specific plus random, will not exceed 10% of the total number tabulated in the report.

D. Job Site Inspections:

During construction, the TAB agency shall inspect the installation of pipe systems, sheet metal work, temperature controls, and other component parts of the HVAC systems. Inspections shall be conducted a minimum of two times. (Typically, these are performed when 60% of the total system is installed and again when 90% of the total system is installed, prior to insulation of the duct and piping). The TAB agency shall submit a written report of each inspection to the Architect.

E. Seasonal Rebalancing:

This TAB contractor shall figure in bid rebalancing HVAC system during peak seasonal conditions (summer & winter) in order to provide design team with HVAC information from peak design conditions. This work shall be completed within the one (1) year warranty period.

F. Duct Leakage Testing:

The installing contractor shall isolate and seal sections of ductwork for testing. The pressurization fan and test apparatus shall be connected to the test section and the test performed. The test pressures required and the amount of duct to be tested shall be described by the engineer in the appropriate duct classification section. All testing shall be based on one test per section.

I. Building/Zone Pressurization:

The TAB agency shall test and adjust building/zone pressurization by setting the design flows to meet the required flow direction and pressure differential. For positive pressure areas, it shall set the supply air to design flow, and gradually reduce the exhaust air rate to obtain the required flow or pressure difference. For negative pressure areas, it shall set the supply air to design flow, and gradually increase the exhaust air rate to obtain the required flow or pressure difference.

J. Air Leakage Rate Testing:

The entire facility (All Buildings) shall be tested for air leakage rate by fan pressurization (Blower Door Test). The air leakage test shall be in accordance with ASTM E779 (Current Edition).

3.4 INDOOR AIR QUALITY VERIFICATION

- A. The Tab agency shall take measurements at minimum outside air. It shall measure temperature and humidity uniformity throughout the space, check filter installation for proper fit, seal, and operation, and verify condensate drain operation. The TAB agency shall note any water damage or obvious contamination sources from inside or outside.
- B. The TAB agency shall conduct the following air sampling tests using TWA limits shown in ASHRAE Standard 62.1-2013, Table B-1 (the test shall be performed on the exterior of the building as well as throughout the interior of the building as to establish comparative data between the indoor & outdoor IAQ):
 - 1. Carbon dioxide
 - 2. Carbon monoxide

3. Formaldehyde
4. Lead
5. Nitrogen dioxide
6. Ozone
7. Radon
8. Sulfur Dioxide
9. Particles

- C. The TAB agency shall prepare a short report showing the results and location of each test, a summary of the HVAC operating conditions, and a listing of any discrepancies.

3.5 VIBRATION TESTING

- A. The TAB agency shall conduct vibration testing on the following equipment per AABC National Standards. Test deflection in mils and velocity in inches per second shall be measured and the results compared to requirements in equipment specification sections.

EQUIPMENT:

Air Handling Units

Fans

Pumps

Boilers

Chillers

VAV Boxes

END OF SECTION

9-2-25

TEST AND BALANCE ANALYSIS REPORT

FOR

JOB

CONTRACTOR

ARCHITECT

ENGINEER

C_x AGENT

PJ#

CERTIFICATION:

AIR DISTRIBUTION SYSTEM HAS BEEN COMPLETELY BALANCED AS PER
REQUIREMENTS OF SPECIFICATIONS AND RESULTS FOR TESTS HEREIN LISTED.

CERTIFICATION NO.

BY

DATE

APPROVED

AIR UNIT TEST SHEET

JOB NAME: _____ DATE _____

SYSTEM _____

SPECIFICATIONS:

FAN: CFM _____ TSP _____ ESP _____ RPM _____ BHP _____ O.A. CFM _____

COOLING	MBH _____	GPM _____	WATER ON _____	OFF _____
	AIR ON DB/WB _____		OFF DB/WB _____	Δ TH _____
HEATING	MBH _____	GPM _____	WATER ON _____	OFF _____
	AIR ON DB _____		OFF DB _____	
	MBH _____	GPM _____	WATER ON _____	OFF _____
	AIR ON DB/WB _____		OFF DB/WB _____	

TEST DATA:

UNIT _____ SIZE _____ SERIAL _____

MOTOR _____ HP _____ RPM _____ VOLTAGE _____ FLA _____

TEST VOLTAGE _____ CORRECTED FLA _____ MISC. _____

STARTER / HEATER SIZE _____ RATING _____ RUNNING AMPS _____

FAN: CFM _____ TSP _____ ESP _____ RPM _____ O.A. CFM _____

COIL:	AIR ON	AIR OFF	Δ		WATER ON	OFF	Δ T	MBH
COOLING				Δ TH				
HEATING				Δ T				
				Δ T				

FLOW METER:	MODEL/SIZE	DESIGN READING	TEST READING	GPM
COOLING	_____	_____	_____	_____
HEATING	_____	_____	_____	_____

MTR. PULLEY = _____ FAN SUCTION = _____

FAN PULLEY = _____ FAN DISCHARGE = _____

BELTS = _____ TOTAL STATIC = _____

AIR MOVING EQUIPMENT TEST SHEET

JOB NAME: _____

DATE: _____

	UNIT #		UNIT #		UNIT #		UNIT #
LOCATION							
MANUFACTURER							
MODEL NO.							
SA SIZE/FPM							
OPERATING COND.	SPECIFIED	ACTUAL	SPECIFIED	ACTUAL	SPECIFIED	ACTUAL	SPECIFIED
TOTAL C.F.M.							
RETURN AIR C.F.M.							
O.S.A. C.F.M.							
EXT. STATIC PRESS.							
SUCTION PRESSURE							
DISCHARGE PRESS.							
FAN SHEAVE							
MOTOR SHEAVE							
BELTS							
MOTOR MANUF.							
SIZE HP							
VOLTAGE							
PHASE							
RPM MOTOR							
AMPERAGE	RATED	RUNNING	RATED	RUNNING	RATED	RUNNING	RATED
RPM FAN							
COOL MBH							
HEAT MBH							

DUCT TRAVERSE SHEET

ZONE TOTALS

JOB NAME: _____ DATE: _____

[illegible]

VAV BOX TEST SHEET

JOB NAME _____

DATE _____

SYSTEM _____

[illegible]

VAV BOX AT MAX. CFM TEST SHEET

JOB NAME: _____ DATE: _____

[illegible]

AIR QUANTITY EACH INLET/OUTLET

JOB NAME: _____ DATE: _____

SYSTEM _____

[illegible]

FAN TEST SHEET

JOB NAME: _____

DATE: _____

SPECIFIED

Total CFM

Fan RPM

Total S.P.

Motor H.P.

FAN #	FAN #	FAN #	FAN #

TEST

Manufacturer

Model #

Serial #

Size

Motor Mfg.

Motor HP

Motor RPM

Motor Volts

Motor F.L.A.

Run Amps.

Heaters Size/Rtg.

Line Voltage

Total CFM

Fan RPM

Total S.P.

Notes

ERV TEST SHEET

JOB NAME: _____

DATE: _____

SPECIFIED

Total CFM

Fan RPM

Total S.P.

Motor H.P.

OSA FAN	WHEEL	EXH. FAN	WHEEL

TEST

Manufacturer

Model #

Serial #

Size

Motor Mfg.

Motor HP

Motor RPM

Motor Volts

Motor F.L.A.

	DES. TEMPS.		DES. TEMPS.
	EDB =		EDB =
	EWB =		EWB =
	LDB =		LDB =
	LWB =		LWB =

Run Amps.

Heaters Size/Rtg

Line Voltage

Total CFM

Fan RPM

Total S.P.

	ACT. TEMPS.		ACT. TEMPS.
	EDB =		EDB =
	EWB =		EWB =
	LDB =		LDB =
	LWB =		LWB =

Notes

ELECTRIC RE-HEAT COIL TEST SHEET

JOB NAME: _____ DATE: _____

[illegible]

HOT WATER RE-HEAT COIL TEST SHEET

JOB NAME: _____ DATE: _____

[illegible]

PUMP TABULATION TEST SHEET

JOB NAME: _____ DATE: _____

SPECIFIED

GPM

HEAD

HP

TEST

MANUFACTURER

MODEL

SIZE

SERIAL

MOTOR MFG.

HP

RPM

VOLTS

LINE VOLTS

F.L. AMPS

TEST AMPS

HEATER

IMPELLER SIZE

DISCHARGE LBS.

SUCTION LBS.

DIFFERENTIAL

HEAD IN FEET

GPM

PUMP #		PUMP #		PUMP #		PUMP #	

AIR COOLED CHILLER DATA

JOB NAME: _____

DATE: _____

UNIT NUMBER		
MANUFACTURER		
CAPACITY		
MODEL NUMBER		
SERIAL NUMBER		
EVAPORATOR	DESIGN	ACTUAL
EWT		
LWT		
P.D. FT.		
GPM		
CONDENSER	DESIGN	ACTUAL
EAT		
LAT		
ELECTRICAL	DESIGN	ACTUAL
VOLTAGE		
AMPERAGE		

REMARKS: _____

UNIT NUMBER		
MANUFACTURER		
CAPACITY		
MODEL NUMBER		
SERIAL NUMBER		
EVAPORATOR	DESIGN	ACTUAL
EWT		
LWT		
P.D. FT.		
GPM		
CONDENSER	DESIGN	ACTUAL
EAT		
LAT		
ELECTRICAL	DESIGN	ACTUAL
VOLTAGE		
AMPERAGE		

REMARKS: _____

WATER COOLED CHILLER DATA

JOB NAME: _____

DATE: _____

UNIT NUMBER		
MANUFACTURER		
CAPACITY		
MODEL NUMBER		
SERIAL NUMBER		
EVAPORATOR	DESIGN	ACTUAL
EWT		
LWT		
P.D. FT.		
GPM		
CONDENSER	DESIGN	ACTUAL
EWT		
LWT		
P.D. FT.		
GPM		
ELECTRICAL	DESIGN	ACTUAL
VOLTAGE		
AMPERAGE		

REMARKS: _____

UNIT NUMBER		
MANUFACTURER		
CAPACITY		
MODEL NUMBER		
SERIAL NUMBER		
EVAPORATOR	DESIGN	ACTUAL
EWT		
LWT		
P.D. FT.		
GPM		
CONDENSER	DESIGN	ACTUAL
EWT		
LWT		
P.D. FT.		
GPM		
ELECTRICAL	DESIGN	ACTUAL
VOLTAGE		
AMPERAGE		

REMARKS: _____

COOLING TOWER DATA

JOB NAME: _____

DATE: _____

UNIT NUMBER		
MANUFACTURER		
CAPACITY		
MODEL NUMBER		
SERIAL NUMBER		
PERFORMANCE	DESIGN	ACTUAL
AMBIENT AIR DB		
AIR EWB		
AIR LWB		
GPM		
EWT		
LWT		
MOTOR	DESIGN	ACTUAL
MANUFACTURER		
HORSEPOWER		
RPM		
VOLTAGE		
PHASES		
AMPERAGE		
HEATER AMPS		
HEATER VOLTS		
HEATER KW		

REMARKS: _____

UNIT NUMBER		
MANUFACTURER		
CAPACITY		
MODEL NUMBER		
SERIAL NUMBER		
PERFORMANCE	DESIGN	ACTUAL
AMBIENT AIR DB		
AIR EWB		
AIR LWB		
GPM		
EWT		
LWT		
MOTOR	DESIGN	ACTUAL
MANUFACTURER		
HORSEPOWER		
RPM		
VOLTAGE		
PHASES		
AMPERAGE		
HEATER AMPS		
HEATER VOLTS		
HEATER KW		

REMARKS: _____

AIR COOLED CONDENSING UNIT DATA

JOB NAME: _____

DATE: _____

UNIT NUMBER		
MANUFACTURER		
CAPACITY		
MODEL NUMBER		
SERIAL NUMBER		
CONDENSER	DESIGN	ACTUAL
EAT		
LAT		
ELECTRICAL	DESIGN	ACTUAL
VOLTAGE		
AMPERAGE		

UNIT NUMBER		
MANUFACTURER		
CAPACITY		
MODEL NUMBER		
SERIAL NUMBER		
CONDENSER	DESIGN	ACTUAL
EAT		
LAT		
ELECTRICAL	DESIGN	ACTUAL
VOLTAGE		
AMPERAGE		

UNIT NUMBER		
MANUFACTURER		
CAPACITY		
MODEL NUMBER		
SERIAL NUMBER		
CONDENSER	DESIGN	ACTUAL
EAT		
LAT		
ELECTRICAL	DESIGN	ACTUAL
VOLTAGE		
AMPERAGE		

UNIT NUMBER		
MANUFACTURER		
CAPACITY		
MODEL NUMBER		
SERIAL NUMBER		
CONDENSER	DESIGN	ACTUAL
EAT		
LAT		
ELECTRICAL	DESIGN	ACTUAL
VOLTAGE		
AMPERAGE		

REMARKS: _____

HOT WATER BOILER DATA

JOB NAME: _____

DATE: _____

UNIT NUMBER		
MANUFACTURER		
CAPACITY		
MODEL NUMBER		
SERIAL NUMBER		
SECONDARY HW	DESIGN	ACTUAL
EWT		
LWT		
P.D. FT.		
GPM		
CNTL. SET. PT.		

UNIT NUMBER		
MANUFACTURER		
CAPACITY		
MODEL NUMBER		
SERIAL NUMBER		
SECONDARY HW	DESIGN	ACTUAL
EWT		
LWT		
P.D. FT.		
GPM		
CNTL. SET. PT.		

UNIT NUMBER		
MANUFACTURER		
CAPACITY		
MODEL NUMBER		
SERIAL NUMBER		
SECONDARY HW	DESIGN	ACTUAL
EWT		
LWT		
P.D. FT.		
GPM		
CNTL. SET. PT.		

UNIT NUMBER		
MANUFACTURER		
CAPACITY		
MODEL NUMBER		
SERIAL NUMBER		
SECONDARY HW	DESIGN	ACTUAL
EWT		
LWT		
P.D. FT.		
GPM		
CNTL. SET. PT.		

REMARKS: _____

LETTERHEAD

FUME HOOD TEST SHEET

JOB NAME: _____

DATE: _____

ROOM NO. _____ HOOD NO. _____ HOOD SIZE _____ AVERAGE FACE VELOCITY _____

FULL OPEN HEIGHT

ROOM NO. _____ HOOD NO. _____ HOOD SIZE _____ AVERAGE FACE VELOCITY _____

OPERATIONAL HEIGHT

**AIR CHANGE PER HOUR
TEST SHEET**

JOB NAME: _____ DATE TESTED: _____
EXPIRATION DATE: _____

LOCATION

AREA CU. FT.

REQUIRED MIN. SUPPLY ACH

REQUIRED MIN. OUTSIDE AIR ACH

REQUIRED MIN. RA/EXH. ACH

REQUIRED MIN. SUPPLY CFM

REQUIRED MIN. OUTSIDE AIR CFM

REQUIRED MIN. RA/EXH. CFM

ACTUAL SUPPLY QUANTITY CFM

ACTUAL OUTSIDE AIR QUANTITY CFM

ACTUAL RA/EXH. QUANTITY CFM

ACTUAL SUPPLY ACH

ACTUAL OUTSIDE AIR ACH

ACTUAL RA/EXH. AIR ACH

ROOM PRESSURE

NOTE: _____

**DUCT PRESSURE TEST
CERTIFICATION**

JOB NAME _____

DATE TESTED _____

DUCT SYSTEM ID _____

DESIGN CFM _____

OPERATING PRESSURE _____

TEST REQUIREMENTS _____

TEST RESULTS _____

CFM LEAKAGE _____

COMMENTS _____

APPROVED BY _____

ELECTRIC RE-HEAT COIL
TEST SHEET

JOB NAME: _____ DATE: _____

BOX NO.	DESIGN CFM	DESIGN BTUH	DESIGN KW	ACTUAL CFM	ACTUAL EAT/LAT	ACTUAL BTUH	ACTUAL KW
NOTE: 1.0 KW = 3413 BTUH							

Testing & Balancing Agency: _____

[illegible]

SPACE TEMPERATURE/HUMIDITY TEST SHEET

JOB NAME: _____ DATE: _____

[illegible]

CHILL WATER COIL
AIR DATA TEST SHEET

JOB NAME: _____ DATE: _____

UNIT NO.	CFM	EDB/EWB	LDB/LWB	Δ TH	MBH	NOTES	
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL

CHILL WATER COIL WATER DATA TEST SHEET

JOB NAME: _____ DATE: _____

UNIT NO.	MBH	EWT	LWT	Δ TW	WPD	GPM	
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL

HOT WATER COIL
AIR DATA TEST SHEET

JOB NAME: _____ DATE: _____

UNIT NO.	CFM	EAT	LAT	ΔTA	MBH	NOTES	
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL

**HOT WATER COIL
WATER DATA TEST SHEET**

JOB NAME: _____ DATE: _____

UNIT NO.	MBH	EWT	LWT	Δ TW	WPD	GPM	
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL
							DESIGN
							ACTUAL

JOB NAME: _____

[illegible]

111

[illegible]

JOB NAME: _____ DATE: _____

[illegible]

JOB NAME: _____ DATE: _____

[illegible]

BLOWER DOOR TEST

DATE: _____

JOB NAME:	
CITY/STATE:	

BLOWER DOOR MODEL	FAN MODEL	NUMBER OF FANS	RING

LOCATION			
REFERENCE			
TEST NUMBER			
RELATIONSHIP			
DESIGN Δp	INCHES H ₂ O	PASCALS	1 Pa (N/m ²) = 0.0040186 Inch of
FINAL CFM			
FINAL Δp INCHES H₂O / PASCALS	INCHES H ₂ O	PASCALS	1 Pa (N/m ²) = 0.0040186 Inch of

TESTED BY:

NOTES:

SECTION 23 0700 - DUCTWORK INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Ductwork insulation.
- B. Duct Liner.
- C. Insulation jackets.

1.02 RELATED SECTIONS

- A. Section 23 31 00 - Metal Ductwork.

1.03 REFERENCES

- A. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.
- B. ASTM C518 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- C. ASTM C553 - Mineral Fiber Blanket and Felt Insulation.
- D. ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.
- E. ASTM E84 - Surface Burning Characteristics of Building Materials.
- F. ASTM E96 - Water Vapor Transmission of Materials
- G. NFPA 255 - Surface Burning Characteristics of Building Materials.
- H. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.
- I. UL 723 - Surface Burning Characteristics of Building Materials.

1.04 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Provide product description, list of materials and thickness for each service, and locations.
- C. Manufacturer's Installation Instructions: Indicate procedures which ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALITY ASSURANCE

- A. Materials: Flame spread/smoke developed rating of 25/50 in accordance with NFPA 25.

1.06 QUALIFICATIONS

- A. Applicator: Company specializing in performing the work of this section.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01600.
- B. Deliver materials to site in original factory packaging, labeled with manufacturer's density and thickness.
- C. Store insulation in original wrapping and protect from weather and construction traffic.
- D. Protect insulation against dirt, water, chemical, and mechanical damage.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 GLASS FIBER, FLEXIBLE

- A. Insulation: ASTM C553; flexible, noncombustible blanket.
 - 1. 'K' ("ksi") value: ASTM C518, 0.29 at 75 degrees F.
 - 2. Maximum service temperature: 250 degrees F.

3. Maximum moisture absorption: 0.20 percent by volume.
4. Density: 0.75 lb/cu ft.
- B. Vapor Barrier Jacket
 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
 2. Moisture vapor transmission: ASTM E96; 0.04 perm.
 3. Secure with pressure sensitive tape.
- C. Vapor Barrier Tape
 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
- D. Tie Wire: Annealed steel, 16 gage.

2.02 GLASS FIBER, RIGID

- A. Insulation: ASTM C612; rigid, noncombustible blanket.
 1. 'K' value: ASTM C518, 0.29 at 75 degrees F.
 2. Maximum service temperature: 250 degrees F.
 3. Maximum moisture absorption: 0.20 percent by volume.
 4. Density: 1.5 lb/cu ft.
- B. Vapor Barrier Jacket
 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
 2. Moisture vapor transmission: ASTM E96; 0.04 perm.
 3. Secure with pressure sensitive tape.
- C. Vapor Barrier Tape
 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

2.03 GLASS FIBER DUCT LINER, FLEXIBLE

- A. Insulation: ASTM C553; flexible, noncombustible blanket.
 1. 'K' value: ASTM C518, 0.28 at 75 degrees F.
 2. Maximum service temperature: 250 degrees F.
 3. Density: 1.5 lb/cu ft.
 4. Maximum Velocity on Coated Air Side: 4,000 ft/min.
- B. Adhesive
 1. Waterproof fire-retardant type.
- C. Liner Fastener
 1. Galvanized steel, impact applied with integral head.

2.04 GLASS FIBER DUCT LINER, RIGID

- A. Insulation: ASTM C518, 0.23 at 75 degree F.
 1. 'K' value: ASTM C518, 0.23 at 75 degrees F.
 2. Maximum service temperature: 250 degrees F.
 3. Density: 3.0 lb/cu ft.
 4. Maximum Velocity on Coated Air Side: 4,000 ft/min.
- B. Adhesive
 1. Waterproof fire-retardant type.
- C. Linear Fasteners
 1. Galvanized steel, self-adhesive pad with press on head.

2.05 FIRED RATED GLASS FIBER DUCT, FLEXIBLE

- A. Insulation: ASTM C518, 0.23 at 75 degree F.

1. 'K' value: ASTM C518, 0.23 at 75 degrees F.
2. Flammability (ASTM E 84 / UL 723)
 - Foil: Flame spread 5, Smoke developed 5
 - Blanket: Flame Spread 0, Smoke developed 0
3. Insulation, strict accordance with manufacturer's recommendations.

B. Manufacturer: "Fyrewrap", 3M Fire master "Fast Wrap".

2.06 DUCTWORK JACKET (Exterior or in ventilated spaces)

- A. Contractor to provide specialty rubberized bitumen membrane designed specifically to be installed over insulation on ductwork subject to ambient conditions. The membrane is 'peel and stick', self-healing if punctured, UV stable, and will expand and contract with the mechanical system. The membrane has excellent emissivity and sound attenuation properties.
 1. Total product thickness of 0.60"
 2. Water Vapor Transmission (grains/hr-ft²) of 0.0022
 3. Upper Temperature Limit of 160 degrees (F).
 4. Sound Transmission Coefficient of 0.18
 5. Permeance of 0.0053
- B. Manufacturer: "Alumaguard" as manufactured by Polyguard. Provide "Alumaguard lite" on bottom of ductwork as to eliminate the need to pin through the Alumaguard on the bottom of the ductwork.

2.07 AIR HANDLING UNIT ROOMS

- A. Finish and install over entire areas of walls/doors/ceiling of air handling rooms/elevator equipment rooms 2" thick acoustical type fiberglass hullboard insulation 3# density, applied over Stick-Klips 12" on center. Stick-Klips shall be applied to wall with Construction Adhesive. Acoustical material shall be applied over Stick-Klips with duct linear adhesive spotted between pins. Joints to be sealed with fiberglass lagging tape.
- B. Manufacturer:
 1. Nautica IMO PFG Acoustic Board as manufactured by RB, LLC.

2.08 APPROVED MANUFACTURERS

- A. John Manville, Knauf, Owens Corning

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that ductwork has been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign materials removed, and dry.

3.02 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Insulated ductwork conveying air below ambient temperature:
 1. Provide insulation with vapor barrier jackets.
 2. Finish with tape and vapor barrier jackets.
 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connection, and expansion joints.
- C. Insulated ductwork conveying air above ambient temperature.
 1. Provide with or without standard vapor barrier jacket.
 2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- D. External Duct Insulation Application
 1. Secure insulation with vapor barrier tape and seal jacket joints with vapor barrier adhesive or tape to match jacket.

2. Secure insulation without vapor barrier with adhesive tape.
 3. Install without sag or underside of ductwork. Use adhesive & mechanical fasteners to prevent sagging. Lift ductwork off trapeze hangers and insert spacers.
 4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
 5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
 6. In mechanical rooms - use rigid glass fiber insulation with duct jacket in lieu of flexible (rectangular ducts only).
 7. All external insulation to be installed utilizing adhesive & mechanically pinned fasteners.
- E. Duct and Plenum Liner Application:
1. Adhere insulation with adhesive for 100 percent coverage.
 2. Secure insulation with mechanical liner fasteners. Refer to SMACNA Standards for spacing.
 3. Seal and smooth joints.
 4. Seal liner surface penetrations with adhesive.
 5. Duct dimensions are metal to metal dimension.
- F. Walk-in Plenum Application:
1. Adhere insulation on interior surface of plenum with adhesive for 100 percent coverage. Secure insulation with mechanical fasteners. Seal and smooth joints. Do not use nail-type fasteners.
 2. Continue insulation with vapor barrier throughout penetrations. Vinyl backing to go against wall, raw insulation to be exposed.

3.03 TOLERANCE

- A. Substituted insulation materials shall provide thermal resistance with 10 percent at normal conditions, as materials indicated.

3.04 FLEXIBLE GLASS FIBER DUCTWORK INSULATION SCHEDULE

<u>LOCATION</u>	<u>THICKNESS (inch)</u>	<u>FINISH</u>
1. Round/oval Supply, Return, Fresh air, & exhaust ductwork	2.33"	Foil Faced
2. Tops of Diffuser	2.33"	Foil Faced
3. Rectangular fresh air & Exhaust Air Ductwork	2.33"	Foil Faced
4. Rectangular/Round Supply Ductwork (medium-high pressure; upstream Of VAV boxes)	2.33"	Foil Faced
<i>Note: 1. All exposed round ductwork to be double wall pre-insulated duct (with perforated inner wall).</i>		

3.05 GLASS FIBER DUCT LINER

<u>LOCATION</u>	<u>THICKNESS (Inch)</u>
1. Rectangular Return air Duct & rectangular supply duct (Low Pressure & downstream VAV boxes)	1"
2. Return air transfer assembly ducts And sleeves	1"

Note: 1. All other ductwork to be externally insulated.

3.06 DUCTWORK JACKET SCHEDULE

<u>LOCATION</u>	<u>THICKNESS (mil)</u>	<u>FINISH</u>
1. Rectangular & Round Outside air, Exhaust, Supply & Return Ductwork	60	Aluminized
<i>Note:</i>		
1.	<i>Install as per manufacturers recommendations.</i>	
2.	<i>Provide on all ductwork that are exposed to ambient conditions.</i>	
3.	<i>Provide on all externally insulated ductwork located in mechanical rooms/closets (Rooms with air handlers).</i>	

3.07 RIGID GLASS FIBER DUCTWORK INSULATION SCHEDULE

<u>LOCATION</u>	<u>THICKNESS (inch)</u>	<u>FINISH</u>
1. Air Handling Room/closet Walls	2"	Perforated

3.08 FIRE RATED GLASS FIBER, FLEXIBLE

<u>LOCATION</u>	<u>THICKNESS (inch)</u>	<u>FINISH</u>
1. Not used.		

3.09 MINERAL WOOL, FLEXIBLE

1. Not used.

END OF SECTION

9-2-25

SECTION 23 0800 - OPERATING AND MAINTENANCE INSTRUCTIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Refer to individual Division 20, 21, 22 and 23 sections for additional equipment specific Operations and Maintenance Manual requirements.

1.02 SUMMARY

- A. This Section includes preparing and furnishing an operating and maintenance manual for mechanical equipment.

1.03 DESCRIPTION

- A. Compile an Operating and Maintenance Manual:
 - 1. For all building mechanical systems and major equipment items.
 - 2. Including, but not necessarily limited to:
 - a. Installing company's name, address, telephone number and name of job supervisor.
 - b. Maintenance and operating booklets (as supplied by the equipment Manufacturer) for each item or representative type item installed.
 - c. Valve tag schedule. Contractor to provide a set of plans shows valve schedule & valve location on plans (full size set, 24"x36 plans). Plans to have valve type, manufacturer and model #. Also provide replacement part contact information for each valve.
 - d. A complete set of Shop Drawings.
 - e. Temperature control drawings.
 - f. Equipment information forms for each equipment piece.
 - 3. Each equipment information form includes all applicable items of the following:
 - a. Type of unit.
 - b. Manufacturer's name.
 - c. Equipment service area.
 - d. Filter Information:
 - 1) Filter change period.
 - 2) Type of filter.
 - 3) Size of filter and number.
 - e. Motor and Drive Information:
 - 1) Belt type and quantity.
 - 2) Belt size.
 - 3) HP.
 - 4) Voltage.
 - 5) Phase.
 - f. Lubrication Information:
 - 1) Recommended service interval.
 - 2) Lubricant application points.
 - 3) Recommended lubricant type.
 - g. Recommended cleaning procedures and intervals.
- B. Prepare Information Packets:

1. Attach to each major piece of equipment in a string tie envelope labeled with the equipment's designation in large print.
2. Information Required:
 - a. A copy of the equipment information form as defined above.
 - b. A temperature control written operation sequence.
 - c. A maintenance checklist form with equipment identification information and listing all relevant maintenance procedures in a column format to accommodate date entries.

1.04 SUBMITTALS

- A. Three copies of Operating and Maintenance Manual.

PART 2 PRODUCTS

- A. Not used.

PART 3 EXECUTION

- A. Not used.

END OF SECTION

9-2-25

SECTION 23 0900 - TEMPERATURE CONTROLS

PART 1 - GENERAL

1.1 OVERVIEW:

- A. The Temperature Controls section shall be provided by the Contractor. The Mechanical Contractor shall include in his bid to coordinate with the Temperature Control Contractor with all the associated work involved. The Temperature Controls Scope Of Work is an expansion of the existing Controls Systems throughout the existing school. The Temperature Controls Contractor (TCC) shall coordinate this scope of work with all related trades, such as, but not limited to, the Mechanical, Electrical and Special Systems Contractors. All temperature control devices, panels, controllers, etc. listed within shall be provided and programmed and shall be installed and final terminations/connections by the installing temperature control contractor.
- B. Controls to be Distech, contact David Rhodus, CMC, (225) 925-5236, david.rhodus@calcmc.com.

PART 3 - EXECUTION

1.1 WARRANTY:

- A. At completion of final test of installation and acceptance by Owner, provide any service incidental to proper performance for a period of one [1] year.
- B. Equipment shall be warranted for one year (including defects in workmanship and material) under normal use and service. During warranty period supplier shall also replace or repair, free of charge, any equipment proven to be defective in workmanship or material.

1.2 A/C UNIT SYSTEM APPLICATION:

- A. AHU Supply Air Fan:
 - 1. VFD Start/Stop:
 - a. The supply air fan will be started according to the time of day schedule. If the VFD supply air fan status does not match the commanded value, an alarm will be generated. When the supply air fan VFD status indicates the supply air fan has started and is operating, the control sequence will be enabled. All safety controls shall stop the supply air fan VFD regardless of which position the H-O-A switch.
 - b. Night setback/night setup, when in the "unoccupied" mode, the unit will cycle as necessary to maintain the shared night setback zone temperature at setpoint. A differential prevents the unit from cycling excessively.
 - c.
- B. Duct Static Pressure Control:

The supply air fan will modulate the VFD to maintain the discharge static pressure at setpoint. Setpoint shall be 1.5" wc [adjustable at the GUI].
- C. Discharge Air Temperature Control:

UPON PROOF OF FAN OPERATION BY THE "CS" (CONTACT CLOSED), THE "AHU" COOLING MODE SEQUENCE SHALL BE ENABLED FOR CONDENSING UNIT STAGING CONTROL TO MAINTAIN THE SUPPLY AIR TEMPERATURE (SAS) SETPOINT. THE SUPPLY AIR TEMPERATURE SETPOINT IS RESET TO THE RETURN AIR TEMPERATURE SENSOR (RAS). A SUPPLY AIR TEMPERATURE SETPOINT RESET SCHEDULE IS AS FOLLOWS (ALL SETPOINTS ADJUSTABLE IN SOFTWARE);

<u>RETURN AIR TEMP.:</u>	<u>SUPPLY AIR TEMP. SETPOINT:</u>
75 Deg F	56 Deg F
71 Deg F	68 Deg F

"COOL 1ST STAGE " SETPOINT SHALL BE A RESULT OF THE CALCULATED SUPPLY AIR TEMPERATURE RESET. THE SETPOINT DIFFERENTIAL SHALL BE FIVE (5) DEGREES (ADJUSTABLE) 2.5 DEG ABOVE = ON, 2.5 DEG BELOW = OFF. "COOL 2ND

STAGE" SETPOINT SHALL BE "COOL 1ST STAGE" SETPOINT PLUS TWO (2) DEG (ADJUSTABLE). "COOL 2ND STAGE SHALL NOT BE ALLOWED TO BE ENABLED UNTIL "COOL 1ST STAGE" HAS BEEN "ON" FOR FIVE (5) MIN. (ADJUSTABLE). UPON PROOF OF "AHU" FAN OPERATION BY THE "CS" AND AN INCREASE IN SUPPLY AIR TEMPERATURE "SA", ABOVE 70 DEG (ADJUSTABLE) FOR 30 MIN (ADJUSTABLE) AN ALARM IS GENERATED.

D. Humidity Control:

UPON PROOF OF "AHU" FAN OPERATION BY THE "CS" (CONTACT CLOSED), THE "UC" SHALL MONITOR THE RETURN AIR % RH (RH). UPON AN INCREASE IN "AHU % RH", ABOVE 58 % (ADJUSTABLE) 3% DIFFERENTIAL (ADJUSTABLE) THE "DEHUMIDIFICATION" OUTPUT IS ENABLED. THE "DEHUMIDIFICATION" OUTPUT PANEL MOUNTED PILOT DUTY RELAY IS ENERGIZED, IS PHYSICALLY WIRED TO FORCE ON "COOL 1ST STAGE" AND /OR "COOL 2ND STAGE" (PANEL SELECTABLE) TO PROVIDE MECHANICAL DEHUMIDIFICATION. UPON A DECREASE IN "AHU % RH" BELOW 55 % RH (3 % DIFFERENTIAL), THE "DEHUMIDIFICATION" OUTPUT SHALL BE DE-ENERGIZED ALLOWING THE "SUPPLY AIR TEMPERATURE CONTROL" MODE TO CONTROL THE STAGES OF COOLING.

THE "SUPPLY AIR LIMIT" OUTPUT PANEL MOUNTED PILOT DUTY RELAY ARE PHYSICALLY WIRED TO DISABLE "COOL 1ST STAGE" AND /OR "COOL 2ND STAGE" (PANEL SELECTABLE). UPON PROOF OF "AHU" FAN OPERATION BY THE "CS" (CONTACT CLOSED), THE "UC" SHALL MONITOR THE SUPPLY AIR TEMPERATURE (SAS). UPON A DECREASE IN "SAS" TEMPERATURE, BELOW 48 DEG (ADJUSTABLE SETPOINT) THE "SUPPLY AIR LIMIT" OUTPUT SHALL ENERGIZE, DISABLING THE STAGES OF COOLING CONTROL RELAYS. UPON A INCREASE IN "SAS" TEMPERATURE, ABOVE THE LIMIT SETPOINT, WITH A 10 DEG DIFFERENTIAL (ADJUSTABLE), THE "SUPPLY AIR LIMIT" OUTPUT SHALL DE-ENERGIZE, ALLOWING THE STAGES OF COOLING CONTROL RELAYS TO BE ENABLED.

E. Outside Air Damper Control (IAQ):

Upon startup of the supply air fan, the outside air damper will open to a minimum position. If the return air Co2 [carbon dioxide] level exceeds the indoor air quality setpoint [700 ppm, adjustable at the GUI], the outside air damper will modulate open to increase the outside air CFM (this value shall not exceed the maximum CFM specified within the construction documents). Upon further increase in the return air Co2, the return air damper shall module close (this value shall not exceed the minimum CFM specified within the construction documents).

F. UNOCCUPIED, NIGHT SETUP / SETBACK:

THE "UC" SHALL MONITOR THE SPACE WALL TEMPERATURE SENSOR (WS) . UPON AN INCREASE IN "AHU" SPACE TEMPERATURE ABOVE 83 Deg OR BELOW 55 Deg, (NIGHT SETUP / SETBACK) (ADJUSTABLE) THE "AHU FAN" SHALL BE ENABLED. ALL OUTPUTS SHALL FOLLOW THE SAME SEQUENCE AS LISTED IN THE "OCCUPIED MODE" UNTIL THE SPACE TEMPERATURE (WS) HAS BEEN SATISFIED (3 DEG DIFFERENTIAL (ADJUSTABLE).

G. UNOCCUPIED MODE TIMED OVERRIDE:

DURING THE UNOCCUPIED MODE, IF THE TIMED OVERRIDE TIMER (O), (CONTACT CLOSED) IS ACTIVATED, THE "AHU FAN" AND ALL VAV BOXES SHALL BE ENABLED IN THE SAME SEQUENCE AS THE "OCCUPIED MODE". UPON EXPIRATION OF THE TIMED OVERRIDE INTERVAL (CONTACT OPEN) , ALL "AHU" AND "VAV" BOX CONTROL SHALL RESUME TO THE "UNOCCUPIED MODE" SEQUENCE.

H. Safety Controls:

1. All of the safety devices shall be manual reset. Any device that has tripped must shut down the supply air fan and must be manually reset before restarting the supply air fan.

2. A High Limit Thermostat located in the unit return air will stop the fan on a rise in temperature above its setpoint. Thermostat shall be set at 125 degrees F and require a manual reset.
3. A manual reset Low Limit Thermostat [freeze stat] at the cooling coil entering air shall stop the fan on a fall in temperature below its setting. Thermostat shall respond to the lowest 1 ft of 20 ft averaging element and shall alarm the EMS computer.
4. If a fire alarm shutdown relay contact is provided, the supply fan will be shutdown when triggered. If Smoke detectors are provided, the supply fan will be shutdown when triggered.
5. A High Limit Duct Static pressure switch shall stop fan when static pressure rises above the static pressure high limit setpoint. High Limit Duct Static pressure safety switch shall require a manual reset.
6. An Emergency Condensate Pan Float Switch, upon detection of a rise in pan water level shall shut the fan down and alarm the "EMS" computer. The Emergency Condensate Pan Float Switch is automatic reset.

1.3 **VAV TERMINAL BOXES WITH ELECTRIC HEAT:**

- A. The "VAV" Boxes shall only operate when the associated air handling unit is operating.
- B. As the space temperature rises, the "VAV" Box Controller shall modulate the damper open to increase the CFM to maintain the space temperature cooling setpoint. As the space temperature drops below the cooling setpoint, the "VAV" Box controller shall modulate the damper to maintain minimum CFM setpoint. Upon a further drop in space temperature, stages of electric heating shall be energized to maintain space heating setpoint.
- C. During unoccupied periods, the heating and cooling setpoints shall be reset to the unoccupied heating and cooling setpoints which are individually adjustable at the "GUI".
- D. The "VAV" Box Controller / thermostat shall include an LED display with local cooling & heating setpoint adjustment buttons. Setpoints and adjustments can be disabled or limited at the "GUI".
- E. Each "VAV" Box controller thermostat will include an override button. The duration of override shall be adjustable at the "GUI". Each "VAV" Box shall have the same schedule as the AHU and shall be adjustable at the GUI.

1.4 **DUCTLESS SPLIT:**

- A. DUCTLESS SPLIT ROOM TEMPERATURE IS MAINTAINED BY THE DUCTLESS SPLIT SYSTEM THERMOSTAT. THE DUCTLESS SPLIT SYSTEM THERMOSTAT ENABLES THE INDOOR FAN AND MODULATES THE COMPRESSOR CAPACITY BASED ON THE THERMOSTAT SETPOINT.
- B. THE "UC" MONITORS THE ROOM SPACE TEMPERATURE SENSOR. UPON A RISE IN THE ROOM SPACE TEMPERATURE ABOVE 78 DEG (ADJUSTABLE) FOR 60 MIN (ADJUSTABLE) THE "UC" SHALL GENERATE AN ALARM AND THE REMOTE ALARM PANEL" OUTPUT IS ENABLE TO ACTIVATE THE WALL MOUNTED "REMOTE ALARM DISPLAY" (RAD). THE "RAD" HORN CAN BE SILENCED BY DEPRESSING THE "SILENCE" BUTTON ON THE DISPLAY.

1.5 **EXHAUST FANS:**

- A. Exhaust fans shall be controlled and/or interlocked as indicated on the plans. Provide and install all control conduit, wiring, relays, transformers etc. for interlocking as required.
- B. Provide and install one (1) firestat in each exhaust fan with 600 CFM or greater capacity. Provide all interlock wire, conduit, relays etc., to stop all unit operation upon a rise in temperature above 125 Deg f.

1.6 **PROGRAMMING:**

- A. Schedules:
 1. Equipment schedules shall be permitted based on one or a combination of time of day schedule, an input state, an output state or other point schedule. Time of Day / Day Of

Week shall have multiple increments (seven days per week) and special scheduling for events and holidays.

2. The "NAC" shall be capable of being programmed with up to 48 discrete schedules. Groups of loads (consisting of up to 128 loads each) shall be programmable for concurrent scheduling.
3. Schedules shall allow temporary adjustment to schedules for "Today and Tomorrow" that will automatically revert to defined weekly schedules without additional operator modifications. Schedules shall be definable for a specific period during a calendar year and if so defined, shift to alternate schedule automatically during the same calendar year. All schedules shall allow for unoccupied mode, timed override operation, software definable.

B. Holiday Scheduling:

1. Holiday scheduling shall allow up to 16 holiday periods to be programmed up to 99 days per holiday. For holidays with numerical repetition, programming shall allow for automatic repetition of those holidays from year to year.

C. Setup / Setback Control:

1. Setup / Setback control shall decrease energy consumption by adjusting up or down the space temperature setpoints during unoccupied mode hours. The system shall operate in the same sequence as the occupied mode utilizing the night setup / setback (adjusted) heat / cool setpoints.

D. Direct Digital Control:

1. DDC for automatic temperature / process control shall be accomplished by the Distributed Control Modules using programmable control algorithms. Control loops used in modulation control applications shall be "self-tuning".

E. Data Logging Program:

1. The Data Logging Program shall record the historic operations of the systems inputs and outputs operation for review and analysis. The Data Logging shall be programmable for 24 Logs of sixteen Input / Output points each. The logs shall allow definition of start time, stop time, and interval time. Logs shall maintain a history of the last 256 defined intervals. Intervals shall be definable from one minute to sixty minutes for each log individually.
2. Program one (1) Data Log for each Controlled Load. The data log shall include any / all outputs and inputs accordingly.

F. Software Application Notes:

1. Program equipment specific notes in the "Application Note" for each load identifying the type of control, equipment controlled and a brief sequence of operation.

G. Site Specific Graphics Monitoring Package:

1. If specified, provide or upgrade the graphic monitoring package, generated in Honeywell licensed Software, to be installed on a site computer.
2. Graphic formatting shall be as follows;
 - a. A "Site Plan" including all zones of control indicated by different colors.
 - b. Split System / AHU replica indicating temperatures, setpoints, output status and schedule.
 - c. VAV Box replica indicating temperatures, setpoints, output status and schedule status.
 - d. Rooftop replica indicating all temperatures, setpoints, output status and schedule status.
 - e. Chiller plant replica indicating all temperatures, setpoints, output status and schedule status.
 - f. Classroom PTAC / Lighting control status in Site Plan format.
 - g. Global Data including Outdoor Temperature and Phase Monitor Status.

- A. Submittals:
 - 1. Provide six (6) copies of submittals and shop drawings to be approved by the engineer.
 - 2. Drawings shall indicate point-to-point, wire-for-wire detail to indicate all aspects of the system.
 - 3. Include site plans indicating intended cable runs and proposed zoning.
- B. Close Out Documents:
 - 1. Provide six (6) copies of Operation & Maintenance Manuals, Warranty and As-Built Control Drawings. Drawings shall indicate point-to-point, wire-for-wire detail to indicate all aspects of the system.
 - 2. Include site plans indicating cable runs and zoning, all bound in a three ring binder.

1.8 **END USER TRAINING:**

- A. Provide on site system operational training including basing HVAC operation, control system sequence of operation, troubleshooting and diagnostics, and module/sensor replacement procedures.

END OF SECTION
9-2-25

SECTION 23 2300 - REFRIGERANT PIPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes refrigerant piping used for air-conditioning applications.
- B. Related Sections include the following:
 - 1. Division 20 Section 20 05 29 "Hangers and Support Devices" for pipe supports and installation requirements.

1.3 SUBMITTALS

- A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for thermostatic expansion valves, solenoid valves, and pressure-regulating valves.
- B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationship between piping and equipment.
- C. Refrigerant piping indicated is schematic only. Manufacturer's installation instructions shall take precedence over contract drawings where a conflict may occur. Size piping and design the actual piping layout in accordance with equipment manufacturers instructions and recommendations, including oil traps, double risers, solenoids and other specialties, and pipe and tube sizes, to ensure proper operation and compliance with warranties of connected equipment.
- D. Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

- A. Welding/Brazing: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX; "Welding and Brazing Qualifications."
- B. ASHRAE Standard: Comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."
- C. ASME Standard: Comply with ASME B31.5, "Refrigeration Piping."
- D. UL Standard: Provide products complying with UL 207, "Refrigerant-Containing Components and Accessories, Non-electrical"; or UL 429, "Electrically Operated Valves."

1.5 COORDINATION

- A. Coordinate layout and installation of refrigerant piping and suspension system components with other construction, including plumbing and electrical.
- B. Coordinate pipe sleeve installations for penetrations in exterior walls.

PART 2 PRODUCTS

2.1 COPPER TUBE AND FITTINGS

- A. Refrigerant piping shall be run in Type "ACR" hard drawn copper tubing (ASTM B280 compliant) attached with wrought copper fittings, utilizing 1000-degree silver solder and a non-corrosive flux. Refrigerant piping shall be sized and installed in strict accordance with the air conditioning unit manufacturer's recommendations and directions and shall be submitted to the Engineer for prior approval before installation. Pressure drops shall not exceed the equivalent of 2-psi. Refrigerant piping system shall be evacuated, charged with refrigerant holding charge. The refrigerant lines to be tested with nitrogen to a test pressure of not less than 450 psi and proved before final charge of refrigerant. Compressor shall not be subject to the 450 psi pressure test.

2.2 VALVES

- A. Provide valves as recommended by equipment manufacturer.

2.3 REFRIGERANT PIPING SPECIALTIES

- A. Provide refrigerant piping specialties as recommended by manufacturer.

PART 3 EXECUTION

3.1 PIPING APPLICATIONS

- A. Aboveground, within Building and Exterior: hard drawn-copper tubing.

3.2 VALVE APPLICATIONS

- A. Install a full-sized, three-valve bypass around each dryer.
- B. Install thermostatic expansion valves as close as possible to evaporator.
- C. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.

3.3 SPECIALTY APPLICATIONS

- A. Install moisture-liquid indicators in liquid lines between filter-dryers and thermostatic expansion valves and in liquid line to receiver.
- B. Install permanent filter-dryers before each solenoid valve.
- C. Install solenoid valves in liquid line of systems operating with single pump-out or pump-down compressor control.
- D. Install receivers, sized to accommodate pump-down charge, on systems and larger and on systems with long piping runs.

3.4 PIPING INSTALLATION

- A. Install refrigerant piping according to ASHRAE 15.
- B. Install refrigerant piping as recommended by the HVAC equipment manufacturer. Include liquid line solenoid, sight glass, filter drier, and thermostatic expansion valve (TXV) with by-pass and check valve assembly around TXV to allow liquid flow from the indoor unit coil to the outdoor unit during the heating mode.
- C. Basic piping installation requirements are specified in Division 23 Section 20 02 13 "Basic Piping".
- D. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- E. Arrange piping to allow inspection and service of compressor and other equipment. Install valves and specialties in accessible locations to allow for service and inspection.
- F. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation. Use sleeves through walls or ceilings, sized to permit installation of full-thickness insulation.
- G. Belowground, install copper tubing in protective conduit. Vent conduit outdoors.
- H. Slope refrigerant piping as follows:
 - 1. Install horizontal suction lines with a uniform slope downward to compressor.
 - 2. Liquid lines may be installed level.
- I. Manufacturers installation instructions shall supercede contract drawings where a conflict may occur. Notify Architect before proceeding if a conflict does occur.
- J. Install unions to allow removal of solenoid valves, pressure-regulating valves, and expansion valves and at connections to compressors and evaporators.
- K. When brazing, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion valve bulb.
- L. Hanger, support, and anchor products are specified in Division 20 Section 20 05 29 "Hangers and Supports."
- M. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal runs less than long.
 - 2. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:

3.5 PIPE JOINT CONSTRUCTION

- A. Braze joints according to Division 20 Section 20 02 13 "Basic Piping."
- B. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide) during brazing to prevent scale formation.

3.6 FIELD QUALITY CONTROL

- A. Test and inspect refrigerant piping according to ASME B31.5, Chapter VI.
- B. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure.

3.7 ADJUSTING

- A. Adjust thermostatic expansion valve to obtain proper evaporator superheat requirements.
- B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.
- C. Adjust set-point temperature of the conditioned air to the system design temperature.
- D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
 - 1. Check compressor oil level above center of sight glass.
 - 2. Open compressor suction and discharge valves.
 - 3. Open refrigerant valves, except bypass valves that are used for other purposes.
 - 4. Check compressor-motor alignment, and lubricate motors and bearings.

3.8 CLEANING

- A. Before installing copper tubing, clean tubing and fittings with trichloroethylene.
- B. Replace core of filter-dryer after system has been adjusted and design flow rates and pressures are established.

3.9 SYSTEM CHARGING

- A. Charge system using the following procedures:
 - 1. Install core in filter-dryer after leak test but before evacuation.
 - 2. Evacuate entire refrigerant system with a vacuum pump to a vacuum. If vacuum holds for 12 hours, system is ready for charging.
 - 3. Break vacuum with refrigerant gas, allowing pressure to build up.
 - 4. Charge system with a new filter-dryer core in charging line. Provide full-operating charge.
 - 5. Measure amount of refrigerant required for each system. Include on close out documents.

END OF SECTION

9-2-25

SECTION 23 3100 - METAL DUCTWORK

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification section, apply to this section.
- B. Requirements of the following Division 20 Sections apply to this section:
 - 1. Section 20 01 00 "General Provisions"

1.02 SUMMARY

- A. This section includes rectangular, round, and flat-oval metal ducts and plenums for heating, ventilating, and air conditioning systems in pressure classes from minus 2 inches to plus 10 inches water gage.
- B. Related Sections: The following sections contain requirements that relate to this Section:
 - 1. Section 23 07 00 "Ductwork Insulation" for exterior duct and plenum insulation.
 - 2. Section 23 33 00 "Duct Accessories" for flexible duct materials, dampers, duct-mounted access panels and doors, and turning vanes.
 - 3. Section 23 37 00 "Air Outlets."
 - 4. Section 23 05 93 "Testing, Adjusting, and Balancing."

1.03 DEFINITIONS

- A. Sealing Requirements Definitions: For the purposes of duct systems sealing requirements specified in this Section, the following definitions apply:
 - 1. Seams: A seam is defined as joining of two longitudinally (in the direction of airflow) oriented edges of duct surface material occurring between two joints. All other duct surface connections made on the perimeter are deemed to be joints.
 - 2. Joints: Joints include girth joints; branch and sub-branch intersections; so-called duct collar tap-ins; louver and air terminal connections to ducts; access door and access panel frames and jambs; duct, plenum, and casing abutments to building structures,

1.04 SYSTEM PERFORMANCE REQUIREMENTS

- A. The duct system design, as indicated, has been used to select and size air moving and distribution equipment and other components of the air system. Changes or alterations to the layout or configuration of the duct system must be specifically approved in writing. Accompany requests for layout modifications with calculations showing that the proposed layout will provide the original design results without increasing the system total pressure.

1.05 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data including details of construction relative to materials, dimensions of individual components, profiles, and finishes for the following items:
 - 1. Duct Liner.
 - 2. Sealing Materials.
 - 3. Fire-Stopping Materials.
 - 4. Construction Methods.
- C. Shop drawings from duct fabrication shop, drawn to a scale not smaller than 1/4 inch equals 1 foot, on drawing sheets same size as the Contract Drawings, detailing:
 - 1. Fabrication, assembly, and installation details, including plans, elevations, sections, details of components, and attachments to other work.
 - 2. Duct layout, indicating pressure classifications and sizes in plan review. For exhaust ducts systems, indicate the classification of the materials handled as defined in this Section.
 - 3. Fittings.
 - 4. Reinforcing details and spacing.

5. Seam and joint construction details.
 6. Penetrations through fire-rated and other partitions.
 7. Terminal unit, coil, and humidifier installations.
 8. Hangers and supports, including methods for building attachment, vibration isolation, and duct attachment.
- D. Coordination drawings for ductwork at congested areas or areas of interference shall be prepared to totally describe proposed installation and routings in accordance with Division 20 01 00 General Provisions." show the following:
1. Coordination with ceiling suspension members.
 2. Spatial coordination with other systems installed in the same space with the duct systems.
 3. Coordination of ceiling- and wall-mounted access doors and panels required to provide access to dampers and other operating devices.
 4. Coordination with ceiling-mounted lighting fixtures and air outlets and inlets.
- E. Welding certificates including welding procedures specifications, welding procedure qualifications test records, and welders' qualifications test records complying with requirements specified in "Quality Assurance" below.
- F. Record drawings including duct system routing, fittings details, reinforcing, support, and installed accessories and devices, in accordance with Division 20 01 00 - General Provisions.

1.06 QUALITY ASSURANCE

- A. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code-Steel" for hangers and supports and AWS D9.1 "Sheet Metal Welding Code."
- B. Qualify each welder in accordance with AWS qualification tests for welding processes involved. Certify that their qualification is current.
- C. NFPA Compliance: Comply with the following NFPA Standards:
 1. NFPA 90A: "Standard for the Installation of Air Conditioning and Ventilating Systems," except as indicated otherwise.
 2. NFPA 96, "Standard for the Installation of Equipment for the Removal of Smoke and Grease Laden Vapors for Commercial Cooking Equipment," Chapter 3, "Duct System," for kitchen hood duct systems, except as indicated otherwise.
 3. Perform tests specified in "Field Quality Control." Modify mock-up construction and perform additional tests as required to achieve specified minimum acceptable results.
 4. Obtain approval of mock-ups before beginning final fabrication.
 5. Retain and maintain mock-ups during construction in undistributed condition as a standard for judging completed unit of work.
 6. Demolish and remove mock-ups from project site when directed.
 7. Accepted mock-ups that form a part of the actual duct system may remain and become part of completed unit of work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sealant and fire-stopping materials to site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.
- B. Store and handle sealant fire-stopping materials in compliance with manufacturers' recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other cause.
- C. Deliver and store stainless steel sheets with mill-applied adhesive protective paper, maintained through fabrication and installation.

PART 2 PRODUCTS

2.01 SHEET METAL MATERIALS

- A. Sheet Metal, General: Provide sheet metal in thickness indicated, packaged and marked as specified in ASTM A 700.
- B. Galvanized Sheet Steel: Lock-forming quality, ASTM A 653/A653M, A924/A924M. Provide mill phosphatized finish for exposed surfaces of ducts exposed to view.
- C. Carbon Steel Sheets: ASTM A 366, cold-rolled sheets, commercial quality, with oiled, exposed matte finish.
- D. Stainless Steel: ASTM A 480/A 480M, Type 316 & 304, and having a No. 2D finish for concealed ducts and No. 4 for exposed ducts.
- E. Reinforcement Shapes and Plates: Unless otherwise indicated, provide galvanized steel reinforcing where installed on galvanized sheet metal ducts. For aluminum and stainless steel ducts provide reinforcing of compatible materials.
- F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for 36-inch length or less; 3/8-inch minimum diameter for lengths longer than 36 inches.
- G. Aluminum Sheets: ASTM B 209, alloy 3003, temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- H. In general, the contract drawings are diagrammatic and are not intended to be scaled, nor indicate all details such as offsets, transitions, etc. for the fabrication/installation of work. It will be the responsibility of the contractor to completely coordinate with other trade systems, and all construction documents for the actual location and elevation of final install. The Mechanical Contractor means and methods of installation shall provide for operating efficiency, neatness of appearance, and ease of maintenance. Where information required to provide a complete working system is omitted or unclear, the contractor is responsible for requesting a clarification from the engineer prior to submission of bids. Bidding contractors must review all construction documents and be knowledgeable of all referenced codes and ordinances prior to submitting bids. The contractor should expect minor deviations from the contract documents and include additional labor & material for offsets and elbows including straight duct in his sheet metal bid. The sheet metal contractor should expect, and include in his bid, at least 5% in poundage (but not less than 2,000 pounds) of the total project poundage estimated. The contractor shall also include any required external insulation (material & labor) that may be required. All deviations shall be discussed and submitted to the engineer for approval. The contractors shall install his work in a manner so that interferences between the various trades are avoided. All deviations from sizes, locations, and from all other methods of the installation, shall be recorded.
 - 1. All uses of this allowance should be submitted to the mechanical engineer for record.
 - 2. All uses of this allowance are to be approved by the mechanical engineer prior to construction of ductwork.

2.02 DUCT INSULATION

- A. Refer to specification 23 07 00 for Duct Insulation specification.

2.03 FIRE-STOPPING

- A. Refer to Division 7 Section "Joint Sealers" for fire-stopping.

2.04 FIRE-STOPPING

- A. Fire-Resistant Sealant: Provide two-part, foamed-in-place, fire-stopping silicone sealant formulated for use in through-penetration fire-stop system for filling openings around duct penetrations through walls and floors, having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E 814 by Underwriters Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Fire-Resistant Sealant: Provide one-part elastomeric sealant formulated for use in a through-penetration fire-stop system for filling openings around duct penetrations through walls and floors, having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E 814 by Underwriter's Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
- D. Products: Subject to compliance with requirements, provide one of the following:
 - 1. "Dow Corning Fire Stop Foam"; Dow Corning Corp.

2. "Pensil 851"; General Electric Co.
3. "Dow Corning Fire Stop Sealant"; Dow Corning Corp.
4. "3M Fire Barrier Caulk CP-25"; Electrical Products Div./3M.
5. "RTV 7403"; General Electric Co.
6. "Fyre Putty"; Standard Oil Engineered Materials Co.

2.05 HANGERS AND SUPPORTS

- A. Building Attachments: Concrete inserts, powder actuated fasteners, or structural steel fasteners appropriate for building materials. Do not use powder actuated fasteners for lightweight aggregate concretes or for slabs less than 4 inches thick.
- B. Hangers: Galvanized sheet steel, or round, uncoated steel, threaded rod.
 1. Hangers Installed In Corrosive Atmospheres: Electro-galvanized, all-thread rod or hot-dipped-galvanized rods with threads painted after installation.
 2. Straps and Rod Sizes: Conform to Table 4-1 in SMACNA HVAC Duct Construction Standards, 1985 Edition, for sheet steel width and gage and steel rod diameters.
- C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- D. Trapeze and Riser Supports: Steel shapes conforming to ASTM A 36.
 1. Where galvanized steel ducts are installed, provide hot-dipped-galvanized steel shapes and plates.
 2. For stainless steel ducts, provide stainless steel support materials.
 3. For aluminum ducts, provide aluminum support materials, except where materials are electrolytically separated from ductwork.

2.06 RECTANGULAR DUCT FABRICATION

- A. General: Except as otherwise indicated, fabricate rectangular ducts with galvanized sheet steel, in accordance with SMACNA "HVAC Duct Construction Standards," Tables 1-3 through 1-19, including their associated details. Conform to the requirements in the referenced standard for metal thickness, reinforcing types and intervals, tie rod applications, and joint types and intervals.
 1. Fabricate rectangular ducts in lengths appropriate to reinforced and rigidity class required for pressure classification.
 2. Provide materials that are free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.
- B. Static Pressure Classifications: Except where otherwise indicated, construct duct systems to the following pressure classifications:
 1. Supply Ducts: 6 inches water gage. (4" downstream VAV boxes)
 2. Return Ducts: 4 inches water gage, negative pressure.
 3. Exhaust Ducts: 2 inches water gage, negative pressure.
- C. Cross breaking or Cross Beading: Cross break or bead duct sides that are 19 inches and larger and are 20 gage or less, with more than 10 sq. ft. of un-braced panel area, as indicated in SMACNA "HVAC Duct Construction Standard," Figure 1-4, unless they are lined or are externally insulated.

2.07 RECTANGULAR DUCT FITTINGS

- A. Fabricate elbows, transitions, offsets, branch connections, and other duct construction in accordance with SMACNA "HVAC Metal Duct Construction Standard," Current Edition, Figures 2-1 through 2-10.

2.08 ROUND DUCT FABRICATION

- A. Round Ducts: Fabricate round supply ducts using seam types identified in SMACNA "HVAC Duct Construction Standards," Most Current Edition, Figure 3-1, RL-1, RL-4, or RL-5. Seams Types RL-2 or RL-3 may be used if spot-welded on 1-inch intervals. Comply with SMACNA "HVAC Duct Construction Standards," Table 3-2 for galvanized steel gages. Ductwork for low

pressure duct (downstream VAV boxes) work may be snap lock type with all joints to be hard cast and sealed.

- B. Double-Wall (Insulated) Ducts (Medium to High Pressure Ductwork): Fabricate double-wall insulated ducts with an outer shell, insulation, and an inner liner as specified below. Dimensions indicated on internally insulated ducts are nominal inside dimensions.
1. Thermal Conductivity: 0.27 Btu/sq. Ft./deg F/inch thickness at 75 deg F mean temperature.
 2. Outer Shell: Base outer shell gage on actual outer shell dimensions. Provide outer shell lengths 2 inches longer than inner shell and insulation, and in gages specified above for single-wall duct.
 3. Insulation: Unless otherwise indicated, provide 1-inch-thick fiber-glass insulation. Provide insulation ends where internally insulated duct connects to single-wall duct or non-insulated components. The insulation shall terminate the insulation and reduce the outer shell diameter to the inner liner diameter.
 4. Perforated Inner Liner: Construct round and flat oval inner liners with perforated sheet metal of the gages listed below. For rectangular flat oval ducts, the diameter in the table below is the equivalent "basic round diameter."
 - a. 3 to 8 inches: 28 gage with standard spiral construction.
 - b. 9 to 42 inches: 28 gage with single-rib spiral construction.
 - c. 44 to 60 inches: 26 gage with single-rib spiral construction.
 - d. 62 to 88 inches: 22 gage with standard spiral construction.
 5. Maintain concentricity of liner to outer shell by mechanical means. Retain insulation from dislocation by mechanical means.

2.09 ROUND SUPPLY AND EXHAUST FITTINGS FABRICATION

- A. 90-Degree Tees and Laterals and Conical Tees: Fabricate to conform to SMACNA "HVAC Duct Construction Standards," Most Current Edition, Figures 3-4 and 3-5 and with metal thickness specified for longitudinal seam straight duct.
- B. Diverging-Flow Fittings: Fabricate with a reduced entrance to branch taps with no excess material projecting from the body onto branch tap entrance.
- C. Elbows: Fabricate in die-formed, gored, pleated, or mitered construction. Fabricate the bend radius of die-formed, gored, and pleated elbows 1.5 times the elbow diameter. Unless elbow construction type is indicated, provide elbows meeting the following requirements:
1. Mitered Elbows: Fabricate mitered elbows with welded construction in gages specified below.
 - a. Mitered Elbows Radius and Number of Pieces: Unless otherwise indicated, construct elbow to comply with SMACNA "HVAC Duct Construction Standards," Table 3-1.
 - b. Round Mitered Elbows: Solid welded and with metal thickness listed below for pressure classes from minus 2 inches to plus 2 inches:
 - 1) 3 to 36 inches: 24 gage.
 - 2) 27 to 36 inches: 22 gage.
 - 3) 37 to 50 inches: 20 gage.
 - 4) 52 to 60 inches: 18 gage.
 - 5) 62 to 84 inches: 16 gage.
 - c. Round Mitered Elbows: Solid welded and with metal thickness listed below for pressure classes from 2 inches to 10 inches:
 - 1) 3 to 14 inches: 24 gage.
 - 2) 15 to 26 inches: 22 gage.
 - 3) 27 to 50 inches: 20 gage.
 - 4) 52 to 60 inches: 18 gage.
 - 5) 62 to 84 inches: 16 gage.

- d. 90-Degree, 2-Piece, Mitered Elbows: Use only for supply systems, or exhaust systems for material handling classes A and B; and only where space restrictions do not permit the use of 1.5 bend radius elbows. Fabricate with a single-thickness turning vanes.
- 2. Round Elbows - 8 Inches and Smaller: Die-formed elbows for 45- and 90-degree elbows and pleated elbows for 30, 45, 60, and 90 degrees only. Fabricate nonstandard bend angle configurations of ½-inch-diameter (e.g. 3 ½ - and 4 ½ - inch) elbows with gored construction.
- 3. Round Elbows - 9 Through 14 Inches: Gored or pleated elbows for 30, 45, 60, and 90 degrees, except where space restrictions require a mitered elbow. Fabricate nonstandard bend angle configurations or ½ - inch-diameter (e.g. 9 ½ - and 10 ½ -inch) elbows with gored construction.
- 4. Round Elbows: Larger Than 14 Inches and All Flat Oval Elbows: Gored elbows, except where space restrictions require a mitered elbow.
- 5. Round Gored Elbows Gages: Same as for non-elbow fittings specified above.
- 6. Flat Oval Elbows Gages: Same as longitudinal seam flat oval duct.
- 7. Pleated Elbows Sizes Through 14 Inches and Pressures Through 10 Inches:
26 gage.
- 8. No adjustable type elbows allowed on high/medium pressure ductwork prior to installation of VAV Boxes, allowed on low pressure ductwork only (after VAV Boxes).
- D. Double-Wall (Insulated) Fittings: Fabricate double-wall insulated fittings with an outer shell, insulation, and inner liner as specified below. Dimensions indicated on internally insulated ducts are nominal inside dimensions.
 - 1. Thermal Conductivity: 0.27 Btu/sq. ft./deg F/inch thickness at 75 deg F mean temperature.
 - 2. Outer Shell: Base outer shell gage on actual outer shell dimensions. Provide outer shell lengths 2 inches longer than inner shell and insulation. Gages for outer shell shall be same as for uninsulated fittings specified above.
 - 3. Insulation: Unless otherwise indicated, provide 1-inch-thick fiber-glass insulation. Provide components. The insulation end shall terminate the insulation and reduce the outer shell diameter to the nominal single-wall size.
 - 4. Perforated Inner Liner: Construct round and flat oval inner liners with perforated sheet metal of the gages listed below. For flat oval ducts, the diameter indicated in the table below is the "basic round diameter."
 - a. 3 to 34 inches: 24 gage.
 - b. 35 to 58 inches: 22 gage.
 - c. 60 to 88 inches: 20 gage.
 - 5. Maintain concentricity of liner to outer shell by mechanical means. Retain insulation from dislocation by mechanical means.

2.10 AUXILIARY DRAIN PAN

- A. Auxiliary Drain Pans: Fabricate of min. 12 gauge 304 stainless steel turned up four (4) inches all around and extend six (6) inches beyond all sides of equipment. All joints and seems to be of welded construction. This is applicable for all auxiliary drain pans under air handling units, hot water heaters, etc.
 - 1. Provide float switch in auxiliary drain line, unit to de-energize when float switch is tripped.
 - 2. Pipe safety pans to nearest floor drain.
 - 3. In air handling unit drain pan, provide ball valve in safety pan condensate drain line.

2.11 KITCHEN HOOD & DISHWASHER EXHAUST DUCT

- A. Not used.

2.12 JOINT AND SEAM SEALANT

- A. Joint and Seam Sealants, General: The term "sealant" is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.

1. All sealants shall be UL181A compliant.
- B. All ductwork joints and seams to be sealed with joint and seam hardcast. Water Based Duct Sealant to be Versa-Grip 102 as manufactured by HardCast, Miracle Kingco D-619 Water Based Duct Sealant or prior approved equal.
 1. All seams on exposed ductwork shall be neatly caulked with HardCast Iron-Grip 601 or prior approved equal. Contractor to seal one (1) duct joint/seam for aesthetic approval by architect prior to sealing entire duct system.
- C. Flange Gaskets Joints: Butyl rubber or EPDM polymer with polyisobutylene plasticizer to be installed at joint connection and then sealed with joint and seam hardcast.

2.13 ALUMINUM DUCTWORK CONSTRUCTION

- A. Not used.

2.14 DUCT LINER

- A. Fibrous-Glass Liner: Comply with NFPA 90A or NFPA 90B and with NAIMA AH124.
 1. Materials: ASTM C 1071; surfaces exposed to airstream shall be coated to prevent erosion of glass fibers.
 - a. Thickness: 1 inch, 1.5lb.density
 - b. Thermal Conductivity (k-Value): 0.26 at 75 deg F mean temperature.
 - c. Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84.
 - d. Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
 - e. Mechanical Fasteners: Galvanized steel suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in duct.
 - 1) Tensile Strength: Indefinitely sustain a 50-lb- tensile, dead-load test perpendicular to duct wall.
 - 2) Fastener Pin Length: As required for thickness of insulation and without projecting more than 1/8 inch into airstream.
 - 3) Adhesive for Attaching Mechanical Fasteners: Comply with fire-hazard classification of duct liner system.

2.15 APPLICATION OF LINER IN RECTANGULAR DUCTS

- A. Adhere a single layer of indicated thickness of duct liner with at least 100 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
- B. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
- C. Butt transverse joints without gaps and coat joint with adhesive.
- D. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
- E. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and standard liner product dimensions make longitudinal joints necessary.
- F. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
- G. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
 1. Fan discharges.
 2. Intervals of lined duct preceding unlined duct.
 3. Upstream edges of transverse joints in ducts where air velocities are greater than 2500 fpm (12.7 m/s) or where indicated.

- H. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.
 - 1. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.
 - 2. Applicable where perforated liner is specified on drawings.
- I. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used; secure buildouts to duct walls with bolts, screws, rivets, or welds.

PART 3 EXECUTION

3.1 DUCT INSTALLATION, GENERAL

- A. Construct and install ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated. All ducts shall be galvanized steel (G90) unless otherwise noted.
- B. Duct System Pressure Class: Construct and install each system for the specific duct pressure classification indicated.
 Static-Pressure Classes: Unless otherwise indicated, construct ducts according to the following:
 - 1. Supply Ducts: 6 inch wg. (4" downstream VAV boxes)
 - 2. Return Ducts (Negative Pressure): 4 inch wg.
 - 3. Exhaust Ducts (Negative Pressure): 2 inch wg.
- C. Install ducts with the fewest possible joints.
- D. Use fabricated fittings for all changes in directions, changes in size and shape, and connections.
- E. Install couplings tight to duct wall surface with a minimum of projections into duct. Secure couplings with sheet metal screws. Install screws at intervals of 12 inches, with a minimum of 3 screws in each coupling.
- F. Locate ducts, except as otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs. Install duct systems in shortest route that does not obstruct useable space or block access for servicing building and its equipment.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Provide clearance of 1 inch where furring is shown for enclosure or concealment of ducts, plus allowance for insulation thickness, if any.
- I. Install insulated ducts with 1-inch clearance outside of insulation.
- J. Conceal ducts from view in finished and occupied spaces by locating in mechanical shafts, hollow wall construction, or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown.
- K. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.
- L. Electrical Equipment Spaces: Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures.
- M. Non-Fire-Rated Partition Penetrations: Where ducts pass interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gage as duct. Overlap opening on 4 sides by at least 1 ½ inches.
- N. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire dampers, sleeves, and firestopping sealant. Fire and smoke dampers are specified in Division 23 Section "Duct Accessories." Firestopping materials

and installation methods are specified in Division 7 Section "Through-Penetration Firestop Systems."

- O. Install round and flat-oval ducts in lengths not less than 12 feet unless interrupted by fittings.
- P. Seal all joints and seams. Apply sealant to male end connectors before insertion, and afterward to cover entire joint and sheet metal screws.
- Q. Install ducts with hangers and braces designed to withstand, without damage to equipment, seismic force required by applicable building codes.
- R. Protect duct interiors from the elements and foreign materials until building is enclosed. Follow SMACNA's "Duct Cleanliness for New Construction."
- S. Paint interiors of metal ducts that do not have duct liner, for 24 inches upstream of registers and grilles. Apply one coat of flat, black, latex finish coat over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 9 painting Sections.
- T. All sections of duct work (Supply, Return, Exhaust, Fresh Air) are to be supplied to project in maximum lengths of 4'-0" as to allow for ease of field modifications and rerouting of ductwork.

3.02 SEAM AND JOINT SEALING

- A. General: Seal all duct seams and joints as follows:
- B. Pressure Classifications Greater Than 3 Inches Water Gage: All transverse joints, longitudinal seams and penetrations.
- C. Pressure Classifications Greater than 2 to 3 Inches Water Gage: All transverse joints and longitudinal seams.
 - 1. Pressure Classification Less than 2 Inches Water Gage: All transverse joints and longitudinal seams.
- D. Seal externally insulated ducts prior to insulation installation.
- E. Self-adhesive foil faced tape not acceptable as a means of ductwork sealant.
- F. Cover all sheet metal screws.
- G. Joint and Seam Sealants, General: The term "sealant" is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.
 - 1. All sealants shall be UL181A compliant.
- H. All ductwork joints and seams to be sealed with joint and seam hardcast. Water Based Duct Sealant to be Versa-Grip 102 as manufactured by HardCast, Miracle Kingco D-619 Water Based Duct Sealant or prior approved equal.
 - 1. All seams on exposed ductwork shall be neatly caulked with HardCast Iron-Grip 601 or prior approved equal. Contractor to seal one (1) duct joint/seam for aesthetic approval by architect prior to sealing entire duct system.
- I. Flange Gaskets Joints: Butyl rubber or EPDM polymer with polyisobutylene plasticizer to be installed at joint connection and then sealed with joint and seam hardcast.

3.03 HANGING AND SUPPORTING

- A. Install rigid round, rectangular, and flat oval metal duct with support systems indicated in SMACNA "HVAC Duct Construction Standards (Most Current Edition)," Tables 4-1 through 4-3 and Figures 4-1 through 4-8.
- B. Support horizontal ducts with 2 feet of each elbow and withing 4 feet of each branch intersection.
- C. Support vertical ducts at a maximum interval of 16 feet and at each floor.
- D. Upper attachments to structures shall have an allowable load not exceeding 1/4 of the failure (proof test) load but are not limited to the specified methods indicated.
- E. Install concrete insert prior to placing concrete.
- F. Install powder actuated concrete fasteners after concrete is placed and completely cured.

3.04 CONNECTIONS

- A. Equipment Connections: Connect equipment with flexible connectors in accordance with Division 23 Section "Duct Accessories."

- B. Branch Connections: Comply with SMACNA "HVAC Duct Construction Standards" (Most Current Edition), Figures 2-7 and 2-8.
- C. Outlet and Inlet Connections: Comply with SMACNA "HVAC Duct Construction Standards" (Most Current Edition), Figures 2-16 through 2-18.
- D. Terminal Units Connections: Comply with SMACNA "HVAC Duct Construction Standards" (Most Current Edition), Figure 2-19.

3.05 FIELD QUALITY CONTROL

- A. Disassemble, reassemble, and seal segments of the systems as required to accommodate leakage testing, and as required for compliance with test requirements.
- B. Conduct tests, in the presence of the Architect, at static pressures equal to the maximum design pressure of the system or the section being tested. If pressure classifications are not indicated, test entire systems at the maximum system design pressure. Do not pressurize systems above the maximum design operating pressure. Give 7 days advanced notice for testing.
- C. Determine leakage from entire system or section of the system by relating leakage to the surface area of the test section.
- D. Maximum Allowable Leakage: As described in ASHRAE (most current edition) Handbook, "Fundamentals" Volume, Chapter 32, Table 6 and Figure 10. Comply with requirements for leakage classification 3 for round and flat oval ducts, leakage classification 12 for rectangular ducts in pressure classifications less than and equal to 2 inches water gage (both positive and negative pressures), and leakage classification 6 for pressure classifications greater than 2 inches water gage and less than and equal to 10 inches water gage.
- E. Remarks leaking joint as required and apply sealants to achieve specified maximum allowable leakage.
- F. Leakage Test: Perform volumetric measurements and adjust air systems as described in ASHRAE (most current edition) "HVAC Systems and Applications" Volume, Chapter 57 and ASHRAE (most current edition) "Fundamentals" Volume, Chapter 13, and Division 15 Section "TESTING, ADJUSTING, AND BALANCING."
- G. Leakage tests shall be performed for the main trunk line up to the terminal units of each air handling unit. The tests shall be concluded as a requirement of Test and Balance Contract.

3.06 ADJUSTING

- A. Adjust volume control devices as required by the testing and balancing procedures to achieve required air flow. Refer to Division 23 Section "TESTING, ADJUSTING, AND BALANCING" for requirements and procedures for adjusting and balancing air systems.

3.07 CLEANING NEW SYSTEMS

- A. Mark position of dampers and air-directional mechanical devices before cleaning, and perform cleaning before air balancing.
- B. Use service openings, as required, for physical and mechanical entry and for inspection.
 - 1. Create other openings to comply with duct standards.
 - 2. Disconnect flexible ducts as needed for cleaning and inspection.
 - 3. Remove and reinstall ceiling sections to gain access during the cleaning process.
- C. Vent vacuuming system to the outside. Include filtration to contain debris removed from HVAC systems, and locate exhaust down wind and away from air intakes and other points of entry into building.
- D. Clean the following metal duct systems by removing surface contaminants and deposits:
 - 1. Air outlets and inlets (registers, grilles, and diffusers).
 - 2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
 - 3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.

4. Coils and related components.
 5. Return-air ducts, dampers, and actuators except in ceiling plenums and mechanical equipment rooms.
 6. Supply-air ducts, dampers, actuators, and turning vanes.
- E. Mechanical Cleaning Methodology:
1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
 2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
 3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
 4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet.
 5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
- F. Cleanliness Verification:
1. Visually inspect metal ducts for contaminants.
 2. Where contaminants are discovered, re-clean and reinspect ducts.
- G. All ductwork shall be in accordance to SMACNA's (current edition) "Duct Cleanliness for New Construction Guidelines". All supply ducts should be considered intermediate level. If upon inspection or during construction it is deemed that the criteria per section 3 of SMACNA's "Cleanliness Guidelines" were violated and the contamination has been identified, NADCA (current edition) "Cleaning New Systems" shall be followed.

3.08 HOOD EXHAUST DUCTS, SPECIAL INSTALLATION REQUIREMENTS

1. Install ducts to allow for thermal expansion through 2000 deg F temperature range.
2. Install ducts without dips or traps that may collect residues unless traps have continuous or automatic residue removal.
3. Install access openings at each change in direction and at intervals defined by NFPA 96; locate on sides of duct a minimum of 1-1/2 inches from bottom; and fit with grease-tight covers of same material as duct.
4. Do not penetrate fire-rated assemblies except as permitted by applicable building codes.

END OF SECTION

9-2-25

SECTION 23 3300 - DUCTWORK ACCESSORIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Backdraft dampers.
 - 2. Volume dampers.
 - 3. Motorized control dampers.
 - 4. Fire dampers.
 - 5. Turning Vanes.
 - 6. Duct-mounting access doors.
 - 7. Flexible connectors.
 - 8. Flexible Duct.
 - 9. Round Branch Takeoff to Diffusers.
 - 10. Cable Control System & Balancing Dampers.
 - 11. Misc Sheetmetal & Duct Accessory Hardware.
 - 12. Smoke Dampers
 - 13. Combination Fire/Smoke Dampers.
- B. Related Sections include the following:
 - 1. Division 26 Section "Fire Alarm" for duct-mounting fire and smoke detectors.
 - 2. Division 23 Section 23 09 00 "Building and Automatic Temperature Controls" for electric and pneumatic damper actuators.

1.03 SUBMITTALS

- A. Product Data: For the following:
 - 1. Backdraft dampers.
 - 2. Volume dampers.
 - 3. Motorized control dampers.
 - 4. Fire dampers.
 - 5. Turning Vanes.
 - 6. Duct-mounting access doors.
 - 7. Flexible connectors.
 - 8. Flexible Duct.
 - 9. Round Branch Takeoff to Diffusers.
 - 10. Cable Control System & Balancing Dampers.
 - 11. Misc Sheetmetal & Duct Accessory Hardware.
 - 12. Smoke Dampers
 - 13. Combination Fire/Smoke Dampers.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Special fittings.
 - 2. Manual-volume damper installations.
 - 3. Fire-damper installations, including sleeves and duct-mounting access doors.
 - 4. Wiring Diagrams: Power, signal, and control wiring.

- C. Coordination Drawings: Reflected ceiling plans, drawn to scale and coordinating penetrations and ceiling-mounting items. Show ceiling-mounting access panels and access doors required for access to duct accessories.

1.04 QUALITY ASSURANCE

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

1.05 EXTRA MATERIALS

- A. Furnish extra materials matching products installed as described below, packaged with protective covering for storage and identified with labels describing contents. Deliver extra materials to Owner.
 - 1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 PRODUCTS

2.01 SHEET METAL MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated.
- B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G90 coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.
- C. Stainless Steel: ASTM A 480/A 480M.
- D. Aluminum Sheets: ASTM B 209, alloy 3003, temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- E. Extruded Aluminum: ASTM B 221, alloy 6063, temper T6.
- F. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.02 BACKDRAFT DAMPERS

- A. Description: Multiple-blade, parallel action gravity balanced, with center-pivoted blades of maximum 6-inch width, with sealed edges, assembled in rattle-free manner with 90-degree stop, steel ball bearings, and axles; adjustment device to permit setting for varying differential static pressure.
- B. Frame: 0.052-inch- thick, galvanized sheet steel, with welded corners [and mounting flange].
- C. Blades: 0.050-inch- thick aluminum sheet.
- D. Blade Seals: Felt, Vinyl or Neoprene.
- E. Blade Axles: Nonferrous or Galvanized steel.
- F. Tie Bars and Brackets: Aluminum or Galvanized steel.
- G. Return Spring: Adjustable tension.

2.03 VOLUME DAMPERS

- A. General Description: Factory fabricated, with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.
 - 1. Pressure Classes of 3-Inch wg or Higher: End bearings or other seals for ducts with axles full length of damper blades and bearings at both ends of operating shaft.
- B. Standard Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating,[with linkage outside airstream,] and suitable for horizontal or vertical applications.
 - 1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.

2. Roll-Formed Steel Blades: 0.064-inch- thick, [galvanized] [stainless] sheet steel.
 3. Aluminum Frames: Hat-shaped, 0.10-inch- thick, aluminum sheet channels; frames with flanges where indicated for attaching to walls; and flangeless frames where indicated for installing in ducts.
 4. Roll-Formed Aluminum Blades: 0.10-inch- thick aluminum sheet.
 5. Extruded-Aluminum Blades: 0.050-inch- thick extruded aluminum.
 6. Blade Axles: [Galvanized steel] [Stainless steel] [Nonferrous].
 7. Bearings: Oil-impregnated bronze or Molded synthetic sleeve].
 8. Tie Bars and Brackets: Aluminum.
 9. Tie Bars and Brackets: Galvanized steel.
- C. Low-Leakage Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, low-leakage rating,[with linkage outside airstream,] and suitable for horizontal or vertical applications.
1. Steel Frames: Hat, U or Angle-shaped, galvanized sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
 2. Roll-Formed Steel Blades: 0.064-inch- thick, galvanized sheet steel.
 3. Aluminum Frames: Hat, U or Angle-shaped]-shaped, 0.10-inch- thick, aluminum sheet channels; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
 4. Roll-Formed Aluminum Blades: 0.10-inch- thick aluminum sheet.
 5. Extruded-Aluminum Blades: 0.050-inch- thick extruded aluminum.
 6. Blade Axles: Galvanized steel, Stainless steel or Nonferrous.
 7. Bearings: Oil-impregnated bronze or Molded synthetic thrust or ball.
 8. Blade Seals: Felt, Vinyl, or Neoprene.
 9. Jamb Seals: Cambered stainless steel.
 10. Tie Bars and Brackets: Galvanized steel.
- D. Jackshaft: 1-inch- diameter, galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
1. Length and Number of Mountings: Appropriate to connect linkage of each damper in multiple-damper assembly.
- E. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.04 MOTORIZED CONTROL DAMPERS

- A. Dampers shall bear the AMCA Certified Ratings Seal for Air Performance Air Leakage in accordance with AMCA 511 (Greenheck VCD-23).
- B. Dampers shall have a maximum leakage of Class 1 (8 cfm/sq. ft @ 4 in. wg at -40°F) as defined by AMCA and shall be tested in accordance with AMCA standard 500-D.
- C. Dampers shall have a maximum differential pressure rating of 5 in. wg. and a maximum velocity rating of 3000 FPM.
- D. Damper frame shall be 16 ga. galvanized steel formed into a 5" x 1" structural hat channel. Top and bottom frame members on dampers less than 17" high shall be low profile design to maximize the free area of these smaller dampers. Frame shall be 4-piece construction with 1 ½" (minimum) integral overlapping gusset reinforcements in each corner to assure square corners and provide maximum resistance to racking.
- E. Damper blades shall be 16 ga. Galvanized steel strengthened by three longitudinal 1" deep Vee grooves running the entire length of each blade. Each blade shall be symmetrical relative to its axle pivot point, presenting identical performance characteristics with air flowing in either direction through the damper. Provide symmetrical blades of varying size as required to

completely fill the damper opening. Blade orientation shall be horizontal and shall be opposed blade or parallel blade as required.

- F. Each blade stop at the top and bottom of the damper frame shall occupy no more than 1/2" of the damper opening area.
- G. Provide TPE blade seals mechanically fastened to each blade, and flexible stainless steel jamb seals.
- H. All linkage shall be stainless steel, and concealed in the jamb. A stainless steel axle with stainless steel axle bearings shall be provided.
- I. Refer to control specifications for damper actuator.
- J. Control dampers shall be equal to Greenheck # VCD-23 with all options specified.

2.05 FIRE DAMPERS

- A. Fire dampers shall be labeled according to UL 555.
- B. Fire Rating: 1-1/2 hours.
- C. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch- thick galvanized steel; with mitered and interlocking corners.
- D. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.
 - 1. Minimum Thickness: 16 GA (0.0635) inch thick as indicated and of length to suit application.
- E. Mounting Orientation: Vertical or horizontal as indicated.
- F. Blades: Roll-formed, interlocking, 0.034-inch- thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- thick, galvanized-steel blade connectors.
- G. Horizontal Dampers: Include blade lock and stainless-steel closure spring.
- H. Fusible Links: Replaceable, 165 deg F rated. General Description: Labeled according to UL 555C; comply with construction details for tested floor- and roof-ceiling assemblies as indicated in UL's "Fire Resistance Directory."
- I. Frame: Galvanized sheet steel, round or rectangular, style to suit ceiling construction.
- J. Blades: Galvanized sheet steel with refractory insulation.
- K. Fusible Links: Replaceable, 165 deg F rated.
- L. Fire dampers to be factory sealed Class "A", suitable to 4" static pressure.
- M. Contractor to provide fire dampers at all wall fire wall/floor/partition penetration, refer to architect life safety plan for rating of respective walls and contractor to provide 1-1/2 hr fire damper (3 hour fire damper at 3 & 4 hour rated wall/floor/partition) at all floor penetrations of ductwork (supply, return and/or exhaust).
- N. All ductwork housing fire dampers shall be equipped with access door of sufficient size to reset and change out fusible link as necessary. All fire dampers have to be check and tested every three (3) years, access doors of sufficient size are mandatory to reset the fusible link, refer to paragraph 3.1 of this specifications for require sizes of access doors, this will be based in actual size of ductwork.
- O. All fire dampers are to be dynamic type.

2.06 TURNING VANES

- A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for vanes and vane runners. Vane runners shall automatically align vanes.
- B. Manufactured Turning Vanes: Fabricate 1-1/2-inch- wide, double-vane, curved blades of galvanized sheet steel set 3/4 inch o.c.; support with bars perpendicular to blades set 2 inches o.c.; and set into vane runners suitable for duct mounting.
- C. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

2.07 DUCT-MOUNTING ACCESS DOORS

- A. General Description: Fabricate doors airtight and suitable for duct pressure class.

- B. Door: Double wall, duct mounting, and rectangular; fabricated of galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch butt or piano hinge and cam latches.
 - 1. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
 - 2. Provide number of hinges and locks as follows:
 - a. Less Than 12 Inches Square: Secure with two sash locks.
 - b. Up to 18 Inches Square: Two hinges and two sash locks.
 - c. Up to 24 by 48 Inches: Three hinges and two compression latches[with outside and inside handles].
 - d. Sizes 24 by 48 Inches and Larger: One additional hinge.
- C. Door: Double wall, duct mounting, and round; fabricated of galvanized sheet metal with insulation fill and 1-inch thickness. Include cam latches.
 - 1. Frame: Galvanized sheet steel, with spin-in notched frame.
- D. Pressure Relief Access Door: Double wall and duct mounting; fabricated of galvanized sheet metal [with insulation fill and thickness] as indicated for duct pressure class. Include vision panel where indicated, latches, and retaining chain.
 - 1. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
- E. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.
- F. Insulation: 1-inch- thick, fibrous-glass or polystyrene-foam board.

2.08 FLEXIBLE CONNECTORS

- A. General Description: Flame-retardant or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.
- B. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Select metal compatible with ducts.
- C. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 - 1. Minimum Weight: 26 oz./sq. Yd..
 - 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 - 3. Service Temperature: Minus 40 to plus 200 deg F.
- D. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
 - 1. Minimum Weight: 24 oz./sq. Yd..
 - 2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
 - 3. Service Temperature: Minus 50 to plus 250 deg F.
- E. High-Temperature System, Flexible Connectors: Glass fabric coated with silicone rubber.
 - 1. Minimum Weight: 16 oz./sq. Yd..
 - 2. Tensile Strength: 285 lbf/inch in the warp and 185 lbf/inch in the filling.
 - 3. Service Temperature: Minus 67 to plus 500 deg F.
- F. High-Corrosive-Environment System, Flexible Connectors: Glass fabric with chemical-resistant coating.
 - 1. Minimum Weight: 14 oz./sq. Yd..
 - 2. Tensile Strength: 450 lbf/inch in the warp and 340 lbf/inch in the filling.
 - 3. Service Temperature: Minus 67 to plus 500 deg F.

2.09.01 LOW PRESSURE FLEXIBLE DUCT

- A. Core material shall be an acoustical transparent CPE fabric supported by helically wound galvanized steel. The fabric shall be mechanically fastened to the steel helix without the use of adhesive.
- B. The internal working pressure rating shall be at least as follows with a bursting pressure of at least 2-1/2 times the working pressure.

1. Positive: 10 inches W.G.
2. Negative: 5 inches W.G.
- C. The duct shall be rated for a velocity of at least 5500 feet per minute.
- D. Suitable for operating temperatures of at least 250 degrees F.
- E. Minimum Acoustic Performance:

1. The insertion loss (dB) of a 10 foot length of duct when tested in accordance with ASTM E 477 at a velocity of 2500 feet per minute shall be at least:

	<u>125 Hz</u>	<u>250 Hz</u>	<u>500 Hz</u>	<u>1000 Hz</u>	<u>2000 Hz</u>	<u>4000 Hz</u>
<u>8 inch dia.</u>	12	31	40	38	38	23
<u>12 inch dia.</u>	17	35	31	31	28	13

2. The radiated noise reduction (dB) of a 10 foot length of duct when tested in accordance with ASTM E 477 at a velocity of 2500 feet per minute shall be at least:

	<u>125 Hz</u>	<u>250 Hz</u>	<u>500 Hz</u>	<u>1000 Hz</u>	<u>2000 Hz</u>	<u>4000 Hz</u>
<u>8 inch dia.</u>	10	7	7	8	10	13
<u>12 inch dia.</u>	9	6	6	5	9	13

3. The self generated sound power levels (dB re: 10-12 watts) of a 10 foot length of duct when tested in accordance with ASTM E 477 at a velocity of 1000 feet per minute shall not exceed:

	<u>125 Hz</u>	<u>250 Hz</u>	<u>500 Hz</u>	<u>1000 Hz</u>	<u>2000 Hz</u>	<u>4000 Hz</u>
<u>8 inch dia.</u>	41	34	27	19	18	21
<u>12 inch dia.</u>	54	45	38	31	27	23

- F. Factory insulate the flexible duct with flexible fiberglass insulation. The R value shall be at least 6.0 at a mean temperature of 75 degrees F.
- G. Cover the insulation with a reinforced aluminum pigmented vapor barrier jacket having a permeance of not greater than 0.05 perms when tested in accordance with ASTM E96, procedure A.
- H. The ductwork shall be UL listed, Class 1 Air Duct and comply with NFPA 90A and 90B.
- I. Manufacturer: Flexmaster Type 1M, 8M, 1B Thermaflex #MKE with Thermaflex #Flexflow Elbow, or prior approved equal. Sample required for prior approval.

2.09.02 ACOUSTICAL LOW PRESSURE FLEXIBLE DUCT

- A. Core material shall be an acoustical Spun Bond Nylon inner film supported by helically wound galvanized steel. The fabric shall be mechanically fastened to the steel helix without the use of adhesive. The core shall maintain its free area and a center line radius of 1.0 or better.
- B. The internal working pressure rating shall be at least as follows with a bursting pressure of at least 2-1/2 times the working pressure.
 1. Positive: 6 inches W.G.
 2. Negative: 5 inches W.G.
- C. The duct shall be rated for a velocity of at least 5500 feet per minute.
- D. Suitable for operating temperatures of at least 250 degrees F.
- E. Minimum Acoustic Performance:
 1. Sound Attenuation - Straight Duct

Flexmaster U.S.A. Flexible Duct	Dia (in.)	Length (ft.)	Insertion Loss, dB Octave Band Center Frequency, Hz						
			63	125	250	500	1,000	2,000	4,000
Type 6	6	12	6.9	36	43	45	47	53	46
		9	5.5	24	28	29	30	33	29
		6	4.0	13	15	15	16	17	16
		3	2.3	4.9	5.3	5.3	5.5	5.8	5.4
		1	0.85	1.36	1.51	1.44	1.55	1.51	1.45
Type 6	8	12	11.3	39	37	46	49	55	49
		9	8.5	25	24	29	31	34	31
		6	5.7	14	13	15	16	18	16
		3	2.9	5.0	4.9	5.4	5.6	5.8	5.6
		1	0.98	1.39	1.37	1.45	1.48	1.52	1.48
Type 6	12	12	10.0	35	33	43	44	55	36
		9	8.1	23	22	28	28	34	24
		6	5.5	13	12	15	15	18	13
		3	2.8	4.8	4.7	5.3	5.3	5.8	4.9
		1	0.96	1.34	1.33	1.43	1.44	1.53	1.36

2. Sound Attenuation - 90° Elbow

Flexmaster U.S.A. Flexible Duct	Dia (in.)	Length (ft.)	Insertion Loss, dB Octave Band Center Frequency, Hz						
			63	125	250	500	1K	2K	4K
Type 6	6	12	21	46	47	52	56	55	55
		9	14	29	30	32	35	34	35
		6	9	15	16	17	18	17	18
		3	3.8	5.4	5.5	5.7	5.9	5.8	5.9
Type 6	8	12	25	44	50	55	50	56	57
		9	17	28	32	34	32	35	36
		6	10	15	16	17	16	18	18
		3	2.4	5.3	5.6	5.8	5.6	5.9	6.0
Type 6	12	12	29	40	43	47	46	49	43
		9	19	26	28	30	29	31	28
		6	11	14	15	16	15	16	15
		3	4.4	5.1	5.3	5.5	5.4	5.6	5.3

- F. Factory insulate the flexible duct with flexible fiberglass insulation. The R value shall be at least 6.0 at a mean temperature of 75 degrees F. (R4.2 not acceptable)
- G. Cover the insulation with a reinforced aluminum pigmented vapor barrier jacket having a permeance of not greater than 0.05 perms when tested in accordance with ASTM E96, procedure A.
- H. The ductwork shall comply with UL Standard 181, as a Class 1 Air Duct and comply with NFPA 90A and 90B.

- I. Manufacturer: Flexmaster Type 6M, with Thermaflex #Flexflow Elbow, or prior approved equal. Sample required for prior approval.

1. Maximum length: 12'0".

2.09.03 FLEXIBLE DUCT ELBOW SUPPORTS

- A. Flexible Duct Elbow Supports: "FlexRight" (Durable Elbow Support).
 1. Universal-mount, 1-piece, fully adjustable, radius-forming brace to support 4-inch (102-mm) through 16-inch (406-mm) diameter flexible air ducts.
 2. Classified: UL 2043.
 3. Material: 100 percent recycled copolymer polypropylene.
 4. Support Frame Radius: 8 inches.
 5. Compliance for Flexible Duct Radius:
 - a. SMACNA HVAC Duct Construction Standards.
 - b. ASHRAE Advanced Energy Design Guides.
 - c. ADC Flexible Duct Performance and Installation Standards.
- B. Manufacturer: Build Right Products (www.BuildRightProducts.com) or prior approved equal.

2.10 ROUND BRANCH TAKEOFF W/ DAMPER TO DIFFUSERS

- A. Furnish and install Flexmaster #STOD-BO3 45, Hamlin Sheetmetal, Spiral Pipe of Texas or approved equal degree side take off fittings with dampers for all round ducts connecting to the side of rectangular ducts. Construction shall be 26 gauge, G-90 galvanized steel. Mounting flanges must be pre-punched, 1" wide, and provided with corner clips and adhesive gaskets. Dampers shall have full length 3/8" square shafts connected with U-Bolts, nylon bearings, 2" insulation build outs and Duro Dyne #KR-3, Elgin Quadrant or approved equal heavy duty locking hand quadrants. Spin collar with wing nut dampers not allowed.

2.11 REMOTE ELECTRONIC BALANCING DAMPER ASSEMBLY FOR INACCESSIBLE MANUAL VOLUME DAMPERS

- A. Dampers above a hard ceiling, dampers located more than 10'-0" above finished floor, or in any inaccessible location shall be controlled with a remote electronic balancing damper positioner (EBDP). Damper positioner shall include an LCD visual indicator meter that shows blade position modulating over a range of 0-100% open via a voltage signal that is proportional to the blade angle. A non-rechargeable 9v lithium battery powers the positioner. Provide multiple EBDP Positioner as noted on drawing detail.
- B. The Electronic Balancing Damper (EBD) shall include a 12V DC motor and a positive feedback control system. When used for shut off, damper shall be provided with blade seals. Damper actuator shall not require electrical power connection.
- C. Round dampers shall be constructed of galvanized steel and shall be available in the following sizes and gages:
 - 4" through 9" (24 gage)
 - 10" through 16" (20 gage)
- D. Rectangular dampers shall be constructed of .050 aluminum extrusion frames and blades with reinforcing channels. Dampers shall be available in the following sizes:
 - Min size = 4" x 3"
 - Max size = 24" x 24"
- E. Damper actuator shall be connected to a wall plate available in 1,2,4,6, and 12 ports. This wall plate shall be installed in an accessible space, preferably above a lay in ceiling, or as noted on drawings. Connecting cable shall be plenum rated 5 conductor wire. This cable shall be provided by the manufacturer of the remote damper system. Field connection between 12V DC motor (Delphi end) and termination wall plate (RJ-12 end) shall be accomplished by connectors installed on the cable by the factory. Standard cable lengths shall be 10', 25', and 50' with longer lengths up to 1000' where required.
- F. The remote electronic balancing damper, wall plate, cable, and remote positioner shall be as manufactured by Young Regulator EBD series.

2.12 MISCELLANEOUS SHEETMETAL AND DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.
- C. Auxiliary Drain Pans: Fabricate of 12-gauge 304 stainless steel iron turned up four (4) inches all around and extend six (6) inches beyond all sides of equipment (air handling units, hot water heaters, etc.). Size of auxiliary drain pans to be based on equipment size maintaining minimum 6" clearance all around. All auxiliary drain pans to be 304 stainless steel. Provide float switch in auxiliary drain pan, unit to de-energize when tripped.

2.13 SMOKE DAMPERS

- A. General: Smoke Dampers meeting the following specifications shall be furnished and installed where shown on plans and/or as described in schedules, and at all rated wall duct penetrations (refer to architectural life safety plan). Dampers shall meet the requirements of NFPA 92A, 92B, 101 & 105 and further shall be tested, rated, and labeled in accordance with the latest edition of UL Standards 555S. Dampers shall have a low leakage design qualified to UL555S Leakage Class I.
- B. Each damper /actuator combination shall have a UL555S elevated temperature rating of 350 F degree minimum and shall be operational at maximum design air flow at its installed location. Each damper shall be supplied with an appropriate actuator installed by the damper manufacturer at the time of damper fabrication. Damper actuator shall be electric type for 24 volt AC, 2-position operation.
- C. Damper blades shall be 16 ga galvanized steel 3V type with three longitudinal grooves for reinforcement. Damper frame shall be galvanized steel formed into a structural hat channel shape with reinforced corners. Bearings shall be sintered bronze sleeve type rotating in polished extruded holes in the damper frame. Blade edge seals shall be silicone rubber designed to inflate and provide a tighter seal against leakage as pressure on either side of the damper increases. Jamb seals shall be stainless steel compression type. Blades shall be completely symmetrical relative to their axle pivot point, presenting identical resistance to airflow in either direction or pressure on either side of the damper. Airfoil blades shall be provided for all dampers with airflow velocities greater than 2000 FPM.
- D. The Damper Manufacturer's submittal data shall certify all air performance pressure drop data is licensed in accordance with the AMCA Certified Ratings Program for Test Figures 5.2, 5.3, and 5.5. Damper air performance data shall be developed in accordance with the latest edition of AMCA Standard 500-D. Dampers shall be labeled with the AMCA Air Performance Seal.
- E. Damper must be rated for mounting vertically (with blades running horizontal) or horizontally and be UL 555S rated for leakage and airflow in either direction through the damper.
- F. The basis of design is Greenheck Model SMD-201 (for ducts with velocities up to 2000 FPM and systems with pressure ratings of 4" w.g. or 6" w.g.) or Greenheck Model SMD-301 (for ducts with velocities greater than 2000 FPM and up to 4000 FPM and systems with pressure ratings of 4" w.g., 6" w.g. and up to 8" w.g.) or prior approved equal.
- G. All smoke dampers shall be provided with the following:
 - 1. Minimum 20 gauge galvanized sleeve.
 - 2. All ductwork housing smoke dampers shall be equipped with access door of sufficient size for damper maintenance and to reset and test actuation of smoke damper. All smoke dampers located in facility have to be check and tested every three (3) years, access doors of sufficient size are mandatory to check operation of smoke dampers, refer to paragraph 3.1 of this specifications for require sizes of access doors, this will be based in actual size of ductwork.
 - 3. Smoke dampers/sleeves must be sealed to a seal class A.
 - 4. All smoke dampers must be rated to 4" w.g. or 6" w.g. (depending on the duct system construction specified) and include velocity ratings that meet or exceed the actual velocity at the smoke damper.
 - 5. Unless otherwise noted, all smoke dampers must fail to the closed position.

6. All smoke dampers must be supplied with single point wiring for damper and specified test switches.
7. All smoke dampers shall be provided with model OCI blade position indicator. Actuator end switches are not a replacement for blade position indicator switches.
8. All smoke dampers must be provided with a factory wired and installed Greenheck #GTS-3 test switch with open/closed LED lights to enable one person to test the damper. Contractor must ensure test switch is accessible.
9. Step-Down transformers: Include to transform from available voltage, single phase to 24V, single phase which comply with UL, FM NFPA Requirements for smoke control systems. Coordinate with Electrical Contractor prior to bid as to ensure a complete and working system.
10. Smoke dampers located in all round ducts and in oval ducts with a minor axis less than 14" shall be supplied as square or rectangular dampers. The minimum damper size shall be 14" x 14" to allow for a minimum 12x12 duct access door for service and maintenance of internal smoke damper components. The sheet metal contractor shall provide and install square/rectangle to round/oval transitions as required.
11. Smoke dampers located in square/rectangular ducts 12x12 and smaller shall be supplied as 14x14 dampers. The sheet metal contractor shall provide transitions from the damper to the duct size shown, as required.
12. Where required for complete access to all damper components, sheet metal contractor shall provide an easily removable section of duct, length as required.
13. Provide a smoke damper schedule with submittal data to include the following information:
 - a. Plan Page
 - b. Room Number
 - c. Duct system served (Exhaust, supply, primary supply, return)
 - d. Damper Tag
(Example #1: SMD-1-AHU 1-Rm #____)
(Example #2: SMD-2-EF-1-Rm #____)
 - e. Damper Size
 - f. Manufacturer's Model #_____
 - g. Install Arrangement (Vertical or Horizontal)
 - h. Wall/Floor thickness
 - i. Sleeve Length
 - j. Sleeve gage
 - k. Actuator voltage/action - 24 volt AC / PO/SR (Power Open/Spring Closed)
 - l. CFM through damper
 - m. Duct airflow velocity
 - n. Damper velocity rating
 - o. Duct access door size

H. Contractor to coordinate with electrical contractor and fire alarm contractor (prior to bid and after award of project) to ensure a complete working and accessible system is installed. Smoke detectors shall be provided & installed by the fire alarm contractor to notify the fire alarm panel in the event of an alarm. Control of smoke damper is by the fire alarm contractor.

2.14 COMBINATION FIRE/SMOKE DAMPERS

- A. Combination Fire Smoke Dampers meeting the following specifications shall be furnished and installed where shown on plans and/or as described in schedules and at all rated wall duct penetrations (refer to architectural life safety plan). Dampers shall meet the requirements of NFPA 80, 90A, 92A, 92B, 101 & 105 and further shall be tested, rated, and labeled in accordance with the latest edition of UL Standards 555 and 555S. Dampers shall have a UL555 fire rating of 1 1/2 hours and be of low leakage design qualified to UL 555S Leakage Class I.

- B. Each damper /actuator combination shall have a UL555S elevated temperature rating of 350 F minimum and shall be operational and dynamic rated to operate at maximum design air flow at its installed location. Each damper shall be supplied with an appropriate actuator installed by the damper manufacturer at the time of damper fabrication. Damper actuator shall be electric type for 24 volt AC, 2-position operation.
- C. Damper blades shall be 16 ga galvanized steel 3V type with three longitudinal grooves for reinforcement. Damper frame shall be 16 ga. galvanized steel formed into a 5" x 1" structural hat channel. Dampers less than 17" high shall utilize low profile geometry and 20 ga. galvanized steel for the top and bottom frame members to maximize free area. Frame shall be 4-piece construction with 1 ½" (minimum) integral overlapping gusset reinforcements in each corner to assure square corners and provide maximum resistance to racking. No welding of damper frames shall be permitted. Bearings shall be stainless steel sleeve type rotating in polished extruded holes in the damper frame. Blade edge seals shall be silicone rubber designed to inflate and provide a tighter seal against leakage as pressure on either side of the damper increases. Jamb seals shall be stainless steel compression type. Blades shall be completely symmetrical relative to their axle pivot point, presenting identical resistance to airflow in either direction or pressure on either side of the damper. Airfoil blades shall be provided for all dampers with airflow velocities greater than 2000 FPM.
- D. The Damper Manufacturer's submittal data shall certify all air performance pressure drop data is licensed in accordance with the AMCA Certified Ratings Program for Test Figures 5.2, 5.3, and 5.5. Damper air performance data shall be developed in accordance with the latest edition of AMCA Standard 500-D. Dampers shall be labeled with the AMCA Air Performance Seal.
- E. Damper must be rated for mounting vertically (with blades running horizontal) or horizontally and be UL 555S rated for leakage and airflow in either direction through the damper. Each damper shall be supplied with a 165 F RRL/OCI (reusable resettable link with blade position indicator package). Actuator end switches are not a replacement for blade position indicator switches.
- F. The basis of design is Greenheck model FSD-211 (for ducts with velocities up to 2000 FPM and systems with pressure ratings of 4" w.g. or 6" w.g.) or Greenheck Model FSD-311 (for ducts with velocities greater than 2000 FPM and up to 4000 FPM and systems with pressure ratings of 4" w.g., 6" w.g. and up to 8" w.g.) or prior approved equal. Combination fire/smoke dampers located in 3 hour or greater walls shall be Greenheck #FSD-311 or prior approved equal.
- G. All combination/fire smoke dampers shall be provided with the following:
 - 1. Minimum 16 gauge galvanized sleeve for sizes up to 36" wide and/or 24" high. Minimum 14 gauge galvanized sleeve for sizes over 36" wide and/or 24" high.
 - 2. All ductwork housing smoke/fire dampers shall be equipped with access door of sufficient size for damper maintenance and to reset and test actuation of smoke damper and/or reset the fusible link. All smoke dampers located in facility have to be checked and tested every three (3) years, access doors of sufficient size are mandatory to check operation of smoke dampers, refer to paragraph 3.1 of this specifications for required sizes of access doors, this will be based in actual size of ductwork. Where required for complete access to all damper components, sheet metal contractor shall provide an easily removable section of duct, length as required.
 - 3. Combination fire/smoke dampers and sleeves must be sealed to a seal class A.
 - 4. Combination fire/smoke dampers must be rated to 4" w.g. and include velocity ratings that meet or exceed the actual velocity at the smoke damper.
 - 5. Unless otherwise noted, all combination fire/smoke dampers must fail to the closed position.
 - 6. All combination fire/smoke dampers must be supplied with single point wiring for damper and specified test switches.
 - 7. All combination fire/smoke dampers shall be provided with model RRL/OCI (reusable resettable link with blade position indicator package). Actuator end switches are not a replacement for blade position indicator switches.

8. All combination fire/smoke dampers must be provided with a factory wired and installed Greenheck #GTS-3 test switch with open/closed LED lights to enable one person to test the damper. Contractor must ensure test switch is accessible.
9. Step-Down transformers: Include to transform from available voltage, single phase to 24V, single phase which comply with UL, FM NFPA Requirements for smoke control systems. Coordinate with Electrical Contractor prior to bid as to ensure a complete and working system.
10. Combination fire/smoke dampers located in all round ducts and oval ducts with a minor axis less than 14" shall be supplied as square or rectangular dampers. The minimum damper size shall be 14" x 14" to allow for a minimum 12x12 duct access door for service and maintenance of internal smoke damper components. The sheet metal contractor shall provide and install square/rectangle to round/oval transitions as required.
11. Smoke dampers located in square/rectangular ducts 12x12 and smaller shall be supplied as 14x14 dampers. The sheet metal contractor shall provide transitions from the damper to the duct size shown, as required.
12. Where required for complete access to all damper components, sheet metal contractor shall provide an easily removable section of duct, length as required.
13. Provide a combination fire/smoke damper schedule with submittal data to include the following information:
 - a. Plan Page
 - b. Room Number
 - c. Duct system served (Exhaust, supply, primary supply, return)
 - d. Damper Tag
(Example #1: SMD-1-AHU 1-Rm #____)
(Example #2: SMD-2-EF-1-Rm #____)
 - e. Damper Size
 - f. Manufacturer's Model #_____
 - g. Install Arrangement (Vertical or Horizontal)
 - h. Wall/Floor thickness
 - i. Sleeve Length
 - j. Sleeve gage
 - k. Actuator voltage/action - 24 volt AC / PO/SR (Power Open/Spring Closed)
 - l. CFM through damper
 - m. Duct airflow velocity
 - n. Damper velocity rating
 - o. Duct access door size

H. Contractor to coordinate with electrical contractor and fire alarm contractor (prior to bid and after award of project) to ensure a complete working and accessible system is installed. Smoke detectors shall be provided & installed by the fire alarm contractor to notify the fire alarm panel in the event of an alarm. Control of smoke damper is by the fire alarm contractor.

2.15 CEILING FIRE SMOKE DAMPER

- A. Not used.

2.16 INSULATED MEDIUM AND HIGH PRESSURE DUCT

- A. Provide where indicated on drawings Flexmaster Type 4M, 4B UL181 Class I Air Duct. Approved equal: Thermaflex model MK-C or prior approved equal. The duct shall be constructed of a heavy coated fiberglass cloth fabric supported by helical wound galvanized steel. The fabric shall be mechanically locked to the steel helix without the use of adhesives or chemicals. The internal working pressure rating shall be at least 12" w.g. positive and 5" w.g. negative with a bursting pressure of at least 2½ time the working pressure. The duct shall be rated for a velocity of at least 5500 feet per minute. The duct must be suitable for continuous operation at a temperature range of -20° F to +250° F.

- B. Factory insulate the flexible duct with fiberglass insulation. The R value shall be at least 6 minimum (R-4.2 is not acceptable) at a mean temperature of 75° F.
- C. Cover the insulation with a fire retardant metalized vapor barrier jacket reinforced with crosshatched scrim having a permeance of not greater than 0.05 perms when tested in accordance with ASTM E96, Procedure A.
- D. Maximum length: 1'0".

2.17 BAG IN/ BAG OUT HEPA FILTER HOUSING & FILTER

- A. Not used.

2.18 ABSORPTIVE SILENCERS

- A. General - Furnish and install Price Silencers of the sizes, configuration and performance as described on plans and / or absorptive silencer schedules. Silencer inlet and outlet connections shall be equal to the duct sizes shown on the drawings. Duct transitions shall be provided by the contractor and are not permitted unless shown on the drawings and approved by the engineer. If discrepancies between the suggested specifications and the silencer schedule occur, the latter takes precedence.
 - 1. Performance - Silencer performance characteristics, including insertion loss, pressure drop, and generated noise, shall be attained through testing in accordance with the latest ASTM E477 test standard for acoustical duct silencers. Performance data shall be obtained from the manufacturer's NVLAP accredited laboratory. Laboratory performance verification in the manufacturer's test facility may be requested, in which case a comparative test report shall be made available to the engineer.
 - 2. Submittal - Manufacturer's performance data for dynamic insertion loss, generated noise and pressure drop shall be provided and shall be obtained in accordance with ASTM E477-13. Data for each scheduled silencer shall be provided with the size, configuration, air volume and air flow direction as it appears on the drawing and / or schedule.
- B. Construction
 - 1. Absorptive Silencers shall consist of solid steel casings, perforated sheet metal liners, absorptive acoustic fiberglass media, and fiberglass cloth as required. Suggested construction gauges are a minimum Stainless Steel or Aluminum gauges shall be adjusted accordingly.
 - 2. Absorptive Rectangular Silencers: RL, RM, RH, RLX, RMX, RHX.
 - 3. Absorptive Elbow Silencers: ERM, ERMX.
 - 4. (Standard) Construction Class 1: 22ga galvanized casing / 26ga galvanized perforated liner.
 - 5. Construction Class 2: 18ga galvanized casing / 26ga galvanized perforated liner.
 - 4. High Transmission Loss 1: 16ga galvanized casing / 26ga galvanized perforated liner.
 - 5. High Transmission Loss 2: 10ga galvanized casing / 26ga galvanized perforated liner.
 - 6. High Transmission Loss 3: For critical applications where high transmission loss is required, custom HTL3 construction shall be specified by the designing manufacturer to meet project requirements.
 - 7. Absorptive Circular Silencers: CH

Connection Diameter		Minimum Casing Gauge
Min	Max	
6	20	22
6	44	18
6	60	16

- 8. Construction Class 1: 22ga galvanized casing / 26ga galvanized perforated liner.
- 9. Construction Class 2: 18ga galvanized casing / 26ga galvanized perforated liner.
- 10. Construction Class 3: 16ga galvanized casing / 26ga galvanized perforated liner.

11. Acceptable methods of fastening include button lock, Pittsburgh lock and welds. In situations where these methods are not feasible, rivets can be used. Screws or other types of mechanical fasteners will not be acceptable.
12. The silencer perforated liners shall be rigidly fastened to the casing of the silencer on both ends, and attached to the outer casing with a minimum of two stiffeners.
 - a. Acoustic Media - Acoustic media shall be shot-free inorganic glass fiber with long, resilient fibers, bonded with thermosetting resin. Glass fiber shall be packed with a minimum 10% compression to eliminate voids and settling; density shall be consistent with that used to generate cataloged test data.
 - b. Fiberglass Cloth - For absorptive silencers with internal velocities that exceed 4000 fpm, a fiberglass cloth shall be added to the silencer between the internal perforated liner and the acoustic media to protect the media from erosion. If Fiberglass Cloth Bagged is required, the acoustic media will be fully encapsulated.
 - c.. Combustion Ratings - Combustion ratings for acoustic media shall be equal to or less than the combustion ratings noted below when tested in accordance with ASTM E84, UL723 and NFPA255.
 - d. Flame Spread Classification: < 25
 - e. Smoke Development Rating: < 50

PART 3 EXECUTION

3.01 APPLICATION AND INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Provide duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- D. Install volume dampers in ducts with liner; avoid damage to and erosion of duct liner.
- E. Provide balancing dampers at points on supply, return, and exhaust systems where branches lead from larger ducts as required for air balancing. Install at a minimum of two duct widths from branch takeoff.
- F. Provide test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install fire and smoke dampers, with fusible links, according to manufacturer's UL-approved written instructions.
- H. Install duct silencers independent of ducts with flexible duct connectors.
- I. Install duct access doors to allow for inspecting, adjusting, and maintaining accessories and terminal units as follows:
 1. On both sides of duct coils.
 2. Downstream from volume dampers, turning vanes, and equipment.
 3. Adjacent to fire or smoke dampers, providing access to reset or reinstall fusible links.
 4. To interior of ducts for cleaning; before and after each change in direction, at maximum 40-foot spacing.
 5. On sides of ducts where adequate clearance is available.
 6. Install the following sizes for duct-mounting, rectangular access doors:
 - a. One-Hand or Inspection Access: 8 by 5 inches.
 - b. Two-Hand Access: 12 by 6 inches.
 - c. Head and Hand Access: 18 by 10 inches.
 - d. Head and Shoulders Access: 21 by 14 inches.
 - e. Body Access: 25 by 14 inches.

- f. Body Plus Ladder Access: 25 by 17 inches.
- 7. Install the following sizes for duct-mounting, round access doors:
 - a. One-Hand or Inspection Access: 8 inches in diameter.
 - b. Two-Hand Access: 10 inches in diameter.
 - c. Head and Hand Access: 12 inches in diameter.
 - d. Head and Shoulders Access: 18 inches in diameter.
 - e. Body Access: 24 inches in diameter.
- 8. Install the following sizes for duct-mounting, pressure relief access doors:
 - a. One-Hand or Inspection Access: 7 inches in diameter.
 - b. Two-Hand Access: 10 inches in diameter.
 - c. Head and Hand Access: 13 inches in diameter.
 - d. Head and Shoulders Access: 19 inches in diameter.
- 9. Label access doors according to Division 23 05 53 Section "Mechanical Identification."
- J. Install flexible connectors immediately adjacent to equipment in ducts associated with fans and motorized equipment supported by vibration isolators.
- K. For fans developing static pressures of 5-inch wg and higher, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
- L. Connect terminal units to supply ducts with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.
- M. Low Pressure Flexible Duct Length Limitation: Connect diffusers to low pressure ducts with maximum 36-inch lengths of flexible duct clamped or strapped in place.
- N. Connect flexible ducts to metal ducts with draw bands.
- O. Install duct test holes where indicated and required for testing and balancing purposes.
- P. Install flexible duct elbow supports at all flexible duct connections to air devices, typical entire project. Install in accordance with manufacturer's instructions. Install over outer flexible ducts to form smooth, 90° bends to eliminate flexible duct kinks and airflow restrictions. Make bends in flexible ducts with minimum of 1-duct diameter centerline radius.

3.02 ADJUSTING

- A. Adjust duct accessories for proper settings.
- B. Adjust fire and smoke dampers for proper action.
- C. Final positioning of manual-volume dampers is specified in Division 23 Section 23 05 93 "Testing, Adjusting and Balancing."

3.03 FIRE, SMOKE, FIRE/SMOKE DAMPER FIELD VERIFICATION

- A. Fire dampers, smoke dampers, & combination fire/smoke dampers shall not be ordered and delivered to the site until field measurements have been taken and ceiling space has been coordinated with other trades. Figure in bid rush delivery for all fire, smoke, & combination fire/smoke dampers in bid in order to accommodate construction schedule. No exception.

END OF SECTION

9-2-25

SECTION 23 34 00 - AIR DISTRIBUTION EQUIPMENT (FANS)

PART 1 - GENERAL

1.1 GENERAL

- A. Fan Accessories
- B. In-Line Fans
- C. Cabinet Fans

1.2 RELATED WORK

- A. Section 20 0100: General Provisions
- B. Section 23 3100: Metal Ductwork
- C. Section 23 3401: Fume Exhaust with Integral Stack

1.3 QUALITY ASSURANCE

- A. Conform to AMCA bulletins regarding construction and testing and bear AMCA certified rating seal.

1.4 SUBMITTALS

- A. Submit shop drawings and product data.
- B. Submit curves showing operating point plotted on curve.
- C. Submit manufacturer's printed installation instructions.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Drives: V-belt drives shall be designed for not less than 150% of connected driving capacity and motor sheaves shall be adjustable to provide not less than 20% speed variation. Sheaves shall be selected to drive the fan at a speed to produce the scheduled capacity indicated on the drawings when set at the approximate midpoint of the sheave adjustment. Motors with V-belt drives shall be provided with adjustable bases.
- B. Disconnects: Safety disconnect switches shall conform to requirements of division 26 - Electrical.

2.2 SELECTING AND BALANCING

- A. Provide fans capable of accommodating static pressure variations of plus or minus ten percent.
- B. Statically and dynamically balance fans to eliminate vibration or noise transmission to occupied areas of building.
- C. Provide safety grille where inlet or outlet is exposed of aluminum wire guard construction. Provide belt guards on all belt-driven fans where drive is exposed.
- D. Integral roof mounted and/or wall mounted fans to have aluminum dome type housing, and of all aluminum construction.
- E. Fans shall be tested and rated in accordance with AMCA 210.

2.3 CABINET TYPE FANS

- 1. Provide cabinet type fan of type, size and capacity as scheduled in the plans and herein specified. Fans shall be A.M.C.A. certified and all fans shall bear the A.M.C.A. Certified Rating Seal. Centrifugal Fan Unit: V-belt or direct driven, with galvanized steel housing lined with 1/2" acoustic insulation, resilient mounted motor, gravity backdraft damper in discharge.

2. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protection motor and solid state speed controller.
3. Grille (Ceiling Mount Fans): Molded white aluminum grille with baked white enamel finish.
4. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings. Fan motor shall be suitably grounded and mounted on vibration isolators.
5. Direct drive fans shall be provided with an electronic speed controller.
6. Fan to be Greenheck model SP-A or approved equal.

2.4 IN-LINE FANS

1. Fans shall be in-line cabinet type with square or rectangular housing and backdraft damper. Fan shall be designed for horizontal or vertical mounting. Where indicated on the drawings to be spark resistant, fans shall comply with AMCA 99-401 for type B construction.
2. Fan housing shall be steel with factory applied baked enamel paint on exterior. Housing shall be internally insulated with 1/2" thk. (minimum) coated fiberglass insulation. Insulation shall comply with ASTM E84 and NFPA 255 for maximum ratings of flame - 25 and smoke - 50. housing shall have mounting brackets at each corner.
3. Fan wheel shall be backward inclined centrifugal type with aluminum construction. On belt driven units, shaft bearings shall be self-aligning, pillow block ball type. Bearings not permanently sealed and lubricated shall have grease fittings.
4. Where fan is indicated to be spark resistant, motor shall be explosion proof type. motor and drive shall be mounted on vibration isolators. Fan shall have a factory installed disconnect switch mounted on exterior of housing and pre-wired to fan motor.
5. Direct driven fans shall be provided with an electronic speed controller.
6. Greenheck model SQ or BSQ, refer to schedules.

PART 3 - EXECUTION

3.1 INSTALLATION:

1. Supply and install sheaves as necessary for final air balancing.
2. Install fans as per manufacturer's recommendations.
3. Provide manual volume damper within exhaust air discharge ductwork, applicable all cabinet fans.
4. In-line centrifugal fan units shall be supported as indicated on detail (all corners) in drawings. All supports shall be equipped with vibration isolators (spring type).
5. Provide complete structural, mechanical, and electrical connections and install in strict accordance with manufacturer's recommendations.
6. Hoods to be built in compliance with the following codes and standards: NFPA 96, SBCCI, UL #710, BOCA, UMC, & NSF #2.

3.02. MANUFACTURER'S INSTRUCTIONS

- A. Compliance: Comply with manufacturer's product data, including technical bulletins, product catalog installation instructions

3.03. EXAMINATION

- A. Examine areas to receive fans. Notify the Engineer of conditions that would adversely affect installation or subsequent utilization and maintenance of fans. Do not proceed with installation until unsatisfactory conditions are corrected

3.04. PREPARATION

- A. Ensure roof openings are square, accurately aligned, correctly located, and in tolerance

3.05. INSTALLATION

- A. Install fans system as indicated on the Installation, Operation and Maintenance Manual (IOM) and contract drawings
- B. Install fans in accordance with manufacturer's instructions

3.06. SYSTEM STARTUP

- A. Refer to Installation, Operation, and Maintenance Manual (IOM)

3.07. ADJUSTING

- A. Adjust exhaust fans to function properly
- B. Adjust Belt Tension
- C. Lubricate bearings
- D. Adjust drive for final system balancing
- E. Check wheel overlap

3.7. CLEANING

- A. Clean as recommended by manufacturer. Do not use material or methods which may damage finish surface or surrounding construction

3.8. PROTECTION

- A. Protect installed product and finished surfaces from damage during construction
- B. Protect installed exhaust fans to ensure that, except for normal weathering, fans will be without damage or deterioration at time of substantial completion

END OF SECTION

9-2-25

SECTION 23 3401 – KITCHEN HOOD FAN SYSTEMS

PART 1 - GENERAL

1.1 GENERAL

- A. Fan Accessories
- B. Kitchen Hood Makeup Air Fans
- C. Kitchen Hood Exhaust Fans
- D. Kitchen Fan Control Center
- E. Temperature Interlock
- F. Dishwasher Hood Exhaust Fan

1.2. SUMMARY

- A. Section Includes: HVAC Power Ventilators
- B. This section includes units with integral Direct Gas-Fired heating with cooling. Integral cooling source shall be Packaged DX cooling Airflow arrangement shall be Outdoor Air only. Each unit shall be constructed in a horizontal configuration and shall incorporate additional product requirements as listed in Section 2 of this specification.
- C. Related Sections:
 - 1. 01 30 00 Submittal Procedures
 - 2. Div 23 Heating, Ventilating, and Air-Conditioning (HVAC)
 - 3. Div 26 Electrical
 - 4. Section 22 0100: General Provisions
 - 5. Section 22 0700: Insulation
 - 6. Div. 22 Plumbing
 - 7. Section 23 0900: Controls and Instrumentation

1.3. REFERENCES

- A. Air Movement and Control Association Inc. (AMCA):
 - 1. 99 - Standards Handbook
 - 2. 200 - Publication, Air Systems
 - 3. 201-90 - Publication, Fans and Systems
 - 4. 202-88 - Publication, Troubleshooting
 - 5. 203-90 - Publication, Field Performance Measurement of Fan Systems
 - 6. 211-05 - Publication, Certified Ratings Program - Product Rating Manual for Fan Air Performance
 - 7. 300-96 - Standard Reverberant Room Method for Sound Testing of Fans
 - 8. 311-05 - Publication, Certified Ratings Program - Product Rating Manual for Fan Sound Performance
 - 9. 99-0401-86 - Classification for Spark Resistant Construction
 - 10. 99-2408-69 - Operating Limits for Centrifugal Fans
- B. Air Movement and Control Association Inc. (AMCA), American National Standards Institute (ANSI):
 - 1. 204-05 - Standards Balance Quality and Vibration Levels for Fans
 - 2. 210-99 - Standard Laboratory Methods of Testing Fans for Aerodynamic Performance Rating
- C. American National Standards Institute (ANSI):
 - 1. 11-r1999 - Method of Evaluating Load Ratings of Bearings

- D. American Society of Civil Engineers (ASCE):
 - 1. 7-02 - Minimum Design Loads for Building and Other Structures
- E. American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE):
 - 1. Chapter 45 - 2003 Handbook, HVAC Applications
 - 2. Chapter 7 - 2001 Fundamentals handbook, Sound-Vibration
 - 3. Chapter 32 - 2001 Fundamentals handbook, Duct Design
 - 4. Chapter 18 - 1992 HVAC System and Equipment handbook, Fans
- F. American Society for Testing and Materials (ASTM):
 - 1. E330-02 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylight and Curtain Walls by Uniform Static Air Pressure Differences
- G. National Fire Protection Association (NFPA):
 - 1. 70 - National Electrical Code
 - 2. 90A-02 - Standard for the Installation of Air-Conditioning and Ventilating Systems
 - 3. 92A-06 - Recommend Practice for Smoke-Control System
 - 4. 92B-05 - Standard for Smoke Management System in Malls, Atria, and Large Areas
 - 5. 96-04 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations
- H. Occupational Safety and Health Administration (OSHA):
 - 1. 1910.212 - General requirements for Machine Guarding
 - 2. 1910.219 - General requirements for guarding safe use of mechanical power transmission apparatus
 - 3. 1926.300 - General requirements for safe operation and maintenance of hand and power tools
- I. Underwriters Laboratories (UL):
 - 1. 507 - Electric Fans
 - 2. 555 - Fire Dampers
 - 3. 555S - Smoke Dampers
 - 4. 705 - Standard Power Ventilators
 - 5. 762 - Standard Power Roof Ventilators for Restaurant Exhaust Appliances
 - 6. 793 - Snow Load

1.4. SUBMITTALS

- A. General: Submit in accordance with Section 01 33 00 Submittal Procedures
- B. Provide dimensional drawings and product data on each fan
- C. Provide fan curves for each fan at the specified operation point, with the flow, static pressure, and horsepower clearly plotted
- D. Provide outlet velocity and fan's inlet sound power readings for the eight octave bands, decibels, and sones
- E. Strictly adhere to QUALITY ASSURANCE requirements as stated in section 1.04 of this specification
- F. Provide manufacturer's certification that exhaust fans are licensed to bear Air Movement and Control Association (AMCA), Certified Rating Seal for sound and air performance
- G. Installation, Operation, and Maintenance Manual (IOM): Provide manufacturer's installation, operations, and maintenance manual, including instructions on installation, operations, maintenance, pulley adjustment, receiving, handling, storage, safety information and cleaning. A troubleshooting guide, parts list, warranty, and electrical wiring diagrams
- H. Provide the following for KSF-1&2:

1. Product Data: For each type or model, include the following:
 1. Complete fan performance curves for Supply Air, with system operating conditions indicated, as tested in an AMCA Certified Chamber.
 2. Sound performance data for Supply Air, as tested in an AMCA Certified chamber.
 3. Motor ratings, electrical characteristics and motor and fan accessories.
 4. Performance ratings for all cooling coils.
 5. Dimensioned drawings for each type of installation, showing isometric and plan views, to include location of attached ductwork and service clearance requirements.
 6. Estimated gross weight of each installed unit.
 7. Installation, Operating and Maintenance manual (IOM) for each model.
 8. Coils shall be Recognized Components per UL 1995, CAN/CSA C22.2 No. 236.05. Coil performance shall be calculated in accordance with AHRI 410.

1.5. QUALITY ASSURANCE

- A. Performance ratings: Conform to AMCA standard 211 and 311. Fans must be tested in accordance with ANSI/AMCA Standard 210-99 and AMCA Standard 300-96 in an AMCA accredited laboratory. Fans shall be certified to bear the AMCA label for sound and air performance seal
- B. Classification for Spark Resistant Construction, levels A, B and C, conform to AMCA 99
- C. Each fan shall be given a balancing analysis which is applied to wheels at the outside radius. The maximum allowable static and dynamic imbalance is 0.05 ounces (Balance grade of G6.3)
- D. Comply with the National Electrical Manufacturers Association (NEMA), standards for motors and electrical accessories
- E. The High Wind models have been analyzed and stamped by a state license P.E. to the ASCE 7-02 Standard which meets the IBC, Florida and Miami-Dade codes
- F. Each High Wind model is subject to be certified by a third party to the ASTM E330 Static Pressure Difference Standard
- G. All High Wind models have been analyzed using Computational Fluid Dynamics (CFD). The CFD simulates the flow of high speed (150MPH) winds over the surface of objects
- H. The Finite Element Analysis (FEA) is the results from the CFD and it can accurately predict the stress, strain, and deflection resulting from high wind loads
- I. Applicable to KSF-1,2:
 1. Source Limitations: Obtain Packaged Make-Up Air Unit with Integral Heating and Cooling with all appurtenant components or accessories from a single manufacturer.
 2. Product Options: Drawings must indicate size, profiles and dimensional requirements of Make-Up Air Units and are to be based on the specific system indicated. Refer to Division 1 Section "Product Requirements".
 3. Certifications:
 - a. Entire unit shall be ETL Certified per ANSI Z83.4 or ANSI Z83.18 and bear an ETL mark.
 - b. Coils shall be Recognized Components per UL 1995, CAN/CSA C22.2 No. 236.05. Coil performance shall be calculated in accordance with AHRI 410.

1.6. DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer, material, products included, and location of installation
- B. Storage: Store materials in a dry area indoor, protected from damage, and in accordance with manufacturer's instructions. For long term storage follow manufacturer's Installation, Operations, and Maintenance Manual

- C. Handling: Handle and lift fans in accordance with the manufacturer's instructions. Protect materials and finishes during handling and installation to prevent damage. Follow all safety warnings posted by the manufacturer

1.7. WARRANTY

- A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents
 - 1. The warranty of this equipment is to be free from defects in material and workmanship for a period of 1 Yr (Standard) from the purchase date. Any units or parts which prove defective during the warranty period will be replaced at the Manufacturers option when returned to Manufacturer, transportation prepaid
 - 2. Motor Warranty is warranted by the motor manufacturer for a period of 1 year. Should motors furnished by us prove defective during this period, they should be returned to the nearest authorized motor service station

1.8. MAINTENANCE

- A. Refer to Manufacturer's Installation, Operation and Maintenance Manual (IOM), to find maintenance procedures

PART 2 - PRODUCTS

2.1 GENERAL

- A. Drives: V-belt drives shall be designed for not less than 150% of connected driving capacity and motor sheaves shall be adjustable to provide not less than 20% speed variation. Sheaves shall be selected to drive the fan at a speed to produce the scheduled capacity indicated on the drawings when set at the approximate midpoint of the sheave adjustment. Motors with V-belt drives shall be provided with adjustable bases.
- B. Disconnects: Safety disconnect switches shall conform to requirements of division 26 - Electrical.

2.2 SELECTING AND BALANCING

- A. Provide fans capable of accommodating static pressure variations of plus or minus ten percent.
- B. Statically and dynamically balance fans to eliminate vibration or noise transmission to occupied areas of building.
- C. Provide safety grille where inlet or outlet is exposed of aluminum wire guard construction. Provide belt guards on all belt-driven fans where drive is exposed.
- D. Integral roof mounted and/or wall mounted fans to have aluminum dome type housing, and of all aluminum construction.
- E. Fans shall be tested and rated in accordance with AMCA 210.

2.3 KITCHEN HOOD MAKEUP AIR FAN

A. MANUFACTURERS

- 1. Available Manufacturers: Subject to compliance with specifications contained within this document, manufacturers offering products that may be incorporated into the work include, but are not limited to:
 - a. Accurex Model XDGX, Greenheck Fan Corporation, or prior approved equal.

B. MANUFACTURED UNITS

- 1. Units with Integral Heating and Cooling shall be fully assembled at the the factory and consist of an insulated metal cabinet, an outdoor air intake weatherhood with aluminum mesh, a motorized intake damper, a packaged DX cooling coil module, supply air blower

assembly, electrical control center. All specified components and internal accessories factory installed and tested and prepared for single-point high voltage connection.

C. CABINET

1. Materials: Formed, double wall insulated metal cabinet, fabricated to permit access to internal components for maintenance.
 - a. Outside casing: 18 gauge, galvanized (G90) steel meeting ASTM A653 for components that do not receive a painted finish. Pre-painted components as supplied by the factory shall have polyester urethane paint on 18 gauge G60 galvanized steel. Base rail is 12 gauge, galvanized (G90) steel. Components that receive a painted finish per A/E specification shall be painted with a polyester urethane powder coat.
 - b. Internal Assemblies: 24 gauge galvanized (G90) steel except for motor supports which shall be minimum 14 gauge galvanized (G90) steel.
2. Cabinet Insulation: Comply with NFPA 90A and NFPA 90B and erosion requirements of UL 181.
 - a. Materials: Fiberglass insulation. If insulation other than fiberglass is used, it must also meet the Fire Hazard Classification shown below.
 - 1) Thickness: 1 inch (25 mm)
 - 2) Fire Hazard Classification: Maximum flame spread of 25 and smoke developed of 50, when tested in accordance with ASTM C 411.
 - 3) Location and application: Floor of each unit shall be insulated with fiberglass insulation. Full interior coverage from "Cooling on".
 - 4) Access panels: Unit shall be equipped with insulated hinged access panels to provide easy access to all major components. Access panels shall be fabricated of 18 gauge galvanized G90 steel.
 - 5) Supply Air blower assembly options:
Forward curve blower: Blower assembly consists of an electric motor and a belt driven, double width, and double inlet forward curve blower. Assembly shall be mounted on heavy gauge galvanized rails and further mounted on minimum 1.125 inch thick neoprene vibration isolators.
3. Control center / connections:
 - a. Unit shall have an electrical control center where all high and low voltage connections are made. Control center shall be constructed to permit single-point high voltage power supply connections.
4. Direct Gas-Fired Furnace:
 - a. Unit shall be factory assembled, piped, and wired. Direct gas-fired system will be 92% efficient while supplying a burner that is capable of providing 25:1 turndown. Unit will utilize a draw through design and incorporate adjustable burner baffles plates for field adjustments. Unit will have a EconomyPilot ignition system.
 - b. Burner construction shall consist of a cast aluminum burner manifold and 400 series stainless steel mixing plates. No air from inside the space shall be allowed to pass across the burner at any time. Flame sensing shall be provided by a flame rod. Burner control shall have a digital coded fault indicator capable of storing the last five faults.
 - c. Shall be equipped for operation on Natural gas with a maximum rated inlet gas pressure of 1/2 PSI.
 - d. Burner control option to include the following: Discharge temperature.
 - e. Shall include the following safety controls:
 - 1) Manual Reset, High Limit Switch: Main gas valve closes if high-limit temperature is exceeded.
 - 2) Dual safety shutoff valves shall be provided that do not exceed 120 VAC control signals.

- 3) FM Global Requirements: Includes high and low gas pressure switches and visual indication gas valves.
5. Condensate drain pan: Drain Pan shall be an integral part of the unit whenever a cooling option is included. Pan shall be formed of welded austenitic stainless steel sheet material and provided with a welded stainless steel drain connection at the front for connection to a P trap. Drain pan shall be double-pitched, sloped in opposite directions to provide positive draining. Drain connector shall be sealed at penetration through cabinet wall.
6. P trap: If the unit is equipped with a condensate drain pan, contractor shall provide, or fabricate, and install an appropriate P trap, in accordance with all local and area codes and Best Practices.
7. Packaged DX: Unit shall be equipped with a Packaged DX system to include compressor(s), evaporator and condenser coil(s), condenser fans, and all appurtenant controls as specified elsewhere in this section. The Packaged DX system is to be an integral module, incorporated into the unit. Stand-alone Packaged DX systems that are connected to the unit, or systems that require hardware or equipment that is not integral to the unit are not acceptable.
8. Direct expansion (DX) or chilled water coil shall be factory tested and rated in accordance with ARI 410. Coils shall have copper tubes with permanently expanded aluminum fins, 12fpi or less. DX coils shall be equipped with distributors to receive expansion valves at the liquid connections. Drain pans shall extend at least 12 inches downstream of coil and be sloped to drain connection. Cooling coil shall meet UL 1995 specifications for non-protected coil. 5 Year Warranty (compressor).
9. Motorized Inlet Air Dampers: to be of low leakage type and shall be factory installed.
10. Sensors are considered to be part of various optional operational modes or device controllers and are to be factory supplied and installed as specified by the A/E.

D. BLOWER-FC

1. Blower section construction, Supply Air: Belt drive motor and blower shall be assembled onto a minimum 14 gauge galvanized steel platform and must have neoprene vibration isolation devices, minimum of 1-1/8 inches thick.
2. Blower assemblies: Shall be statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and horsepower.
3. Centrifugal blower housing: Formed and reinforced steel panels to make curved scroll housing with shaped cutoff.
4. Forward curved blower (fan) wheels: Galvanized or aluminum construction with inlet flange and shallow blades curved forward in direction of airflow. Mechanically attached to shaft with set screws.
5. Blower section motor source quality control: Blower performance shall be factory tested for flow rate, pressure, power, air density, rotation speed and efficiency. Ratings are to be established in accordance with AMCA 210, "Laboratory Methods of Testing Fans for Rating".

E. MOTORS

1. General: Blower motors greater than 3/4 horsepower shall be "NEMA Premium" unless otherwise indicated. Compliance with EPA's minimum energy-efficiency standards for single speed ODP and TE enclosures is not acceptable. Motors shall be heavy-duty, permanently lubricated type to match the fan load and furnished at the specified voltage, phase, and enclosure.

F. UNIT CONTROLS

1. The unit shall be constructed so that it can function as a stand-alone heating and cooling system controlled by a factory-supplied remote panel, thermostats and sensors or it can be operated as a heating and cooling system controlled by a Building Management System (BMS).

2. Variable Frequency Drive (VFD): Unit shall have factory installed variable frequency drives for modulation of the blower motors. The VFDs shall be factory-programmed for unit-specific requirements and shall not require additional field programming to operate.
3. Sensors to be provided with the unit:
 1. Heating Inlet Air Sensor
 2. Cooling Inlet Air Sensor

2.4 KITCHEN HOOD EXHAUST FAN:

- A. Provide Accurex exhaust fan model XCUBE, Greenheck, or prior approved equal.
- B. General Description:
 1. Discharge air directly away from the mounting surface.
 2. Upblast fan shall be for roof mounted applications for fan sizes 060-300 or wall mounted applications for fan sizes 060-200.
 3. Performance capabilities up to 14,700 cubic feet per minute (cfm) and static pressure to 3 inches of water gauge.
 4. Fans are available in twenty-two sizes with nominal wheel diameters ranging from 9 inches through 30 inches (060 - 300 unit sizes).
 5. Maximum continuous operating temperature for fan sizes 098-300 is 400 Fahrenheit (204.4 Celsius) and for fan sizes 060-095 is 160 Fahrenheit (71.1 Celsius)
 6. Each fan shall bear a permanently affixed manufacture's engraved metal nameplate containing the model number and individual serial number
- C. Wheel:
 1. Material Type: Aluminum
 2. Non-overloading, backward inclined centrifugal wheel
 3. Statically and dynamically balanced in accordance to AMCA Standard 204-05
 4. The wheel cone and fan inlet will be matched and shall have precise running tolerances for maximum performance and operating efficiency
- D. Motors:
 1. AC Induction Motor
 - a. Motor Enclosure: Totally enclosed fan cooled (TEFC) - no opening in the frame or brackets. Equipped with an external fan to blow air over the motor
 - b. Motors are permanently lubricated, heavy duty ball bearing type to match with the fan load and pre-wired to the specific voltage and phase
 - c. Mounted on vibration isolators, out of the airstream
 - d. For motor cooling there shall be fresh air drawn into the motor compartment through an area free of discharge contaminants
 - e. Accessible for maintenance
- E. Housing:
 1. Constructed of heavy gauge aluminum includes exterior housing, curb cap, windband, and motor compartment housing. Galvanized material is not acceptable
 2. Housing shall have a rigid internal support structure
 3. Windband to be one piece uniquely spun aluminum construction and maintain original material thickness throughout the housing
 4. Windband to include an integral rolled bead for strength
 5. Curb cap base to be fully welded to windband to ensure a leak proof construction. Tack welding, bolting, and caulking are not acceptable
 6. Curb cap to have integral deep spun inlet venturi and pre-punched mounting holes to ensure correct attachment to curb

7. Drive frame assemblies shall be constructed of heavy gauge steel and mounted on vibration isolators
 8. Breather tube shall be 10 square inches in size for fresh air motor cooling, and designed to allow wiring to be run through it
- F. Motor Cover:
1. Constructed of aluminum
- G. Vibration Isolation:
1. Double studded or pedestal style true isolators
 2. No metal to metal contact
 3. Sized to match the weight of each fan
- H. Disconnect Switches:
1. NEMA rated: NEMA 3R: outdoor application falling rain water.
 2. Positive electrical shut-off
 3. Wired from fan motor to junction box installed within motor compartment
- I. Drain Trough:
1. Allows for one-point drainage of water, grease, and other residues
- J. Options/Accessories:
1. Birdscreen:
 - a. Material Type: Aluminum
 - b. Protects fan discharge
 2. Curb Extension:
 - a. Type: VCE - Vented Curb extension
 - b. Material Type: Aluminum

2.5 KITCHEN FAN CONTROL CENTER:

- A. Provide Accurex Kitchen Fan Control Center Model (XFCC) as shown on plans and in accordance with the following specification:
- B. The XFCC shall be constructed of 16 gauge 300 series stainless steel, and UL Listed to Standard 891. The pre-engineered control center shall include, but not be limited to, fan motor starters, light and fan switches, fire relay which controls both the supply and exhaust fan(s), quarter turn latch, color coded wiring with wiring diagram, grounding terminal blocks, and distribution terminal control strip for control wiring connection. All electrical components shall be UL listed or classified where applicable and wired in compliance with the National Electrical Code.
- C. The control center and control switching have two typical mounting locations. 1) The panel will be remote mounted with the switches mounted on the panel face, or 2), utility cabinet mounted with the switches face mounted on the utility cabinet. Other options are available.
- D. Three, standard overall dimensions for the control cabinets are 12 in. x 18 in. x 6 in., 18 in. x 18 in. x 6 in., and 25 in. x 18 in. x 6 in. Minimum control center dimensions are 12 in. x 18 in. x 6 in. for up to four fan motor starters. Minimum control center dimensions are 18 in. x 18 in. x 6 in. for up to eight fan motor starters. For single phase control panels, the maximum horsepower for 120V is 5 hp; the maximum horsepower for 208V is 10 hp; the maximum horsepower for 240V is 10 hp. For three phase control panels, the maximum horsepower for 208V is 30 hp; the maximum horsepower for 480V is 50 hp, the maximum horsepower for 575V is 100 hp. Panel is available with mixed fan voltages and mixed phase. Each fan will receive its own, dedicated motor starter. Other options are available.
- E. The control centers may be equipped with temperature interlock(s), which is compliant with International Mechanical Code (IMC) 2021 section 507.1.1. The temperature interlock(s) consist of either a thermostat style probe and off-delay time relay, or a temperature controller and resistive temperature detector (RTD). With both options the sensor/probe a junction box

and fire proof/leak proof threaded fitting (Evergreen Quik-Seal® and/or Evergreen Compression Seal) will be provided. The interlock(s) shall power the fans when the sensor detects the temperature set point. The interlock(s) shall hold the circuit closed upon the fan switch being turned off until the temperature sensor detects a temperature below the set point.

- F. If exhaust hood includes an automatic fire damper, damper switch will be mounted on hood front if control center is remote mounted. The damper switch will be mounted on front of utility cabinet if control panel is mounted in a utility cabinet.
- G. The electrical contractor is to follow field-wiring requirements listed in the installation instructions. If the control center is mounted in the utility cabinet and the light and fan switches are mounted on the either the face of the hood or side of the utility cabinet, they will be factory wired. If there is a fire suppression system also mounted in the same utility cabinet, wiring to the micro switch is to be completed at the factory unless otherwise specified.

2.6 TEMPERATURE INTERLOCK

- A. International Mechanical Code (IMC) 2021 section 507.1.1 Compliant Electrical Package
- B. Provide Accurex Temperature Interlock electrical package as shown on plans and in accordance with the following specification:
- C. The Temperature Interlock(s) shall be U.L. 710 Listed and consist of a temperature controller, RTD, junction box, Evergreen threaded fitting, and shall be a self-contained unit or as part of another preengineered electrical control package. Hood systems should always be turned on manually before cooking equipment is turned on. The temperature interlock is intended as a backup system and the auto-on feature should only be utilized when the fans are forgotten to be turned on. The Temperature Interlock package shall close a relay powering the fans when the temperature set point is reached at the temperature sensor. The Interlock shall hold the circuit closed upon fan switch being turned off until the temperature at the sensor decreases below the set point plus hysteresis. Once the temperature is below the set point plus hysteresis, the fans shall shut down.
- D. In the event that the cooking equipment is started without the fans being manually turned on, the fans shall automatically activate and remain running with the presence of heat under the hood. The temperature controller shall open the relay after the temperature at the temperature sensor in the exhaust duct or capture tank has dropped below the set point plus hysteresis. Once the temperature is below the set point plus hysteresis, the fans shall shut down.
- E. Due to continuous research Accurex reserves the right to change specifications without notice.

2.7 DISHWASHER HOOD EXHAUST FAN

- A. Provide Accurex Exhaust Fan Model XCUE-VG as shown on plans and in accordance with the following specification:
- B. Roof exhaust fans shall be upblast centrifugal direct drive type, ECM motor. The fan wheel shall be centrifugal backward inclined, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced.
- C. The fan housing shall be constructed of heavy gauge aluminum with a rigid internal support structure. Wind bands shall have a rolled bead for added strength and shall be joined to curb caps with a leak proof, continuously welded seam.
- D. Motors shall be mounted out of the airstream on vibration isolators. Fresh air for motor cooling shall be drawn into the motor compartment from an area free of discharge contaminants. Motors shall be readily accessible for maintenance.
- E. A disconnect switch shall be factory installed and wired from the fan motor to a junction box within the motor compartment. A conduit chase shall be provided through the curb cap to the motor compartment for ease of electrical wiring.
- F. All fans shall bear the AMCA Certified Ratings Seal for sound and air performance.
- G. Each fan shall bear a permanently affixed manufacturer's engraved metal nameplate containing the model number and individual serial number for future identification.
- H. Fans shall be listed by Underwriters Laboratory for UL/cUL 762 Listed for all electrical components and grease removal.

- I. Fans shall be Model XCUE-VG (with ECM motor) as manufactured by Accurex.

PART 3 - EXECUTION

3.1 INSTALLATION:

1. Supply and install sheaves as necessary for final air balancing.
2. Set roof mounted fans on factory fabricated curbs, minimum 24" high.
Provide acoustical insulation on roof curb and on fan inlet plenum.
3. Install fans as per manufacturer's recommendations.
4. Provide manual volume damper within exhaust air discharge ductwork, applicable all cabinet fans.
5. Not used.
6. Upblast centrifugal roof exhausts shall be mounted on prefabricated roof curb. Fan curb cap shall be secured to roof curb with cadmium plated steel screws a max. 12" on center. Kitchen exhaust fan shall maintain min. 52" clearance between exhaust and roof deck, provide vented extension to curb as required. Units to meet all requirement as specified by Louisiana State Fire Marshal.
7. Secure rooftop fan assemblies to curbs with minimum 1/4" diameter, stainless steel hex-head lag screws with cadmium-plated washers; provide minimum 2 lag screws per side, but no less than one for each factory-drilled hole provided by the fan manufacturer.
8. Provide complete structural, mechanical, and electrical connections and install in strict accordance with manufacturer's recommendations.
9. Hoods to be built in compliance with the following codes and standards: NFPA 96, SBCCI, UL #710, BOCA, UMC, & NSF #2.

3.2 MANUFACTURER'S INSTRUCTIONS

- A. Compliance: Comply with manufacturer's product data, including technical bulletins, product catalog installation instructions

3.3 EXAMINATION

- A. Examine areas to receive fans. Notify the Engineer of conditions that would adversely affect installation or subsequent utilization and maintenance of fans. Do not proceed with installation until unsatisfactory conditions are corrected

3.4 PREPARATION

- A. Ensure roof openings are square, accurately aligned, correctly located, and in tolerance
- B. Ensure duct is plumb, sized correctly, and to proper elevation above roof deck. Install duct as specified in Air Distribution (Division 23)

3.5 INSTALLATION

- A. Install fans system as indicated on the Installation, Operation and Maintenance Manual (IOM) and contract drawings
- B. Install fans in accordance with manufacturer's instructions

3.6 SYSTEM STARTUP

- A. Refer to Installation, Operation, and Maintenance Manual (IOM)

3.7 ADJUSTING

- A. Adjust exhaust fans to function properly
- B. Adjust Belt Tension
- C. Lubricate bearings
- D. Adjust drive for final system balancing
- E. Check wheel overlap

3.8 CLEANING

- A. Clean as recommended by manufacturer. Do not use material or methods which may damage finish surface or surrounding construction

3.9 PROTECTION

- A. Protect installed product and finished surfaces from damage during construction
- B. Protect installed exhaust fans to ensure that, except for normal weathering, fans will be without damage or deterioration at time of substantial completion

3.10 CONNECTIONS

- 1. In all cases, industry Best Practices shall be incorporated. Connections are to be made subject to the installation requirements shown above.
 - a. Piping installation requirements are specified in Division 22 (Plumbing). Drawings indicate general arrangement of piping, fittings and specialties.
 - b. Duct installation and connection requirements are specified in Division 23 of this document.
 - c. Electrical installation requirements are specified in Division 26 of this document.

3.11 FIELD QUALITY CONTROL

- 1. Manufacturer's Field Service: Engage a factory authorized service representative to inspect field assembled components and equipment installation, to include electrical and piping connections. Report results to A/E in writing. Inspection must include a complete startup checklist to include (as a minimum) the following: Completed Start-Up Checklists as found in manufacturer's IOM.

3.12 START-UP SERVICE

- 1. Engage a factory authorized service representative to perform startup service. Clean entire unit, comb coil fins as necessary, and install clean filters. Verify water source for compliance with manufacturer's requirements for flow and temperature. Measure and record electrical values for voltage and amperage. Refer to Division 23 "Testing, Adjusting and Balancing" and comply with provisions therein.

3.13 DEMONSTRATION AND TRAINING

- 1. Engage a factory authorized service representative to train owner's maintenance personnel to adjust, operate and maintain the entire Make-Up Air unit. Refer to Division 01 Section Closeout Procedures and Demonstration and Training.

END OF SECTION

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SECTION 23 35 00 - AIR PURIFICATION SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. This section describes the design, performance and installation of an air purification system intended for use as part of another manufacturer's air handling unit or mounted on the duct as shown on the plans, details and/or equipment schedules.

1.2 REFERENCED CODES & STANDARDS

- A. The following codes and standards are referenced through out. The edition to be used is that currently enforced by the authority having jurisdiction (AHJ) or in absence of such direction that referenced by the current enforceable IBC code or as indicated by the contract documents, except where specifically referenced by this section of the specifications.
 - 1. ASHRAE Standards 62 & 52
 - 2. National Electric Code NFPA 70
 - 3. UL 867 including ozone chamber test required as of December 21, 2007
 - 4. UL 2998 Environment – No Ozone Certification
 - 5. The cold plasma equipment and power supply shall be UL listed.
 - 6. The technology shall have been tested to DO-160 by an independent lab and successfully passed all requirements for shock, vibration, EMF and line noise. Manufacturers not tested to DO-160 shall not be acceptable. DO-160 is normally used to test devices in aviation applications, but this standard is applicable to confirm EMF and line noise in HVAC applications.

1.3 RELATED WORK

- A. Testing, Adjusting and Balancing
- B. Facility Access and Protection
- C. Ductwork
- D. Filters
- E. Water and Refrigerant Piping
- F. Electrical Wiring
- G. Control Wiring

1.4 QUALITY & IP ASSURANCE

- A. Basis of design is Global Plasma Solutions. All other manufacturers requesting prior approval must submit product drawings, specifications and test results specified in section 2.2 at least four weeks prior to bid date.
- B. The Air Purification System shall be a product of an established manufacturer within the USA. Direct Current (DC) Ion modules manufactured outside the USA and assembled in the USA on mounting plates or formed channels shall not be acceptable.
- C. A qualified representative from the manufacturer shall be available to inspect the installation of the air purification system to ensure installation in accordance with manufacturer's recommendation.
- D. Technologies that do not address gas disassociation such as UV Lights, Powered Particulate Filters and/or polarized media filters shall not be considered. Uni-polar ion generators shall not be acceptable. "Plasma" particulate filters shall not be acceptable. Any system containing titanium dioxide (TiO₂), which has been listed by the CDC as a known carcinogen, shall not be acceptable.
- E. Projects designed using ASHRAE Standard 62, IAQ Procedure shall require the manufacturer to provide Indoor Air Quality calculations using the formulas within ASHRAE Standard 62.1-2007 to validate acceptable indoor air quality at the quantity of outside air scheduled with the technology submitted. The manufacturer shall provide independent test data on a previous installation performed within the last two years and in a similar application, that proves compliance to ASHRAE 62 and the accuracy of the calculations. The data shall be based on the manufacturer's use of the same make and model number as the equipment submitted on this project.
- F. The Air Purification Technology shall have been tested by UL to prove conformance to UL 867-2007 including the ozone chamber testing and peak ozone test for electronic devices. Manufacturers that achieved UL 867 prior to December 21, 2007 and have not been tested

in accordance with the newest UL 867 standard with the ozone amendment shall not be acceptable. All manufacturers requesting prior approval shall submit their independent UL 867 test data with ozone results to the engineer for preliminary review and during the submittal process. All manufacturers shall submit a copy with their quotation. Contractors shall not accept any proposal without the proper ozone testing documentation.

- G. The maximum allowable ozone concentration per the UL 867-2007 chamber test shall be 0.001 PPM. The maximum peak ozone concentration per the UL 867-2007 peak test as measured 2 inches away from the electronic air cleaner's output shall be no more than 0.001 PPM. Manufacturers with ozone output exceeding these ozone values shall not be acceptable.
- H. All manufacturers shall have their product tested to UL 2998 Environmental Standard for confirmation of no ozone with certificate available. The final report shall indicate the ozone levels and high voltage output the device's electrode(s) were operating during the test. Reports that do not include high voltage output during the UL 2998 testing shall not be acceptable.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data for ion generators including:
 - 1. Schedule of plasma generators indicating unit designation, number of each type required for each unit/application.
 - 2. Data sheet for each type of plasma generator, and accessory furnished; indicating construction, sizes, and mounting details.
 - 3. Performance data for each type of plasma device furnished.
 - 4. Indoor Air Quality calculations using the formulas within ASHRAE Standard 62.1-2007 to validate acceptable indoor air quality at the quantity of outside air Scheduled (when projects are designed with outside air reduction).
 - 5. Product drawings detailing all physical, electrical and control requirements.
 - 6. Copy of UL 867 independent ozone test.
 - 7. Copy of UL 2998 conformance certificate.
 - 8. Statement on the manufacturer's letterhead stating that the technology contains no titanium dioxide (TiO₂).
- B. Operating & Maintenance Data: Submit O&M data and recommended spare parts lists.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver in factory fabricated shipping containers. Identify on outside of container type of product and location to be installed. Avoid crushing or bending.
- B. Store in original cartons and protect from weather and construction work traffic.
- C. Store indoors and in accordance with the manufacturers' recommendation for storage.

1.7 WARRANTY

- A. Equipment shall be warranted by the manufacturer against defects in material and workmanship for a period of thirty-six months after shipment or eighteen months from owner acceptance, whichever occurs first. Labor to replace equipment under warranty shall be provided by the owner or installing contractor.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The air purification system(s) shall be of the size, type, arrangement and capacity indicated and required by the unit furnished and shall be of the manufacturer specified.
- B. Basis of Design: Global Plasma Solutions
- C. All other Suppliers of comparable products requesting prior approval shall:
 - 1. Submit for prior approval four weeks in advance in accordance with the requirements of Section 20 0100.
 - 2. In addition, manufacturers submitting for prior approval for Bi-Polar Ionization must as part of the prior approval request provide their ASHRAE 62.1-2007 calculations that prove conformance to the ASHRAE Standard with the reduction of outside air to the scheduled values. A letter on the manufacturer's letterhead requesting prior approval must accompany the request for prior approval stating their calculations are ASHRAE

- compliant. A third party validation study performed on a previous installation of the same application using the same make and model equipment shall also be included.
3. Submit independent test data from UL showing ozone levels produced during the UL 867 ozone chamber test. Manufacturers without this test data shall not be acceptable.
 4. Submit UL 2998 Environmental Claim Certificate proving no ozone output.
 5. Submit pathogen testing per section 2.2.
 6. Submit at least two other end user references in the same application with contact phone number, email, equipment used and application for the equipment at that facility. Manufacturers not having the above references in similar applications using the same equipment models as proposed on the current project shall not be acceptable.
 7. Ionization bars manufactured using DC output ionization modules shall not be permitted due to corrosion, ion short-circuiting, and intermittent coil coverage and shock hazard.
 8. Ionization bars manufactured using ion modules not having epoxy coating all circuit boards and internal components shall not be acceptable.
 9. Manufacturers submitting as an alternate shall include their DO-160 test results.
 10. It is the responsibility of any alternate manufacturer and mechanical contractor proposing an alternate to the basis of design to confirm any proposed substituted product does not infringe on the patented intellectual property of the basis of design. The engineer and owner recognize the basis of design holds multiple patents and multiple patents are pending.

2.2 BI-POLAR IONIZATION DESIGN & PERFORMANCE CRITERIA

- A. Each piece of air handling equipment, so designated on the plans, details, equipment schedules and/or specifications shall contain a Plasma Generator with Bi-polar Ionization output as described here within.
- B. The Bi-polar Ionization system shall be capable of:
 1. Effectively killing microorganisms downstream of the bi-polar ionization equipment (mold, bacteria, virus, etc.).
 2. Controlling gas phase contaminants generated from human occupants, building structure, furnishings and outside air contaminants.
 3. Capable of reducing static space charges.
 4. Effectively reducing space particle counts.
 5. When mounted to the air entering side of a cooling coil, keep the cooling coil free from pathogen and mold growth.
 6. All manufacturers shall provide documentation by an independent NELEC accredited laboratory that proves the product has minimum kill rates for the following pathogens given the allotted time and in a space condition:
 - A. MRSA - >96% in 30 minutes or less
 - B. E.coli - > 99% in 15 minutes or less
 - C. TB - > 69% in 60 minutes or less
 - D. C. diff - >86% in 30 minutes or less
 - E. Noro Virus -> 93.5% in 30 minutes or less
 - F. Legionella -> 99.7% in 30 minutes or less

Manufacturers not providing the equivalent space kill rates shall not be acceptable. All manufactures requesting prior approval shall provide to the engineer independent test data from a NELAC accredited independent lab confirming kill rates and time meeting the minimum requirements stated in section 2.2 B, points 6A, 6B and 6C. Products tested only on Petri dishes to prove kill rates shall not be acceptable. Products being sold under different trade names than those tested shall not be acceptable.
 7. Capable of modular field assembly in six inch (150mm) sections.
- C. The bi-polar ionization system shall operate in a manner such that equal amounts of positive and negative ions are produced. Uni-polar ion devices shall not be acceptable. Ionizers with positive and negative output (DC type) shall not be acceptable. All ionizers provided shall be AC type ionizers with one electrode pulsing between positive and negative.
 1. Air exchange rates may vary through the full operating range of a constant

Volume or VAV system. The quantity of air exchange shall not be increased due to requirements of the air purification system.

2. Velocity Profile: The air purification device shall not have maximum velocity profile.

D. Humidity: Plasma Generators shall not require preheat protection when the relative humidity of the entering air exceeds 85%. Relative humidity from 0 - 100%, condensing, shall not cause damage, deterioration or dangerous conditions within the air purification system. Air purification system shall be capable of wash down duty.

E. Equipment Requirements:

1. Electrode Specifications (Bi-polar Ionization):

- a. Each alternating current (AC) Ionization Bar with Bi-polar Ionization output shall include a minimum of eighteen carbon fiber cluster ion needles per foot of coil face width shall be provided. The entire cooling coil width shall have equal distribution of ionization across the face. Systems without ion needles at least 0.50" (12.5mm) apart shall not be acceptable. The plasma electrode shall require no more than 1.0" (25mm) in the direction of airflow for mounting. All hardware required for mounting shall be provided by the air purification manufacturer except self-tapping screws for the power supply. Bi-polar ionization tubes manufactured of glass and steel mesh shall not be acceptable due to replacement requirements, maintenance, and performance output reduction over time, ozone production and corrosion.
- b. Electrodes shall be provided in 6.0" (150mm) increments, epoxy filled for an IP55 rating and utilizing brass connection hardware that is recessed into the connection joint once fully engaged and assembled.
- c. Electrodes shall be energized when the main unit disconnect is turned on.
- d. The ionization output shall be a minimum of 60 million ions/cc per inch of cooling coil width as measured 1 inch from the cold plasma needles.
- e. Ionization bars shall be provided with magnet mounting kits to prevent penetration into cooling coils.
- f. Ionization bars shall be constructed of UL 94VO and UL746C composite material.

F. Air Handler (4,000 CFM and lower) & Plenum Mounted Units (non-ductless mini-split units):

1. Plasma Generator(s) shall be supplied and installed at all air handling systems. The mechanical contractor shall mount the Plasma Generator and wire it to the AHU control power (24VAC) as instructed by the Air Purification Manufacturer's instructions or line voltage subject to power available. Each unit shall be designed with a molded casing, self-cleaning system, weather proof housing with clear cover, integral digital display that provides unit status, self-cleaning test button, power status LED and dry contacts to prove ion output is operating properly. The dry contacts shall close to prove the ion generator is working properly and may be daisy chained in series such that only one dry contact per AHU is required to interface to the BAS or the DDC controller. Dry contacts proving power has been applied in lieu of the ion output is actually operating, are not acceptable. Manufacturers providing multiple ion modules that have alarm status wired in parallel, and not in series, shall not be acceptable.

G. Ionization Requirements:

1. Plasma Generators with Bi-polar ionization output shall be capable of controlling gas phase contaminants and shall be provided for all equipment listed above.
 - a. The Bi-polar ionization system shall consist of Bi-Polar Plasma Generator and integral power supply. The Bi-polar system shall be installed at all air handling systems. The device shall be capable of being powered by 18VAC to 260VAC without the use of an external transformer. Ionization systems requiring isolation transformers shall not be acceptable.

- b. Ionization Output: The ionization output shall be controlled such that an equal number of positive and negative ions are produced. Imbalanced levels shall not be acceptable.
- c. Ionization output from each electrode shall be a minimum of 200 million ions/cc when tested at 2" from the ionization generator.
- d. All manufacturers shall provide documentation by an independent NELAC accredited laboratory that proves the product has minimum kill rates for the following pathogens given the allotted time and in a space condition:
 - A. MRSA - >96% in 30 minutes or less
 - B. E.coli - > 99% in 15 minutes or less
 - C. TB - > 69% in 60 minutes or less
 - D. C. diff - >86% in 30 minutes or less
 Manufacturers not providing the equivalent space kill rates shall not be acceptable. All manufactures requesting prior approval shall provide to the engineer independent test data from a NELEC accredited independent lab confirming kill rates and time meeting the minimum requirements stated in section 2.2 B, points 6A, 6B and 6C. Products tested only on Petri dishes to prove kill rates shall not be acceptable.

2. Ozone Generation:

- a. The operation of the electrodes or Bi-polar ionization units shall conform to UL 867-2007 with respect to ozone generation. There shall be no ozone generation during any operating condition, with or without airflow.

J. Electrical Requirements:

- 1. Wiring, conduit and junction boxes shall be installed within housing plenums in accordance with NEC NFPA 70. Plasma Generator shall accept an electrical service of 18VAC to 260VAC, universal input, 1 phase, 50/60 Hz. The contractor shall coordinate electrical requirements with air purification manufacturer during submittals.

K. Control Requirements:

- 1. All Plasma Generators shall have internal short circuit protection, overload protection, and automatic fault reset circuit breakers. Systems with manual fuses shall not be allowed.
- 2. Integral airflow sensing shall modulate the Plasma output as the airflow varies or stops. A mechanical airflow switch shall not be acceptable as a means to activate the Plasma device due to high failure rates and possible pressure reversal.
- 3. The installing contractor shall mount and wire the Plasma device within the air handling unit specified or as shown on the plans. The contractor shall follow all manufacturer IOM instructions during installation.
- 4. All Plasma devices shall have a means to interface with the BAS system. Dry contacts shall be provided to prove there are ions being produced. Systems providing indication that power is applied to the Plasma device, but not directly sensing the power at the ion output, shall not be acceptable.

L. Air Handler Mounted Units (greater than 4,000 CFM):

- 1. Where so indicated on the drawings and/or schedules Plasma Generator(s) shall be supplied and installed. The mechanical contractor shall mount the Plasma Generator and wire it to the remote mount power supply using the cables provided by the air purification manufacturer. A 24VAC, 115VAC or 208-230VAC circuit shall be provided to the plasma generator power supply panel. No more than 15 watts shall be required per power supply. Each power supply shall be capable of powering up to 6 ionization bars or a total of 100 linear feet of bar. Each plasma generator shall be designed with powder coated metal casing, liquid tight flexible conduit and a high voltage quick connector.

G. Plasma Requirements:

- 3. Plasma Generators with Bi-polar ionization output shall be capable of controlling gas phase contaminants and shall be provided for all equipment listed above.

- a. The Bi-polar ionization system shall consist of Bi-Polar Plasma Generator and power supply. The Bi-polar system shall be installed where indicated on the plans or specified to be installed. The device shall be capable of being powered by 24VAC, 115VAC or 208-230VAC without the use of an external transformer. Ionization systems requiring isolation transformers shall not be acceptable.
 - b. Ionization Output: The ionization output shall be controlled such that an equal number of positive and negative ions are produced (AC Ionizers only are acceptable). Imbalanced levels shall not be acceptable.
 - c. Ionization output from each bar shall be a minimum of 60 million ions/cc per inch of bar when tested at 1" from the ionization bar. Bars with needles spaced further apart than 0.5" shall not be acceptable.
 - d. Each plasma electrode shall be made from an all composite, UL 94V0 and UL 746C rated material for prevention of corrosion and electrical insulation.
- 4. Ozone Generation:
 - a. The operation of the electrodes or Bi-polar ionization units shall conform to UL 2998 as tested by UL proving no ozone output.
- H. Electrical Requirements:
 - 1. Wiring, conduit and junction boxes shall be installed within housing plenums in accordance with NEC NFPA 70. Plasma Generator shall accept an electrical service of 24VAC, 115 VAC or 208-230VAC, 1 phase, 50/60 Hz. The contractor shall coordinate electrical requirements with air purification manufacturer during submittals.
- I. Control Requirements:
 - 1. All Plasma Generators shall have internal short circuit protection, overload protection, and automatic fault reset. Systems requiring fuses shall not be acceptable.
 - 2. The Plasma Generator power supply shall have internal circuitry to sense the ionization output and provide dry contact alarm status to the BMS as well as a local "Plasma On" indication light.
 - 3. If scheduled, the ionization system shall be provided with a stand-alone, independent ion sensor designed for duct mounting to the ionization bar to monitor the ion output and report to the BAS system that the ion device is working properly. Ion systems provided without an independent ion sensor, shall not be permitted. The control voltage to power the ion sensor shall be 24VAC to 260VAC and draw no more than 150mA of current. The sensor shall provide at minimum, dry contact status to the BAS and optionally a BacNet or Lonworks interface as specified on the control drawings. If scheduled, manufacturers not providing a stand-alone ion sensor shall not be acceptable.
 - 4. The installing contractor shall mount and wire the Plasma device within the air handling unit specified or as shown on the plans. The contractor shall follow all manufacturer IOM instructions during installation.
 - 5. An optional fiberglass NEMA 4X panel with Plasma On/Off Indicator Light (interfaced with stand-alone ionization detector), Ionization Output On/Off Indicator Light and an On/Off Illuminated Switch shall be provided to house the power supply, if noted on the schedule.

PART 3 - EXECUTION

3.1 GENERAL

- A. The Contractor shall be responsible for maintaining all air systems until the owner accepts the building (Owner Acceptance).

3.2 ASSEMBLY & ERECTION: PLASMA GENERATOR WITH BI-POLAR IONIZATION

- A. All equipment shall be assembled and installed in a workman like manner to the satisfaction of the owner, architect, and engineer.
- B. Any material damaged by handling, water or moisture shall be replaced, by the mechanical contractor, at no cost to the owner.
- C. All equipment shall be protected from dust and damage on a daily basis throughout construction.

3.3 TESTING

- A. Provide the manufacturers recommended electrical tests.

3.4 COMMISSIONING & TRAINING

- A. A manufacturer's authorized representative shall provide start-up supervision and training of owner's personnel in the proper operation and maintenance of all equipment.

END OF SECTION

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SECTION 23 36 00 – AIR TERMINAL UNITS – VARIABLE VOLUME

PART 1 – GENERAL

1.01 Section Includes

- A. Single-duct terminal units (VAV Boxes).

1.02 Related Requirements

- A. Section 01 40 00 - Quality Requirements
- B. Section 01 74 19 - Construction Waste Management and Disposal
- C. Section 01 78 00 - Closeout Submittals
- D. Section 01 79 00 - Demonstration and Training
- E. Section 23 09 00 – Building and Automatic Temperature Controls
- F. Section 20 02 13 – Basic Piping
- G. Section 23 05 03 – Piping for HVAC System
- H. Section 23 21 14 - Hydronic Specialties: Connections to heating coils.
- I. Section 23 31 00 – Metal Ductwork
- J. Section 23 33 00 - Ductwork Accessories
- K. Section 23 37 00 - Air Outlets and Inlets
- L. Section 23 73 13 – Modular Indoor Central-Station Air-Handling Units
- M. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

1.03 Reference Standards

- A. All referenced standards and recommended practices in this section pertain to the most recent publication thereof, including all addenda and errata.
- B. AHRI 410 - Standard for Forced-Circulation Air-Cooling and Air-Heating Coils.
- C. AHRI 880 - Performance Rating of Air Terminals.
- D. AHRI 885 - Procedure for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets.
- E. ASHRAE 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.
- F. ASHRAE 62.1 - Ventilation for Acceptable Indoor Air Quality.
- G. ASHRAE 130 - Methods of Testing for Rating Ducted Air Terminal Units.
- H. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).
- I. ASTM C1338 Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
- J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- K. ASTM E488/E488M - Standard Test Methods for Strength of Anchors in Concrete Elements.
- L. CSA C22.2 No. 236 – Heating and Cooling Equipment.
- M. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- N. NFPA 70 - National Electrical Code.
- O. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association.
- P. UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.
- Q. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Underwriters Laboratories Inc.
- R. UL 1995 – Standards for Heating and Cooling Equipment.

1.04 Administrative Requirements

- A. Pre-installation Meeting: Conduct a pre-installation meeting one week prior to the start of the work of this section, and require attendance by all affected installers.
- B. Sequencing: Ensure that utility connections are achieved in an orderly and efficient manner.

1.05 Submittals

- A. Refer to Specification Section 013000 "Submittal Procedure", for submittal procedures.
- B. Product Data shall be provided with data indicating configuration, general assembly, and materials used in fabrication, including catalog performance ratings that indicate air flow, static pressure, NC designation, electrical characteristics, and connection requirements.
- C. Shop Drawings shall indicate configuration, general assembly, and materials used in fabrication, and electrical characteristics and connection requirements.
 - 1. Manufacturer shall include schedules listing discharge and radiated sound power level for each of the second through seventh octave bands (125 – 4000 Hertz) at specified differential static pressures.
- D. Manufacturer shall include schedules listing discharge and radiated sound power level for each of second through sixth octave bands at inlet static pressures from 1 to 4 inch water gauge.
- E. Certificates shall be issued to certify that the air coil capacities, pressure drops, and selection procedures meet or exceed specified requirements or coils are tested and rated in accordance with AHRI 410.
- F. Manufacturer's Installation Instructions shall indicate support and hanging details, installation instructions, recommendations, and service clearances required.
- G. Project Record Documents shall record actual locations of units and controls components and locations of access doors.
- H. Operation and Maintenance Data shall include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists. Include directions for resetting constant-volume regulators.
- I. Manufacturer's warranty shall be submitted and ensure forms have been completed in Owner's name and registered with manufacturer.
- J. Maintenance Materials shall be furnished for the Owner's use in maintenance of the project.

1.06 Quality Assurance

- A. Manufacturer Qualifications shall be specified in this section, with minimum ten years of documented experience.
- B. Product Listing Organization Qualifications: The manufacturer shall be listed with an organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 System Responsibility

- A. The contractor shall be responsible for any and all costs associated with any and all changes resulting from the use of a supplier other than the listed acceptable manufacturers.

1.08 Warranty

- A. Refer to Specifications Section 017800 "Closeout Submittals", for additional warranty requirements.
- B. Provide 18 month manufacturer warranty from date of shipment for air terminal units, integral sound attenuators, integral heating coils, and integral controls.

PART 2 – PRODUCTS

2.01 Single-Duct Terminal Units

- A. Basis of Design: Price Industries, Inc.
 - 1. Single-Duct Terminal Unit: SDV (direct digital controls).
- B. Performance Requirements:
 - 1. The assemblies shall be pressure independent and shall reset to any air flow between zero and the maximum cataloged air volume. Sound ratings of air distribution assemblies: Not to exceed 20 NC at 1.5" inlet static pressure, with a downstream static pressure of 0.25".
 - 2. Use attenuation values found in AHRI 885 Appendix E.
- C. General:
 - 1. The terminal units shall be factory-assembled, AHRI 880 rated and bearing the AHRI seal for an air volume control terminal with damper assembly and flow sensor.

2.02 Single-Duct Terminal Units

- A. Description:
 - 1. Furnish and install Price model SDV, or prior approved equal, single duct terminal units in the sizes and configurations as indicated on the contract documents.
- B. Unit Casing:
 - 1. The unit casing shall be constructed of a minimum 22 gauge, 0.032 inch galvanized steel.
 - a. The casing shall be assembled with longitudinal lock seam construction.
 - b. Casing leakage shall be tested in accordance with ASHRAE 130.
 - c. Casing leakage for the basic assembly shall not exceed 1.0 percent of the maximum rated airflow at 1.0 inches of water gauge.
 - d. Casing leakage for the basic assembly shall not exceed 2.0 percent of the maximum rated airflow at 3.0 inches of water gauge.
- C. Unit Discharge:
 - 1. Manufacturer shall provide rectangular unit discharges with slip-and-drive connections.
- D. Liners:
 - a. Fiber-Free Foam Insulation - FF.
 - 1. Insulation shall comply with the requirements of UL 181 (erosion, mold growth and humidity) and ASHRAE 62.1, and shall have a maximum flame/smoke spread of 25/50 for both the insulation and the adhesive when tested in accordance with ASTM E84.
 - 2. The insulation shall be secured with adhesive.
 - 3. Insulation thickness shall be: 1 inch thick, R-value of 4.0.
 - 4. Refer to schedules for exact liner type.
 - b. Dual-Wall Solid Metal Liner - SM.
 - 1. The interior surface of the unit casing shall be thermally lined with a minimum 1 inch, glass fiber with a high density facing. The insulation R-Value shall be a minimum of 4.1. Insulation shall meet NFPA-90A and UL 181 requirements. The insulation is covered by an interior metal liner made of 26 gauge galvanized steel. The interior metal liner shall isolate the fiberglass insulation from the airstream and allow for cleaning of the terminal unit interior surfaces. All wire penetrations through the interior metal liner shall be covered by grommets.

2. Provide antimicrobial coating, suitable for cleanroom applications, where noted on schedules.
3. Refer to schedules for exact liner type.

E. Primary Air Damper Assembly:

1. The damper assembly shall be heavy-gauge, galvanized steel with a solid shaft rotating in bearings.
2. The damper shaft shall incorporate a visual position indicator etched into the end of the damper shaft to clearly indicate damper position over the full range of 90 degrees.
3. The damper shaft shall be mounted on the [left], [right], [top], or [bottom] of the damper when looking in the direction of airflow.
4. The 18 gauge damper assembly shall incorporate a peripheral gasket on the damper blades for tight airflow shutoff.
5. Air leakage past the closed damper shall not exceed 2 percent of the unit maximum rated airflow at 3.0 inch water gauge inlet static pressure, tested in accordance with ASHRAE 130.
6. The damper, seal, and bearing system shall be tested to 1.25 million cycles, or the equivalent of 100 full open/closures per day for 35 years, with no visible signs of wear, tear, or failure of the damper assembly after such testing.

F. Airflow Sensor:

1. The airflow sensor shall be a differential pressure airflow device measuring total and static pressures, and mounted to the inlet valve.
2. Plastic parts shall be fire-resistant, complying with UL 94.
3. The airflow sensor shall be RoHS (Restriction of Hazardous Substances) compliant. Material containing polybrominated compounds shall not be acceptable.
4. Control tubing shall be protected by grommets at the wall of the airflow sensor's housing.
5. The airflow sensor shall be furnished with twelve total pressure sensing ports and four static pressure sensing ports, and shall include a center averaging chamber that amplifies the sensed airflow signal.
6. After balancing, the airflow sensor signal accuracy shall be plus or minus five percent throughout terminal operating range.

G. Inlet Valve:

1. The inlet valve shall be a consistent diameter to retain flex duct and provide a stop for hard duct.
2. The inlet valve shall include a 1/8 inch raised single bead weld for added strength.
3. The gasket seal shall be a low leakage continuous piece with a peripheral gasket for tight airflow shutoff.
4. The inlet valve shall include two heavy duty stop pins to accurately position the damper in the closed and open positions.

H. Accessories:

1. Bottom Access Door:
 - a. The unit shall be supplied with a 4 inch x 6-3/4 inch bottom access door, secured to the casing with screws.
2. Hot Water Heating Coil (Provide where noted on schedule):

- a. The hot water coil casing shall be constructed from a minimum 22 gauge, 0.032 inch galvanized steel, factory-installed on the terminal discharge with slip-and drive attachment for downstream ductwork.
 1. A gasketed access door shall be provided, located on bottom of unit.
 2. Coil handing shall be specified as right hand or left hand when looking into the coil inlet in the direction of airflow (coordinate with exact field conditions prior to ordering equipment/material).
 3. The water coil shall be supplied with multiple access doors located:
 - a. Upstream of the water coil in the terminal casing.
 - b. Downstream of the water coil in a common casing with the coil.
 - c. The water coil access door shall be secured to the casing with screws.
 - b. The water coil fins shall be 0.0045 inch aluminum fins, mechanically-bonded to seamless 0.50 by 0.016 inch copper tubes.
 1. Fins shall be formed in a high heat transfer sine wave configuration.
 2. Standard coil shall be a 10 fins-per-inch fin construction.
 3. High capacity coil shall be a 12 fins-per-inch fin construction.
 - c. The water coil shall be leak tested to a minimum 390 pounds per square inch, with a minimum burst pressure of 1800 pounds per square inch.
 - d. The water coil shall be certified in accordance with AHRI 410 and units shall bear an AHRI 410 label.
 1. An optional oversized casing shall be upsized to increase heat transfer with low supply water temperatures while reducing air side pressure drop.
3. Electric Heating Coil (Provide where noted on schedule):
- a. The electric heating coil shall be ETL listed to UL 1995 and CSA 22.2, and provided by the terminal unit manufacturer.
 - b. The electric coil casing shall be constructed from a minimum 20 gauge, 0.038 inch galvanized steel.
 - c. The heating elements shall be open wire nickel chrome construction, supported by ceramic insulators.
 - d. The integral control panel shall be a NEMA 250, Type 1 enclosure with hinged access door for access to all controls and safety devices.
 - e. The electric coils shall be provided with a primary automatic reset thermal cutout, a manual reset thermal cutout, and a differential pressure airflow switch for proof of airflow.
 - f. The electric coils shall be provided with a non-fused door interlocking disconnect switch.
 - g. The electric coils shall be provided with a silicon controlled rectifier (SCR) controller.
4. Sound Attenuator:
- a. The manufacturer shall supply sound attenuators to meet scheduled acoustical performance requirements (refer to schedule). The attenuators shall be supplied in the following configuration: Three foot integral discharge attenuator (Price model ATT).

ACOUSTICAL PERFORMANCE REQUIREMENTS	NOISE REDUCTION METHOD #1 SEE NOTES 4,9,10 (more liberal way to look at noise) Based on 2008 guidelines. Performance of Method #1 required within submittals	NOISE REDUCTION METHOD #2 SEE NOTE 2 (more conservative way to look at noise) Based on most current ASHRAE & AHRI standards. Performance of Method #2 required within submittals.

Model	Size	Inlet SP (in. w.g.)	Downstream SP (in. w.g.)	Min Oper PD (in. w.g.)	* Max Disc NC 2008	** Max Dis Lw 2008	* Max Rad NC 2008	** Max Rad Lw 2008	Max Dis NC	Max Dis Lw	Max Rad NC	Max Rad Lw
SDV & SDVLP - WITH ATTENUATOR (PRICE ATT)	6	1.50	0.25	0.14	27 (3)	67, 67, 65, 61, 49, 51	26 (3)	62, 57, 49, 41, 35, 29	30 (3)	75, 70, 66, 61, 49, 51	26 (3)	62, 57, 49, 41, 35, 29
SDV & SDVLP - WITH ATTENUATOR (PRICE ATT)	8	1.50	0.25	0.01	23 (3)	67, 64, 60, 58, 48, 51	23 (2)	61, 53, 46, 39, 36, 29	29 (2)	74, 67, 61, 58, 48, 51	23 (2)	61, 53, 46, 39, 36, 29
SDV & SDVLP - WITH ATTENUATOR (PRICE ATT)	10	1.50	0.25	0.01	21 (3)	68, 64, 61, 59, 49, 52	23 (2)	61, 54, 48, 41, 37, 32	26 (2)	74, 66, 62, 59, 49, 52	23 (2)	61, 54, 48, 41, 37, 32
SDV & SDVLP - WITH ATTENUATOR (PRICE ATT)	12	1.50	0.25	0.01	21 (3)	67, 64, 64, 61, 52, 54	25 (4)	61, 54, 51, 42, 39, 33	23 (3)	72, 66, 64, 61, 52, 54	25 (4)	61, 54, 51, 42, 39, 33
SDV & SDVLP - WITH ATTENUATOR (PRICE ATT)	14	1.50	0.25	0.01	--	66, 62, 63, 62, 53, 55	25 (3)	60, 56, 50, 42, 39, 36	21 (2)	70, 63, 63, 62, 53, 55	25 (3)	60, 56, 50, 42, 39, 36
SDV & SDVLP - WITH ATTENUATOR (PRICE ATT)	16	1.50	0.25	0.01	20 (3)	68, 63, 64, 61, 53, 56	27 (3)	61, 58, 52, 44, 40, 35	22 (2)	71, 64, 64, 61, 53, 56	27 (3)	61, 58, 52, 44, 40, 35
SDV & SDVLP - WITH ATTENUATOR (PRICE ATT)	24x16	1.50	0.25	0.01	20 (3)	68, 63, 64, 61, 53, 56	27 (3)	61, 58, 52, 44, 40, 35	22 (2)	71, 64, 64, 61, 53, 56	27 (3)	61, 58, 52, 44, 40, 35

Notes: 1. Dashes (--) indicate NC values less than 20. 2. NC values are calculated based on procedures outlined in AHRI Standard 885-2008, "A Procedure for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets." 3. Sound power levels are given in decibels (dB). 4. "*** Discharge sound power levels 2008" do not include duct end reflection. For the most current data based on ASHRAE Standard 130-2008 and AHRI Standard 880-2011 reference "Discharge sound power levels." 5. Dashes (--) indicate sound power levels below 36-29-26-22-19-17 for each octave band; values below these sound power levels are considered below significance per AHRI 880. 6. Minimum operating pressure is the minimum static pressure required to operate the terminal unit assembly at maximum primary flow with a wide open damper. 7. Airflow shall be given in cubic feet per minute (cfm). 8. Air pressure drop is given in inches water gauge (in. w.g.), and water pressure drop is given in feet of water gauge (ft. w.g.). 9. NC values are derived from sound power levels obtained in accordance with ASHRAE Standard 130-2008 and AHRI Standard 880-2011, which include duct end reflection corrections. 10. * NC values are derived from sound power levels obtained in accordance with ASHRAE Standard 130-2008 and AHRI Standard 880-2008. 11. Include duct end reflection corrections to reflect proper NC levels.

5. Control Transformers:

- The terminal unit shall be supplied with a factory mounted 50 VA control transformer.

6. Low Leakage Construction:

- The terminals shall be provided with factory certified low leakage construction up to Six (6") inches water gauge internal pressure.
- Inlet dampers shall exhibit leakage rates of less than:
 - 0.5% of maximum nominal catalog airflow for CLL3
- Single duct casings shall exhibit external leakage rates of less than:
 - 1% of maximum nominal catalog airflow for CLL3
- Terminals units shall be low leakage construction shall include the following design features:
 - The access door shall be supplied with compression style gasketing and quarter turn latches.
 - The unit casing shall be flanged and gasketed at all external casing seams.
 - All production units shall be individually factory tested to ensure compliance with project specific leakage requirements.
 - Leakage test results shall be documented on a label affixed to each certified low leakage unit.

- I. Electrical Requirements:
 - 1. Single duct terminal units shall be provided with single-point power connection.
 - 2. The terminal unit equipment wiring shall comply with the requirements of NFPA 70.
- J. Controls:
 - 1. Refer to Specification Section 23 09 00 "Building and Automatic Temperature Controls":
Thermostats and actuators for controls requirements.
- K. Controls Sequence:
 - 1. Refer to Specification Section 23 09 00 "Building and Automatic Temperature Controls" for
HVAC Controls for controls sequence requirements.

PART 3 – EXECUTION

3.01 Examination

- A. Verify that conditions are suitable for installation.
- B. Examine areas and conditions under which air terminals are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to the manufacturer.
- C. Verify that field measurements comply with all required clearances as recommended by manufacturer & NEC.

3.02 Installation

- A. Install the terminal units in strict accordance with the manufacturer's instructions.
- B. Install the inlets of the air terminal units with the air flow sensors a minimum of three duct diameters from elbows, transitions, and duct takeoffs.
- C. Refer to contract documents for the size(s) and duct location(s) of the air terminal units.
- D. Provide ceiling access doors/panels and/or locate units above easily removable ceiling components.
- E. Support the terminal units individually from the structure.
- F. Embed anchors in concrete in accordance with ASTM E488/E488M.
- G. Do not support the terminal units from the ductwork.
- H. Connect the terminals to the ductwork in accordance with Section 23 31 00.
- I. Install heating coils in accordance with Section 233100 & 233300.
- J. Verify that electric power is available and of the correct characteristics prior to ordering any/all terminal units.
- K. Contractor to install VAV boxes with sufficient room on control side for servicing, contractor to provide accessibility to the control side of the VAV box through the ceiling providing access doors in hard (gypsum) ceilings. Figure in bid access door in ceiling at every VAV box. Locate in field at the direction of the architect/engineer.
- L. Location: Install each unit level and accurately in position indicated in relation to other work; and maintain sufficient clearance for normal service and maintenance, but in no case less than that recommended by manufacturer.

3.03 Adjusting

- A. Ensure the damper operator attached to the assembly allows full modulation of flow range from 100 percent of design flow to zero.

3.04 Field Quality Control

- A. Upon completion of installation and prior to initial operation, test and demonstrate that air terminals, and duct connections to air terminals, are leak-tight.
- B. Repair or replace air terminals and duct connections as required to eliminate leaks, and retest to demonstrate compliance.
- C. Refer to Specification Section 014000 "Quality Requirements", for additional quality requirements.

3.05 Cleaning

- A. Clean exposed factory-finished surfaces. Repair any marred or scratched surfaces with manufacturers touch-up paint.
- B. Refer to Specification Section 017419 "Construction Waste Management and Disposal", for additional cleaning requirements.

3.06 Closeout Activities

- A. Refer to Specification Section 017800 "Closeout Submittals", for closeout submittals.
- B. Refer to Specification Section 017900 "Demonstration and Training", for additional closeout requirements.

3.07 Training

- A. Provide three (3) hours of Factory Authorized Training.
- B. Field Training shall cover all of the items contained in the Operations and Maintenance Manuals.

END OF SECTION

9-2-25

SECTION 23 3700 - AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 GENERAL

- A. Grilles and Diffusers
- B. Louvers

1.02 RELATED WORK

- A. Section 20 01 00: General Provisions
- B. Section 23 31 00: Metal Ductwork

1.03 REFERENCES

- A. ADC 1062 - Certification, Rating and Test Manual.
- B. AMCA 500 - Test Method for Louvers, Dampers and Shutters.
- C. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
- D. ARI 650 - Air outlets and inlets.
- E. ASHRAE 70 - Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.
- F. SMACNA - Low Pressure Duct Construction Standard.

1.04 QUALITY ASSURANCE

- A. Test and rate performance of air outlets and inlets in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.
- B. Test and rate performance of louvers in accordance with AMCA 500.

1.05 REGULATORY REQUIREMENTS

- A. Conform to ANSI/NFPA 90A.

1.06 SUBMITTALS

- A. Submit product data under provisions of Section 01300.
- B. Provide product data for items required for this project.
- C. Submit schedule of outlets and inlets indicating type, size, application, and noise level.
- D. Review requirements of outlets and inlets as to size, finish, and type of mounting prior to submitting product data and schedules of outlets and inlets.
- E. Submit diffuser, grille and register color data to Architect of approval.

1.07 JOB CONDITIONS

- A. Review requirements of outlets as to size, finish and type of mounting prior to submitting shop drawings and schedules of outlets.
- B. Check location of outlets and make sure necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

PART 2 PRODUCTS

2.01 APPLICATIONS

- A. Base air outlet application of space noise level of NC 35 maximum.
- B. Provide supply outlets with sponge rubber seal around edge.
- C. Provide appropriate frame for all outlets compatible with ceiling/wall construction.
- D. Finish
 - 1. Aluminum grilles, registers, and diffusers which are ceiling mounted shall be provided with a factory applied white baked enamel finish unless otherwise, herein or on the drawings.
 - 2. Aluminum grilles and registers which are wall or floor mounted shall be factory etched to a satin finish and coated with a clear lacquer.
- E. Mounting

1. Model numbers indicated herein are for surface mounting in exposed tee-bar grids or for integral mounting in exposed tee-bar grids. Where grilles, registers or diffusers are to be installed in concealed spine ceilings or plaster ceilings the mounting frame shall be adjusted to match the ceiling requirements. In plaster ceilings, provide plaster frames.

2.02 LOUVER FACE CEILING DIFFUSER

- A. Ceiling diffuser shall be round, square or rectangular with to provide 1, 2, 3, or 4-way air patterns as indicated on the drawings. All items to be of aluminum construction. Frame and directional core to have baked white enamel finish.
- B. Frame style for fixed ceiling shall be raised "V" type. Frame style for lay-in ceilings shall be lay-in matching frames, panel size 24-inch x 24-inch unless otherwise required. For spline or other type ceiling systems, use appropriate matching frame styles. Diffusers shall be sized as indicated on the drawings.

2.03 SIDEWALL SUPPLY GRILLES

- A. Provide sidewall supply grilles with streamlined and individually adjustable blades, maximum 3/4" spacing. Provide spring tension or other device to set blades. Provide units with vertical face, double Deflection bar style grilles.
- B. Provide 1/4" margin frame with counter sunk screw holes.
- C. Fabricate of steel 20 gage minimum frames and 22 gage blades, or of all aluminum with 20 gauge for frames and blades.
- D. Provide grille with integral gang-operated opposed blade dampers with removable key operators, operable from face.
- E. Finish for steel construction in standard baked enamel finish.

2.04 RETURN GRILLES

- A. Provide sidewall and ceiling return grilles having fixed vee blades. Provide units with horizontal face.
- B. Provide 1/4" margin frame countersunk screw holes.
- C. Fabricate of steel with 20 gage minimum frames and 22 gage minimum blades, or all aluminum construction, 20 gage minimum for frames and blades.
- D. Provide return grilles, where not individually connected to return fans, with integral, gang-operated opposed blade dampers with removable key operator, operable from face.
- E. Finish steel outlets in factory baked enamel finish.

2.05 DOOR GRILLES

- A. Door grilles shall be inverted bee shaped on 1/2 inch centers with telescoping frame. Louvers and frame to be steel construction with prime coat or aluminum as indicated on Air distribution Schedule in the drawings.
- B. Where required on drawings, contractor shall provide filter housing on back side of door grille.

2.06 OUTSIDE LOUVERS

- A. Greenheck #ESD-435X:
 1. Construction Features: Louvers shall be model #ESD-435X as manufactured by Greenheck. Louver frame shall be 4 inch deep channel style with 0.081 inch extruded aluminum wall thickness. Louver blades shall be horizontal stationary drainable style and shall be located on 3 1/4 inch centers and 37.5 degree angles with 0.081 inch extruded aluminum wall thickness. Bird screen shall be internally mounted 3/4 inch x 0.051 inch flattened expanded aluminum unless specified otherwise. Finish of all materials shall be mill aluminum only unless specified otherwise.
 2. Performance Requirements: Louvers shall be AMCA Licensed when tested in accordance with AMCA 500-L Air Performance and Water Penetration. Free area for a size 48 inch louver shall not be less than 9.98 square feet. Airflow resistance at 1000 feet per minute free area intake velocity shall not be greater than 0.163 inches water gauge. Airflow resistance at 1000 feet per minute. Beginning point of water penetration shall not be less than 1151 feet per minute area intake velocity.

3. Louvers shall be Florida Product Approved and shall be approved for use in Florida's High Velocity Hurricane Zone. Louvers shall be AMCA Licensed when tested in accordance with AMCA 540 (Basic Protection, Missile Level D). Louvers shall be tested in accordance with and pass the following Florida test protocols: TAS 201 (Large Missile Impact), TS 202 (Uniform Static Air Pressure) and TAS 203 (Cyclic Wind-Loading). Louvers must be designed to withstand the wind loads specified on the structural drawings. Structural drawings must indicate all applicable positive and negative wind loads using methods prescribed by ASCE 7 (version 05 or 10 where applicable) in pound per square foot units. All louvers must be installed in accordance with the manufacturer's published installation instructions.
4. Louvers shall be supplied with a 70% Kynar finish applied following a thorough cleaning and pretreatment of the metal surface. Dry film thickness of the Kynar shall be approximately 1.2 mils after baking at 450 F. Color shall be custom, selected by architect.
5. Refer to plans for type louvers and controls, fixed, hand (crank) operated, motor operated, etc.
6. Provide heavy duty screen/mesh in front of unit (inside) for louver protection, color same as louver. Screen to be 0.5" square constructed of stainless steel.
7. Refer to schedules for louvers required flanges & louvers requiring channel frames with sub sills. Provide blankoffs panels as noted within contract documents.
8. Ruskin approved equal.

2.07 EXHAUST GRILLES

- A. Register (Wall): 35 degree deflection register with horizontal bars, opposed blade damper and plaster frame. All items to be aluminum construction. Register and plaster frame to have an anodized finish.
- B. Register (Ceiling): Grid core register with 1/2x1/2x1/2 inch core spacing and opposed blade damper. All items to be of aluminum construction. Register to have an anodized finish. Frames shall be appropriate to type ceiling used in project.

2.08 LINEAR DIFFUSERS

- A. Linear diffuser shall be extruded aluminum. Diffuser face shall be natural anodized aluminum with narrow surface mounted border. Interior air pattern controller shall be painted flat black. Diffusers shall be furnished in one piece up to a maximum of four feet; where diffuser exceeds four feet, multiple sections shall be butted with hairline joints and provided with alignment spines. Diffusers shall have concealed fastening. Linear diffusers shall be furnished in lengths, and number of 1 inch slots, as required for CFM as indicated on the drawings.
- B. Contractor to figure in bid field fabrication of internally insulated plenum on rear of linear slot diffuser in the event the structure does not allow for the proper installation of the factory fabricated plenum boxes. Verify exact locations of plenum boxes with structure prior to ordering plenums.

2.09 SQUARE PLAQUE CEILING DIFFUSER

- A. Ceiling diffuser shall be round, square or rectangular with to provide 1,2,3, or 4-way air patterns as indicated on the drawings. All items to be of aluminum construction. Frame and directional core to have baked white enamel finish.
- B. Frame style for fixed ceiling shall be raised "V" type. Frame style for lay-in ceilings shall be lay-in matching frames, panel size 24-inch x 24-inch unless otherwise required. For spline or other type ceiling systems, use appropriate matching frame styles. Diffusers shall be sized as indicated on the drawings.

2.10 PERFORATED CEILING DIFFUSERS

- A. Ceiling diffusers shall be aluminum with removable perforated face panel, adjustable diffusion louvers, and round neck or round neck adapter. Face panel shall fit 24" x 24" lay-in tee-bar ceiling grid. Throw pattern assembly shall be removed, air shall drop/dump into space.. Perforated ceiling diffusers to be located in kitchen cooking area only.

2.11 THERMALLY POWERED VAV DIFFUSERS

- A. Thermally powered variable air volume diffusers shall be Therma-Fuser™ model ST manufactured by Acutherm, and shall have separate set points for VAV Heating and VAV Cooling.
- B. Thermally powered VAV diffusers shall be a complete VAV terminal and thermostat self-contained in nominal 24"x24"/600mm square diffuser. They shall be thermally powered with one room thermostat/actuator and one changeover thermostat/actuator. External wiring or pneumatics shall not be allowed.
- C. The VAV diffusers shall have a thumbwheel and temperature scale to adjust the cooling set point and a separate thumbwheel and temperature scale for the heating set point. The adjustment shall be right above the hinged appearance panel and shall not require tools. Each set point shall be separately adjustable between 70°F/21°C and 78°F/26°C. The initial set point shall be factory set at 74°F/23°C..
- D. In the cooling mode the VAV diffusers shall open on a rise in room temperature and in the heating mode they shall close on a rise in room temperature. The changeover thermostat shall be factory installed and adjusted to engage the heating mode when the supply air temperature rises above 80°F/27°C and return to the cooling mode when the supply air temperature falls below 68°F/20°C. During changeover the diffuser shall close or, if a minimum flow is set, go to the minimum. Nothing including the changeover mechanism shall extend above the inlet of the diffuser.
- E. All VAV diffusers shall have a dial and scale to adjust minimum flow between 5 cfm/2.4 l/s and 50% of maximum flow without tools. Minimum flow shall be factory set at 10%. A fixed maximum flow stop shall be factory set for the full open air flow of the specified inlet size.
- F. All VAV diffusers shall have a lever which will open the damper for balancing without tools. The balancing lever shall be accessible from the outside of the diffuser without folding down the appearance panel or removing any part of the diffuser.
- G. All VAV diffusers shall have a solid (no holes or slots), hinged appearance panel that can be unlatched and folded down to hang allowing hands to be free for adjusting temperature set points. Instructions for the VAV diffuser shall be on the inside of the appearance panel.
- H. The VAV diffusers shall have positive induction of secondary room air over the room thermostat/actuator at all flows from fully closed to fully open.
- I. The manufacturer shall warrant that all VAV diffusers shall be free from defects in materials and workmanship for a period of ten years from date of shipment.
- J. Supply air to the VAV diffuser shall be constant temperature (may be reset to another constant temperature). Supply air shall be limited to no lower than 50°F/10°C on cooling and no higher than 120°F/49°C on heating. The heating high limit shall be as low as possible but no lower than 80°F/27°C.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install items in accordance with manufacturer's recommendations.
- B. Paint ductwork visible behind air outlets flat black, if not inherently black.
- C. Install items in accordance with manufacturer's instructions.
- D. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
- E. Install diffusers to ductwork with air tight connection.
- F. Provide balancing dampers on duct take-off to diffusers, and grilles and register, regardless of whether dampers are specified as part of the diffuser, or grille and register assembly.
- G. Furnish and install necessary frames, bucks, sponge rubber gasketed, etc. to make a neat setting job.
- H. Diffusers shall be placed to insure that air does not blast against columns and lights.
- I. All diffusers, registers etc. shall have external volume controls and deflecting grids.
- J. Ceilings in areas where plaster or gypsum board ceiling are used, shall be surfaced mounted.

3.02 AIR OUTLET SCHEDULE

- A. Refer to schedules within contract documents.

END OF SECTION

9-2-25

SECTION 23 04 14 - MOTOR STARTERS

PART 1 MANUFACTURER

1.01 Manufacturer

- A. Approved Manufacturer: Franklin Controls, General Electric, or prior approved equal.

1.02 Submittals

Manufacturer shall provide copies of the following documents:

- A. Product data sheets on specified products.
- B. Shop drawings for specified product.
- C. Wiring Schematics for specified products.

PART 2 PRODUCTS

2.01 Section Includes:

- A. Enclosed FVNR combination single phase motor starter with electronic overload relay
- B. Enclosed FVNR non-combination motor starters with electronic overload relay
- C. Enclosed FVNR combination motor starters with electronic overload relay

2.02 References

The starters referenced in this section are designed and manufactured to the following standards unless otherwise noted:

- A. ANSI/NFPA -70, National Electric Code
- B. UL 508, and UL508A Industrial Control Equipment
- C. NEMA ICS-2, 2000
- D. IEC 60947-5, 60947-4, 60947-3

2.03 System Description

- A. Single Phase Starter: Starters for 115VAC single phase motors less than 1 HP shall be capable of both manual and automatic operation. Refer to Section 2.03.1 for single phase starter requirements.
- B. Magnetic Starters: Starters for 3-phase motors shall be magnetic starters. Refer to Section 2.03.2 for magnetic starter requirements.
- C. Combination Starters: Provide combination magnetic starters for all motors requiring branch circuit protection or a line-of-sight disconnect. Refer to Section 2.03.3 for combination magnetic starter requirements.
- D. Enclosures: NEMA/UL Type 1 for indoor applications, NEMA or UL Type 3R for outdoor applications

2.03.1 Enclosed Full Voltage Non-Reversing (FVNR) Single Phase Starter

- A. Single Phase Motor Starter Control: The single phase motor starter shall consist of a manually operated quick-make toggle mechanism lockable in the "Off" position which shall also function as the motor disconnect. Additionally, the starter shall provide thermal overload protection, run status pilot light and fault pilot light. The starter must include the capability to operate in both manual and automatic control modes. In automatic mode, the starter shall have the capability to integrate with a building automation system by providing terminals for run input, run status output and fault output. All control terminals shall be integrated in the starter. At a minimum, each single phase starter shall include an interposing run relay and current sensing status output relay. Single phase motor starter shall be in a surface mount enclosure.
- B. Approved manufacturer: Franklin Controls, model BAS-1P or approved equal.

2.03.2 Enclosed Full Voltage Non-Reversing (FVNR) Non-Combination Starter

- A. Magnetic Motor Starters shall be enclosed in a general purpose electrical enclosure with the appropriate environmental rating.

- B. Starters shall consist of a horsepower rated magnetic contactor with a minimum of 2NO and 2NC auxiliary contacts and solid state electronic overload relay.
- C. Overload relay shall protect all three phases with a wide range 1-40 amp current setting and trip class to allow field adjustment for specific motor FLA. Interchangeable heater elements are not acceptable.
- D. Overload relay shall incorporate SmartStart Technology, or the following protective functions:
 - a. Out of calibration protection (if the FLA on the overload is set outside acceptable range, overload will trip to indicate fault event)
 - b. Stall protection
 - c. Max time to start
 - d. Locked Rotor
 - e. Phase Unbalance
 - f. Phase loss
 - g. Cycle Fault
- E. Starter shall be field selectable for manual or auto reset to restore normal operation after a trip or fault condition. Manual pushbutton shall be accessible without removing or opening cover on starter.
- F. In the event of a power failure, starter shall restart in last mode by default. Starter shall also be capable of restart with 10 second delay, or restart in "off" mode.
- G. All starters must be provided with a universal power supply capable of a 208 to 600 volt input range. The power supply must accept the available line voltage and the control voltage shall not exceed 24V.
- H. Installed accessories shall include Hand-Off-Auto operation pushbutton keypad. Include LED pilot light indicators for Hand, Off, Auto, Run and Overload conditions.
- I. When remotely controlled by an automation system, the starter shall include remote run terminals which accept both a voltage input signal and a contact closure. The voltage run input shall accept both AC and DC signals from 12-250V to allow direct connection of the transistorized automation signal to the starter.
- J. Starter must contain an integral current sensor with NO contact which closes to indicate motor run status as well as a NO contact which closes when an overload trip condition occurs.
- K. In applications where the motor is interlocked with a 24VDC damper or valve, the actuator control must reside within the starter enclosure. The starter must provide a voltage output to operate the actuator to open the damper or valve without closing the motor circuit. The starter will only close the motor circuit and start the motor after it has received a contact closure from a limit or end switch confirming the damper or valve position.
- L. The starter shall include a dedicated voltage input for Fireman's Override operation. When activated, the starter run the motor in any mode (Hand, Off or Auto) regardless of other inputs or lack of inputs either manual or auto. The purpose of the Fireman's Override input is to act as a smoke purge function. Fireman's Override has priority over the Emergency Shutdown input.
- M. If the starter is controlled by a fire alarm or life safety system, the starter shall include an Emergency Shutdown input which will disable the starter from operating in either Hand or Auto mode regardless of other inputs either manual or auto.
- N. Manufacturer shall provide and install tags with engraved white lettering to designate equipment served

2.03.3 Enclosed Full Voltage Non-Reversing (FVNR) Combination Starter

- A. Enclosed combination starters shall include all of the magnetic starter requirements in addition to a disconnecting method. All disconnects shall include a lock-out mechanism when in the off position.
- B. Motor circuit protectors (MCP) shall be provided as the acceptable form of disconnecting means. The MCP shall be a UL listed 508 current limiting manual motor starter with magnetic

trip elements only. The MCP shall carry a UL 508F rating (up to 100A frame size) which provides for coordinated short circuit rating for use with the motor contactor and provides a minimum interrupting rating of 30,000 AIC for the combination starter.

2.04 PROVIDE OPTIONAL FEATURES, AS REQUIRED, TO MEET DESIGN PERFORMANCE ACCORDING TO THE FOLLOWING REQUIREMENTS.

- A. Must provide over/under voltage and phase monitoring capability. Monitor shall be field adjustable for both over and under voltage levels and a delay time before returning to normal operation after a trip.
- B. Starter must measure and display output current on the front cover. If necessary, install digital or analog ammeter.
- C. The starter shall provide the capability to monitor and calculate power consumption (kWh) of the motor load. Each starter shall display the calculated kW and kWh. Additionally, provide either a pulse output (kWh) or 4-20mA analog signal (kW) to the automation system to monitor the power consumption.
- D. Starter must be capable of communicating over BACnet MS/TP. At a minimum, reported points shall include starter mode, terminal input status, run/fault status, voltage, current, power factor, kW and kWh.

2.05 Quality Assurance

- A. Manufacturer shall provide a five year warranty on the complete starter assembly.
- B. The starter assembly shall be UL listed under UL 508A.

END OF SECTION

9-2-25

SECTION 23 6313 - AIR COOLED CONDENSING UNIT

PART 1: GENERAL

1.01 Section Includes:

- A. Split system air conditioners.

1.02 SUBMITTALS

- A. Shop Drawings: Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, electrical characteristics and connection requirements.
- B. Product Data:
 - 1. Provide literature that indicates dimensions, weights, capacities, ratings, and electrical characteristics and connection requirements.

1.03 OPERATION AND MAINTANENCE DATA

- A. Maintenance Data: Provide instruct tions for installation, maintenance and service

1.04 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience, who issues complete catalog data on total product.
- B. Startup must be done by trained personnel experienced with split systems.
- C. Do not operate units for any purpose, temporary or permanent, until remote controls are in place, and manufacturers' installation instructions have been followed.

1.05 DELIVERY, STORAGE, HANDLING

- A. Deliver, store, protect and handle products to site.
- B. Handle carefully to avoid damage to components, enclosures, and finish
- C. Store in a clean, dry place to protect from weather and construction traffic.

PART 2: PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design: Daikin Applied

2.02 GENERAL DESCRIPTION

- A. Furnish as shown on plans, Condensing Unit(s). Unit performance and electrical characteristics shall be per the job schedule.
- B. Configuration: Fabricate as detailed on prints and drawings.
- C. The complete unit shall be listed.
- D. Unit shall be completely factory assembled and shipped in one piece.
- E. Unit to be shipped with a nitrogen holding charge only.
- F. The unit shall undergo an operational test prior to shipment. The factory test shall include a refrigeration circuit check test, a unit safety control system operations checkout, and a final unit inspection.
- G. All units shall have decals and tags to indicate caution areas and aid unit service. Unit nameplates shall be fixed to the main control panel door. Electrical wiring diagrams shall be attached to the control panels. Installation, operating and maintenance bulletins and start-up forms shall be supplied with each unit.
- H. Performance: All scheduled capacities and face areas are the minimum accepted value. All scheduled amps, KW, and HP are maximum accepted values that allow scheduled capacity to be met.

2.03 CABINET

- A. Exterior surfaces shall be constructed of pre-painted galvanized steel for aesthetics and long term durability. Paint finish to include a base primer with a high quality, polyester resin topcoat of a neutral beige color. Finished surface to withstand a minimum 750-hour salt spray test in accordance with ASTM B117 standard for salt spray resistance.
- B. Lifting brackets shall be provided on the unit base with lifting holes to accept cable or chain hooks.

2.04 ELECTRICAL

- A. Unit wiring shall comply with NEC requirements and with all applicable UL standards. All electrical components shall be UL recognized where applicable. All wiring and electrical components provided with unit shall be number and color coded and labeled according to the electrical diagram provided for easy identification. The unit shall be provided with a factory wired weatherproof control panel. Unit shall have a power terminal block for main power connection. A terminal board shall be provided for low voltage control wiring. Branch circuit short circuit protection, 115 volt control circuit transformer and fuse, system switches, and a high temperature sensor. Each compressor and condenser fan motor shall be furnished with contactors and inherent thermal overload protection. Knockouts shall be provided in the side of the main control panels for field wiring entrance. All 115-600 volt internal and external wiring between control boxes and components shall be protected from damage by raceways or conduit.
- B. The receptacle shall be powered by a field supplied 115V source.
- C. Single terminal block shall be provided for connecting electrical power at the unit.
- D. Unit SCCR rating to be 10 kAIC.
- E. Unit shall be provided with a 24 volt transformer and terminal strip for field supplied controls.

2.05 CONDENSING SECTION

- A. Air Cooled Condenser
 - 1. Units shall have at least one head pressure sensing condenser fan controlled to maintain positive head pressure.
 - 2. The condensing section shall be open on the sides and bottom to provide access and to allow airflow through the coils. Condenser coils shall be multi-row and fabricated from cast aluminum micro-channel coils. Each condenser coil shall be factory leak tested with high-pressure air under water. Coils are to be recessed so that the cabinet provides built in hail protection.
 - 3. Condenser fans shall be direct drive, propeller type designed for low tip speed, vertical air discharge, and include service guards. Fan blades shall be constructed of steel and riveted to a steel center hub. Condenser fan motors shall be heavy-duty, inherently protected, three-phase, non-reversing type with permanently lubricated ball bearing and integral rain shield.
- B. Scroll Compressors
 - 1. Each unit shall have multiple, heavy-duty Copeland scroll compressors.
 - 2. Each compressor shall be complete with gauge ports, crankcase heater, sight-glass, anti-slug protection, motor overload protection and a time delay to prevent short cycling and simultaneous starting of compressors following a power failure.
 - 3. Compressors shall be isolated with resilient rubber isolators to decrease noise transmission.
- C. Refrigeration Circuit
 - 1. Each unit shall have two independent refrigeration circuits. Each circuit shall be complete with low pressure control, liquid line charging valve with a 3/8" charging port, a manual reset high pressure safety switch. Each circuit shall be dehydrated and leak tested.
 - 2. Each circuit shall be dehydrated and factory charged with 410-A Refrigerant and oil. Refrigeration capacity control shall be accomplished by staging of the unit's multiple compressors. All compressor capacity control staging shall be controlled by the factory installed main unit control system.
- D. Hot gas bypass capped T shall be factory installed on the discharge line of refrigerant circuits.

2.06 CONTROLS

- A. Unit shall be equipped with a 120V terminal strip for field supplied and installed controls.

2.07 MISC FEATURES

- A. Neoprene Isolators: Provide field-installed rubber-in-shear isolators.
- B. Low Ambient Control: Electronic head pressure control that allows operation to 0 degree F outdoor ambient.
- C. Condenser Coil guard: Metal grille with Polyvinyl chloride coating to cover condenser coil area.

2.08 WARRANTY

- A. The manufacturer shall provide 12 month parts only warranty. Defective parts will be repaired or replaced during the warranty period at no charge. The warranty period shall commence at start up, or 6 months after shipment, which ever occurs first.

PART 3: EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide for connection to electrical service.
- C. Install units on vibration isolation.
- D. Install units on elevated structural platform.
- E. Provide connection to refrigeration piping system and evaporators.
- F. Provide float switch in respective air handling unit auxiliary drain pan, respective condensing unit to de-energize when float switch is tripped.

END OF SECTION

9-2-25

SECTION 23 7313 - MODULAR INDOOR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 SUMMARY

- A. Section Includes:
 - 1. Variable-air-volume, multiple zone air-handling units.

1.4 ACTION SUBMITTALS

- A. Product Data: For each air-handling unit indicated.
 - 1. Unit dimensions and weight.
 - 2. Cabinet material, metal thickness, finishes, insulation, and accessories.
 - 3. Fans:
 - a. Certified fan-performance curves with system operating conditions indicated.
 - b. Certified fan-sound power ratings.
 - c. Fan construction and accessories.
 - d. Motor ratings, electrical characteristics, and motor accessories.
 - 4. Certified coil-performance ratings with system operating conditions indicated.
 - 5. Dampers, including housings, linkages, and operators.
 - 6. Filters with performance characteristics.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Floor plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Mechanical-room layout and relationships between components and adjacent structural and mechanical elements.
 - 2. Support location, type, and weight.
 - 3. Field measurements.
- B. Operation and Maintenance Data: For air-handling units to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Filters: One set for each air-handling unit.

1.7 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NFPA Compliance: Comply with NFPA 90A for design, fabrication, and installation of air-handling units and components.
- C. ARI Certification: Air-handling units and their components shall be factory tested according to ARI 430, "Central-Station Air-Handling Units," and shall be listed and labeled by ARI
- D. Comply with NFPA 70.

1.8 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.

- B. Coordinate sizes and locations of structural-steel support members, if any, with actual equipment provided.

1.9 WARRANTY

- A. The complete unit shall be covered by a parts warranty issued by the manufacturer covering the first year of operation. This warranty period shall start at the date of substantial completion. Contractor to extend manufacturer warranties to start from this date.
- B. The installing contractor shall provide labor warranty during the unit's first year of operation, from date of substantial completion.

PART 2 - PRODUCTS

2.0 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Daikin

2.01 GENERAL DESCRIPTION

- A. Units shall ship in the number of sections necessary to meet project requirements and shall ship in as many splits as specified in selection software. Split options as follows:
 - 1. Shipped in sections — shipping split.
 - 2. Shipped assembled.
- B. Unit shall be factory-supplied, central station air handler. The air-handling unit may consist of a fan with the factory-installed components as indicated on the equipment schedule & details.

2.02 CASING

- A. Construction:
 - 1. Unit shall be constructed of a complete frame with easily removable panels. Removal of any panel shall not affect the structural integrity of the unit.
 - 2. All units shall be supplied with 14-gage or heavier, G-90 galvanized steel base rails. Bolton legs are NOT acceptable. Perimeter lifting lugs for overhead lifting shall be provided on each shipping section. Slings units in place of lifting lugs shall not be acceptable.
 - a. Base rail to be 10" height as to properly trap condensate drain piping.
 - 3. Unit shall be thermally broken to minimize the conduction path from the inside of the casing to the outside.
 - 4. Casing panels (top, sides, and bottom) shall be constructed of galvanized steel, and shall have one of the following exterior finishes as specified:
 - a. Pre-painted with a baked enamel finish passing 500-hour salt spray test (ASTM B-117) for pre-painted steel and 125-hour marine level 1 cohesion test (ASTM G-85.A5) for pre-painted steel.
 - 5. Casing panels (top, sides, and bottom) shall be constructed of galvanized steel, and shall have one of the following interior finishes as specified:
 - a. Pre-coated with a silver zeolite antimicrobial material registered by the US EPA for use in HVAC applications.
 - 6. Casing panels (top, sides, and bottom) shall be one piece, double-wall construction with insulation sealed between the inner and outer panels. Panel assemblies shall not carry an R-value of less than 13.
 - 7. Casing deflection shall not exceed a 1:200 ratio when subject to an internal pressure of ± 8 -in. wg. Casing leakage rate shall be less than 1% at 8 in. wg of nominal unit airflow or 50 cfm, whichever is greater. Leakage rate shall be tested and documented on a routine basis on random production units. Optionally, factory witness leak testing and/or test reports shall be available.
 - 8. Side panels shall be easily removable for access to unit and shall seal against a full perimeter automotive style gasket to ensure a tight seal.

9. The panel retention system shall comply with UL 1995 which states all moving parts (for example, fan blades, blower wheels, pulleys, and belts) that, if accidentally contacted, could cause bodily injury, shall be guarded against accidental contact by an enclosure requiring tools for removal.
10. Accessibility options shall be as follows:
 - a. Hinged double-wall access door on either side with removable access panel(s) on the other side.
11. Fan supports, structural members, panels, or flooring shall not be welded, unless aluminum, stainless steel, or other corrosion-resistant material is used. Painted welds on unit exterior steel or galvanized steel are not acceptable.
13. All coil sections shall be double-wall construction with insulation sealed between the inner and outer panels. Panel assemblies shall not carry an R-value of less than 13. Single height coil sections shall have removable frame sections to facilitate vertical coil extraction.
14. Blow-thru sections shall have a diffuser plate as an integral part of the fan section.

B. Access Doors:

Access doors shall be one piece, double-wall construction with insulation sealed between the inner and outer panels. Panel assemblies shall not carry an R-value of less than 13.

C. Drain Pans:

Drain pans shall be insulated double-wall stainless steel construction. The pan shall be sloped toward the drain connection. Drain pan shall have 1 1/2-in. MPT connection exiting through the hand side or opposite side of the casing as specified. One drain outlet shall be supplied for each cooling coil section. Drain pan shall allow no standing water and comply with ASHRAE Standard 62.1-2010. Where 2 or more coils are stacked in a coil bank, intermediate drain pans shall be provided and the condensate shall be piped to the bottom drain pan. The bottom coil shall not serve as a drain path for the upper coil.

2.03 FANS

A. General:

1. Direct drive plenum fan sections shall have TWO single width single inlet (SWSI) airfoil fan wheel. Airfoil blades shall be double thickness design continuously welded to the back plate and the front plate. Fan wheel shall be constructed of aluminum. Airfoil blades shall be aluminum extrusions and shall be top welded to the back plate and front plate of the wheel. Fan wheel shall be dynamically balanced per ISO standard 1940 quality grade G6.3.
2. Fan assembly vibration shall not exceed 0.248 in. per second when mounted on active isolators. Vibration shall be measured in both vertical and horizontal directions at the specified fan operating speed using specified motor. Accelerometers shall be mounted on the motor near the bearing locations.
3. All fan sled components shall provide corrosion protection to pass 100-hour salt spray test per ASTM B-117.
4. Fan wheels shall be keyed to the shaft and shall be designed for continuous operation at maximum rated fan speed and motor horsepower. Fan wheels and shafts shall be selected with a maximum operating speed 25% below the first critical.

B. Performance Ratings:

Fan performance shall be rated and certified in accordance with AHRI Standard 430, latest edition.

C. Sound Ratings:

Manufacturer shall submit first through eighth octave sound power for fan discharge and casing radiated sound. Sound ratings shall be tested in accordance with AHRI 260.

D. Mounting:

Fan scroll, wheel, shaft, bearings, drives, and motor shall be mounted on a common base assembly. The base assembly is isolated from the outer casing with factory-installed isolators and

rubber vibration absorbent fan discharge seal. A canvas style duct connection between fan discharge and cabinet is not acceptable. Units shall use 2-in. deflection spring isolators.

E. Fan Accessories:

1. Direct Drive Plenum Fans:

- a. Variable frequency drives.
- b. Motor protection box for motor current protection with a single VFD driving multiple motors.
- c. Airflow measuring piezo ring.
- d. Piezo ring transducer.
- e. Motor shaft grounding ring.
- f. Inlet guard.
- g. Outlet guard.

F. Flexible Connection:

The base assembly is isolated from the outer casing with factory-installed isolators and rubber vibration absorbent fan discharge seal. A canvas style duct connection between fan discharge and cabinet is not acceptable.

2.04 BEARINGS AND DRIVES

A. BEARINGS

All plenum fans shall be direct drive.

B. Shafts:

Fan shafts shall be solid steel, turned, ground, polished and coated with a rust inhibitor.

2.05 COILS

- A. Coils section header end panel shall be removable to allow for removal and replacement of coils without impacting the structural integrity of the unit.
- B. Install coils such that headers and return bends are enclosed by unit casing to ensure that if condensate forms on the header or return bends, it is captured by the drain pan under the coil.
- C. Coils shall be manufactured with plate fins to minimize water carryover and maximize airside thermal efficiency. Fin tube holes shall have drawn and belled collars to maintain consistent fin spacing to ensure performance and air pressure drop across the coil as scheduled. Tubes shall be mechanically expanded and bonded to fin collars for maximum thermal conductivity. Use of soldering or tinning during the fin-to-tube bonding process is not acceptable due to the inherent thermal stress and possible loss of bonding at that joint.
- D. Construct coil casings of 16GA stainless steel. End supports and tube sheets shall have belled tube holes to minimize wear of the tube wall during thermal expansion and contraction of the tube.
- E. When two or more cooling coils are stacked in the unit, an intermediate drain pan shall be installed between each coil. The intermediate drain pan shall be designed being of sufficient size to collect all condensation produced from the coil and sloped to promote positive drainage to eliminate stagnant water conditions. The intermediate drain pan shall be constructed of the same material as the sections primary drain pan.
- F. The intermediate drain pan shall begin at the leading face of the water-producing device and be of sufficient length extending downstream to prevent condensate from passing through the air stream of the lower coil.
- G. Hydronic Coils
 1. Supply and return header connections shall be clearly labeled on unit exterior such that direction of coil water-flow is counter to direction of unit air-flow.
 2. Coils shall be proof-tested to 300 psig and leak-tested to 200 psig air pressure under water.
 3. Headers shall be constructed of round copper pipe or cast iron.

4. Tubes shall be 1/2-inch .016 copper, with aluminum fins.
5. Hydronic coils shall be supplied with factory installed drain and vent piping to the unit exterior.

H. Refrigerant Coils:

1. Headers shall be constructed of copper with brazed joints.
2. Standard circuiting selections include:
 - A. Row split intertwined, multiple distributor arrangement for sizes 03-110.
3. Replaceable nozzle, brass refrigerant distributors and seamless copper distribution tubes are supplied to ensure uniform flow.
4. Submittals must include a DX coil and condensing unit cross plot to show that the coil and condensing unit capacity match at the rated design conditions.

2.06 FILTER SECTIONS

- A. Angle filter sections shall accept either 2-in. or 4-in. filters of standard sizes, arranged in a horizontal V formation.
- B. Magnehelic Gages:
 1. Housing shall be constructed of a die cast aluminum case and bezel with acrylic cover. Exterior finish shall be coated gray to withstand 168 hr salt spray corrosion test.
 2. Accuracy shall be $\pm 2\%$ of full scale throughout range at 70 F (21.1 C).
 3. Pressure limits shall be -20 in. Hg to 15 psig (0.677 bar to 1.034 bar).
 4. Overpressure relief plugs shall open at approximately 25 psig (1.72 kPa).
 5. Temperature limits shall be 20 to 140 F (-6.67 to 60 C).
 6. Diameter of dial face shall be 4 in. (101.6 mm).
 7. Process connections shall be 1/8-in. female NPT duplicate high and low pressure taps — one pair side and one pair back.

2.07 DAMPERS

Factory-supplied dampers shall be warranted to be free from defects in material and workmanship for a period of 12 months after being installed or placed in service, but in no instance shall the period of warranty be longer than 18 months from the date of the original shipment by the manufacturer.

- A. Mixing boxes, filter-mixing boxes, and exhaust boxes shall have parallel or opposed blades and interconnecting outside-air and return-air dampers.
 1. Premium Dampers:

Damper blades shall be constructed of galvanized steel with a double-skin airfoil design, with blade seals and stainless steel jamb seals. Blades shall be mechanically fastened to axle rods rotating in self-lubricating synthetic bearings. Maximum leakage rate shall be 2 cfm/ft² at 1 in. wg (0.25 kPa) differential pressure.

2.08 FACTORY MOUNTED MOTOR REMOVAL TROLLEY SYSTEM

1. All direct drive & belt drive plenum fan sections shall have a factory provided/mounted motor removal trolley system to facilitate fan motor replacement and maintenance. The trolley system shall be suspended from the ceiling of the fan section and be rated to handle the maximum total weight of the fan motor and trolley system.

2.09 DISCHARGE PLENUM

- A. Units to be equipped with discharge plenum, same construction as unit casing. Provide factory opening with unit mounted electric heater.

2.10 ELECTRIC HEATING SECTION

- A. Not used.

2.11 ULTRAVIOLET (UV-C) LIGHTS

1. Not used.

2.12 ELECTRICAL ACCESSORIES:

A. Disconnects:

1. Fused and non-fused disconnects shall have the following characteristics:
 - a. Visible blades.
 - b. Quick-make, quick-break operating mechanism.
 - c. Cover padlock hasp and handle lock "OFF."
 - d. 240 vac maximum.
 - e. Factory supplied and installed class RK5 fuses (fused disconnects only).
 - f. Up to 100,000 rms symmetrical amperes SCCR, utilizing appropriately rated, factory-supplied Class R fuses.
 - g. Horsepower rated for motor applications.
 - h. Tangential combination knockouts for field wiring.
 - i. Spring reinforced plated copper fuse clips.
 - j. NEMA type 1 enclosures.
 - k. Insulated, bondable solid neutral assemblies.
 - l. UL listed, File E2875.
 - m. Meet or exceed NEMA KS1-1990.

B. Variable Frequency Drives (unit mounted):

1. Refer to specification 23 05 14 "Variable Frequency Drives".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine casing insulation materials and filter media before air-handling unit installation. Reject insulation materials and filter media that are wet, moisture damaged, or mold damaged.
- C. Examine roughing-in for refrigerant and condensate drainage piping systems and electrical services to verify actual locations of connections before installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Equipment Mounting:
 1. Install air-handling units on 1" neoprene waffle pads on auxiliary drain pan directly on mechanical room/mezzanine floor.

3.3 CONNECTIONS

- B. Comply with requirements for piping specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- C. Install piping adjacent to air-handling unit to allow service and maintenance.
- D. Connect piping to air-handling units mounted on vibration isolators with flexible connectors.
- E. Connect condensate drain pans using, ASTM B 88, Type L copper tubing. Extend to nearest equipment or floor drain. Construct deep trap at connection to drain pan and install cleanouts at changes in direction.
- F. Refrigerant Piping: Comply with applicable requirements in Section 232300 "Refrigerant Piping". Install refrigerant piping in strict accordance with manufacturer's recommendations.
- G. Connect duct to air-handling units with flexible connections. Comply with requirements in Section 233300 "Air Duct Accessories."

3.4 FIELD QUALITY CONTROL

- H. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- I. Tests and Inspections:
 - 1. Leak Test: After installation, fill water and steam coils with water, and test coils and connections for leaks.
 - 2. Fan Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 3. Filter Operational Test: Pressurize housing to a minimum of 6-inch wg or to designed operating pressure, whichever is higher; test housing joints, door seals, and sealing edges of filter with soapy water to check for air leaks.
- J. Air-handling unit or components will be considered defective if unit or components do not pass tests and inspections.
- K. Prepare test and inspection reports.

3.5 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
 - 2. Verify that shipping, blocking, and bracing are removed.
 - 3. Verify that unit is secure on mountings and supporting devices and that connections to piping, ducts, and electrical systems are complete. Verify that proper thermal-overload protection is installed in motors, controllers, and switches.
 - 4. Verify proper motor rotation direction, free fan wheel rotation, and smooth bearing operations. Reconnect fan drive system, align belts, and install belt guards.
 - 5. Verify that bearings, pulleys, belts, and other moving parts are lubricated with factory-recommended lubricants.
 - 6. Verify that zone dampers fully open and close for each zone.
 - 7. Verify that face-and-bypass dampers provide full face flow.
 - 8. Verify that outdoor- and return-air mixing dampers open and close, and maintain minimum outdoor-air setting.
 - 9. Comb coil fins for parallel orientation.
 - 10. Verify that proper thermal-overload protection is installed for electric coils.
 - 11. Install new, clean filters.
 - 12. Verify that manual and automatic volume control and fire and smoke dampers in connected duct systems are in fully open position.
- B. Starting procedures for air-handling units include the following:
 - 1. Energize motor; verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated rpm.
 - 2. Measure and record motor electrical values for voltage and amperage.
 - 3. Manually operate dampers from fully closed to fully open position and record fan performance.

3.6 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing" for air-handling system testing, adjusting, and balancing.

3.7 CLEANING

- A. After completing system installation and testing, adjusting, and balancing air-handling unit and air-distribution systems and after completing startup service, clean air-handling units internally

to remove foreign material and construction dirt and dust. Clean fan wheels, cabinets, dampers, coils, and filter housings, and install new, clean filters.

3.8 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain air-handling units.

3.9 prior to The Mechanical Contractor shall verify that the following items have been completed scheduling the AHU manufacturer's final inspection and start up:

1. All spring-isolated components have had their shipping restraints removed and the components have been leveled.
2. On all field-joined units, that all interconnections have been completed, i.e., electrical and control wiring, piping, casing joints, bolting, welding, etc.
3. All refrigerant/water/steam piping connections have been completed and hydrostatically tested and all water flow rates have been set in accordance with the capacities scheduled on the Drawings.
4. All ductwork connections have been completed and all ductwork has been pressure tested for its intended service.
5. All power wiring, including motor starters and disconnects, serving the unit has been completed.
6. All automatic temperature and safety controls have been completed.
7. All dampers are fully operational.
8. All shipping materials have been removed.

3.10 LEVELING

1. The Mechanical Contractor shall level all unit sections in accordance with the unit manufacturer's instructions. The Mechanical Contractor shall provide and install all necessary permanent shim material to ensure individual sections and entire assembled units are level.

END OF SECTION

9-2-25

SECTION 23 81 27 - DUCTLESS SPLIT SYSTEM AIR CONDITIONERS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Ductless Split Air Conditioning Unit
- B. Refrigeration Cooling Coil
- C. Controls

1.2 RELATED WORK

- A. Section 200100: General Provisions

1.3 QUALITY ASSURANCE

- A. Conform to requirements of AGA, UL and applicable codes.
- B. B. Cooling system tested and rated to ARI Standard 210.

1.4 SUBMITTALS

- A. Submit manufacturer's installation instructions.
- B. Submit manufacturer's descriptive literature, operating instructions, and maintenance and repair data.

PART 2 - PRODUCTS

2.1 DUCTLESS SPLIT SYSTEM AIR CONDITIONER(S)

- A. General: Indoor, direct-expansion, wall mounted fan coil, as noted on schedule. Unit shall be complete with cooling/heating coil, fan, fan motor, piping connectors, electrical controls, microprocessor control system, and integral temperature sensing. Unit shall be furnished with integral wall-mounting bracket, mounting hardware, and thermistor interconnection cable .
- B. Unit Cabinet: Cabinet discharge and inlet grilles shall be attractively styled, high-impact polystyrene. Cabinet shall be fully insulated for improved thermal and acoustic performance.
- C. Fans: Fan shall be tangential direct-drive blower type with air intake at the upper front face of the unit and discharge at the bottom front. Automatic, motor-driven vertical air sweep shall be provided standard. Air sweep operation shall be user selectable. Horizontal direction may be manually adjusted (using remote controller) and vertical air sweep may be manually set.
- D. Coil: Coil shall be copper tube with aluminum fins and galvanized steel tube sheets. Fins shall be bonded to the tubes by mechanical expansion. A drip pan under the coil shall have a drain connection for hose attachment to remove condensate. Condensate pan shall have internal trap and auxiliary drip pan under coil header. NOTE: The units use the accessory AccuRatert piston refrigerant metering device in the indoor unit (for cooling) and at the outdoor unit liquid line service valve for heating.
- E. Motors: Motors shall be open drip-proof, permanently lubricated ball bearing with inherent overload protection. Fan motors shall be 3-speed.
- F. Controls: Controls shall consist of a microprocessor-based control system which shall control space temperature, determine optimum fan speed, and run self diagnostics. The temperature control range shall be from 64 F to 84 F. The unit shall have the following functions as a minimum:
 - 1. An automatic restart after power failure at the same operating conditions as at failure.
 - 2. A timer function to provide a minimum 24-hour timer cycle for system Auto Start/Stop.
 - 3. Temperature-sensing controls shall sense return-air temperature. Indoor-air high discharge temperature shutdown shall be provided.

4. Indoor coil freeze protection.
 5. Wireless infrared remote control to enter set points and operating conditions.
 6. Auto Stop features shall have integral setback control.
 7. Automatic airsweep control to provide on or off activation of airsweep louvers.
 8. Dehumidification mode shall provide increased latent removal capability by modulating system operation and set point temperature.
 9. Fan-only operation to provide room air circulation when no cooling is required.
 10. Diagnostics shall provide continuous checks of unit operation and warn of possible malfunctions. Error messages shall be displayed at the unit and at the remote controller.
 11. An indoor to outdoor thermistor connection cable shall be provided with the fan coil unit.
 12. Fan speed control shall be user-selectable: high, medium, low, or microprocessor automatic operation during all operating modes.
 13. A time delay shall prevent compressor restart in less than 3 minutes.
 14. Automatic heating-to-cooling changeover to provide automatic heating and cooling operation. Control shall include deadband to prevent rapid mode cycling.
 15. Demand defrost shall be provided and shall minimize defrost cycles by internally adjusting defrost timing based on frost accumulation.
 16. Indoor coil high temperature protection shall be provided to detect excessive indoor discharge temperature when unit is in heat pump mode.
 17. Refrigerant to be R-410a.
- G. Filters: Unit shall have filter track with factory-supplied cleanable filters.
- H. Electrical Requirements: Refer to schedule on drawings.
- I. Refrigerant Lines: All units shall have rotatable refrigerant lines for penetration through the wall using flare connections. All units shall have flare connections.
1. All refrigerant lines material & installation shall be in accordance with manufacturers recommendation.
 - a. Refrigerant piping shall be Type "ACR" hard drawn copper tubing (ASTM B280 compliant) attached with wrought copper fittings, utilizing 1000-degree silver solder and a non-corrosive flux. Refrigerant piping shall be sized and installed in strict accordance with the air conditioning unit manufacturer's recommendations and directions and shall be submitted to the Engineer for prior approval before installation. Pressure drops shall not exceed the equivalent of 2-psi. Refrigerant piping system shall be evacuated, charged with refrigerant holding charge. The refrigerant lines to be tested with nitrogen to a test pressure of not less than 450 psi and proved before final charge of refrigerant. Compressor shall not be subject to the 450 psi pressure test.
- J. Special Features (Field Installed):
1. Condensate Pump: The condensate pump shall remove condensate from the drain pan when gravity drainage cannot be used. Pump shall be designed for quiet operation. Pump shall consist of two parts: an internal reservoir/sensor assembly, and a remote sound-shielded pump assembly. The lift capability of the condensate pump shall be 1 to 10 ft (009 size unit) or 3 to 25 ft (012-024 size units). A level sensor on the condensate pan shall stop cooling operation if the level in the condensate pan is unacceptable.
 2. Not used.
- K. Warranty: Unit to include five year warranty, compressor along with all parts, including labor and refrigerant.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in strict accordance with manufacturer's recommendations.
- B. Pipe condensate drain as shown on the drawings or to nearest plumbing vent if not shown with "P" trap.
- C. System(s) shall be installed according to manufacturer's instructions & recommendations, as well as, all governing local & national codes. System(s), as well as the infrared remote controller, shall be mounted & placed as shown on plans within all minimum clearances as specified by manufacturer's instructions, & secured to provide for safe operation. Refrigerant tubing size shall not vary from manufacturer's specifications, and shall be properly secured & insulated. Installer shall insulate both liquid & suction lines individually on Low Ambient specified system(s). High voltage & low voltage communication wiring between indoor & outdoor unit(s) shall be run separately from each other in their own enclosures per manufacturer's instructions. Outdoor condensers shall be mounted & secured to accommodate for extreme weather conditions. Distance between indoor & outdoor unit(s) shall not exceed manufacturer's recommendations.

END OF SECTION

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SECTION 23 8218 - VERTICAL STACK FAN COIL UNIT

PART 1 – GENERAL

1.1 GENERAL

- A. Furnish and install Vertical Direct Drive Fan Coil Units or approved equal where indicated on the plans and in the specifications. Units shall be completely factory assembled, tested and shipped as one piece. All units shall be capable of meeting or exceeding the scheduled capacities for cooling, heating and air delivery. All unit dimensions for each model and size shall be considered maximums. Units shall be ETL listed in compliance with UL/ANSI Standard 1995, and be certified as complying with the latest edition of ARI Standard 440.

1.2 CONSTRUCTION

- A. All unit chassis shall be fabricated of heavy gauge galvanized steel panels able to meet 125 hour salt spray test per ASTM B-117. All exterior panels shall be insulated with 1/2" thick elastomeric closed cell foam type insulation with a maximum k value of .24 (BTU • in) / (hr • ft² • °F) and rated for a maximum air velocity of 5000 f.p.m. Insulation must meet all requirements of ASTM C1071 (including C665), UL 181 for erosion, and carry a 25/50 rating for flame spread/smoke developed per ASTM E-84, UL 723 and NFPA 90A.
- B. Fan coil units to be provided with discharge supply air plenum with multiple outlets for duct connections or discharge grilles (as shown on drawings). Fan coil units to be provide with no exposed fasteners (rivets, heads of screws, etc.).
- C. Unit with multiple outlets shall include an insulated sheet metal baffle inside the discharge plenum to break the sight lines between the two discharge outlets and to attenuate room noise that could be transmitted through the openings.
- D. All unit panels shall have knockouts for supply air openings and riser slots to facilitate the field conversion of riser location and supply air grille location. Supply air opening knockouts shall be factory sealed and left in place during shipping and staging at the job site.
- E. Where supply grilles are required, fan coil unit must include an architectural double deflection discharge grille. Where duct connections are required, unit shall be provided with a duct collar.
- F. All units shall have decorator front panels fabricated of not less than 18 gauge galvanized steel. The front panel shall include a stamped louver return air grille and be attached with quarter turn quick open fasteners to allow for easy removal and access for service.
- G. All exposed units shall have exterior panels fabricated of not less than 18 gauge galvanized steel. The front panel shall be attached with quarter turn quick open fasteners to allow for easy removal and access for service.
- H. Elastomeric Closed Cell Foam Insulation shall be provided in lieu of standard. Insulation shall conform to UL 181 for erosion and NFPA 90A for fire, smoke and melting, and comply with a 25/50 Flame Spread and Smoke Developed Index per ASTM E-84 or UL 723. Additionally, insulation shall comply with Antimicrobial Performance Rating of 0, no observed growth, per ASTM G-21. Polyethylene insulation is not acceptable.

PART 2 – PRODUCTS

2.1 PAINTED FINISH

- A. The vertical fan coil units shall be delivered to the site factory primed to receive field paint (re: specification section 0990 – Painting). The unit manufacturer shall verify

compatibility of primer with the field top coat, prior to fabrication. Manufacturer shall clean and prepare the surfaces of mechanical units to receive primer to assure complete adhesion of the primer coat. If Architect determines the primer is unacceptable for field top-coating, the units shall be rejected. Any corrective work shall be performed by the Unit Manufacturer, at no cost to the Owner. Powder coat priming is acceptable, based on compatibility with field top coat.

2.2 SOUND

- A. Units shall have published sound power level data tested in accordance with ARI Standard 350-2000.

2.3 FAN ASSEMBLY

- A. Unit fan shall be dynamically balanced, forward curved, DWDI centrifugal type constructed of 18 gauge galvanized steel for corrosion resistance. Motors shall be high efficiency ECM type for infinite modulation of the supply fan and quiet operation. Motors shall be provided with UL and CSA listed automatic reset thermal overload. PSC-type fan motors or motors with multiple fan speeds/taps shall not be acceptable.
- B. The fan assembly shall be removed and serviced through the front and safety panels. The entire assembly shall be able to come out of the unit easily by removing two lock nuts and unplugging the motor.

2.4 COILS

- A. All cooling and heating coils shall optimize rows and fins per inch to meet the specified capacity. Coils shall have seamless copper tubes and shall be mechanically expanded to provide an efficient, permanent bond between the tube and fin. Fins shall have high efficiency aluminum surface optimized for heat transfer, air pressure drop and carryover.
- B. All coils shall be hydrostatically tested at 450 PSIG air pressure under water, and rated for a maximum 300 PSIG working pressure at 200°F.
- C. Heating coils shall be furnished in the reheat position as standard.
- D. All water coils shall be provided with a manual air vent fitting to allow for coil venting.

2.5 DRAIN PANS

- A. Primary condensate drain pans shall be single wall, heavy gauge stainless steel for corrosion resistance, and extend under the entire coil section. Drain pans shall be of one piece construction and be positively sloped for condensate removal. A P-Trap shall be furnished, factory piped to the condensate drain riser. The drain pan shall be externally insulated with fire retardant, closed cell foam insulation. The insulation shall carry no more than a 25/50 Flame Spread and Smoke Developed Rating per ASTM E-84 and UL 723 and an Antimicrobial Performance Rating of 0, no observed growth, per ASTM G-21. The P-Trap shall be easily removed and serviced through the front panel.

2.6 FILTERS

- A. All units shall be furnished with a minimum 1" pleated 30% (MERV 13) filter. Filters shall be tight fitting to prevent air bypass. Filters shall be easily removable from the return air opening with the front panel removed, without the need for tools.

2.7 ELECTRICAL

- A. Units shall be furnished with single point power connection. Provide an electrical junction box with terminal strip for motor and other electrical terminations. The factory mounted terminal wiring strip consists of a multiple position screw terminal block to facilitate wiring terminations for the electric control valves and thermostats.

- B. Provide toggle switch disconnect, locate within fan coil accessible from removing front panel.

2.8 PIPING PACKAGES

- A. Provide a standard factory assembled valve piping package to consist of a 2-way, 3-wire floating point fully modulating control valve (fail-in-place), motorized electric control valve, two ball isolation valves, a flow control valve which can be field replaced without disturbing the unit piping and pressure/temperature taps. Control valves shall be piped normally closed to the coil. Maximum entering water temperature on the control valve shall be 200°F, and maximum close-off pressure 25 PSIG. Maximum operating pressure shall be 300 PSIG.
- B. Piping packages shall include stainless steel braided hoses to allow for thermal expansion within the unit cabinet. The hose shall be EPDM inner lined and Kevlar® reinforced, with stainless steel FNPT swivels and/or fittings. The hoses shall be rated for a maximum 450 PSIG working pressure at 250°F, and shall conform to NFPA 90A and carry no more than a 25/50 Flame Spread and Smoke Developed Rating, per ASTM E-84 and UL 723.
- C. Piping packages shall be completely factory assembled, including interconnecting pipe, and mounted inside the unit in a serviceable location over the coil and primary drain pan.

2.9 RISERS

- A. Furnish chilled and hot water supply and return risers mounted to the unit, with sizes as indicated on the plans. Risers shall be Type-M seamless copper tube and include swaged connections at the top for connection to the unit above. Slip couplings are not acceptable.
- B. Risers shall be insulated with 1/2" closed cell foam insulation covering the entire riser. Insulation shall conform to NFPA 90A and carry no more than a 25/50 Flame Spread and Smoke Developed Rating, per ASTM E-84 and UL 723.
- C. Condensate drain risers shall be Type-L seamless copper tube and meet the requirements stated above.
- D. Risers not to be extended below base of unit. Riser to stop 12" from base of unit to be capped in field for single building floor installation.

2.10 THERMOSTATS

- A. Each unit shall be provided with remote mounted thermostat that wires into each fan coil unit. Thermostats shall be capable of operating modulating control valves and ECM fan motor. Refer to controls specification.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work and opening dimensions are as indicated on shop drawings.
- B. Verify that required utilities are available, in proper location, and ready for use.
- C. Beginning of installation means installer accepts existing surfaces.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

- B. Install fan-coil units as indicated. Coordinate to assure correct recess size.
- C. Protect units with protective covers during balance of construction.
- D. Provide hydronic units with shut-off valve on supply and lockshield balancing valve on return piping. If not easily accessible, extend vent to exterior surface of cabinet for easy servicing. For fan coil units provide float operated automatic air vents with stop valve.

3.03 CLEANING

- A. Clean work.
- B. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.
- C. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials available from manufacturer.
- D. Install new filters.

3.04 FAN COIL UNIT SCHEDULE: Refer to Drawings.

END OF SECTION

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SECTION 23 8219 - HORIZONTAL FAN COIL UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fan-coil units

1.02 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

- A. Section 230900 - Controls and Instrumentation: Installation and wiring of thermostats and other control components.
- B. Section 26 - Equipment Wiring Systems: Electrical connections to building equipment.

1.03 RELATED SECTIONS

- A. Section 230213 - Basic Piping.
- B. Section 230523 - Valves for HVAC Systems.
- C. Section 232116 - Piping Specialties
- D. Section 230900 - Controls and Instrumentation.

1.04 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.
- B. NFPA 90 A & B - Installation of Air Conditioning and Ventilation Systems and Installation of Warm Air Heating and Air Conditioning Systems.
- C. UL 883 - Fan-Coil Units and Room Fan-Heater Units Standard for safety requirements.
- D. UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.
- E. ARI 350 - Standard for Sound Rating of Non-Ducted Indoor Air-Conditioning Equipment.
- F. ANSI S1.32 - Precision methods for the determination of sound power levels of discrete-frequency and narrow-band noise sources in reverberation rooms.
- G. ARI 440 - Room Fan-Coil Air-Conditioners testing and rating standard.
- H. ASHRAE 79 - Methods of testing for Room Fan-Coil Air-Conditioners.
- I. UL 181 - Factory Made Air Ducts and Connectors.

1.05 SUBMITTALS

- A. Submit shop drawings and product data sheets indicating cross section of cabinets, general assembly, and materials used in fabrication.
- B. Submit product data indicating typical catalog of information including arrangements.
- C. Indicate mechanical and electrical service locations and requirements, specifically indicating deviations from indicated products.
- D. Submit manufacturer's installation instructions.

1.06 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data.
- B. Include manufacturers descriptive literature, operating instructions, installation instructions, maintenance and repair data, including filter replacement and unit lubrication.

1.07 REGULATORY REQUIREMENTS

- A. Units must be UL listed as a Fan Coil Unit and meet UL 883 - Fan-Coil Units and Room Fan-Heater Units Standard for Safety requirements.
- B. Unit performance data must be Rated in Accordance with ARI Standard 440, and must display the ARI Symbol on all standard units.
- C. Conform to applicable ANSI/NFPA 70 code for internal wiring of factory wired equipment.

1.08 WARRANTY

- A. Provide a full parts warranty for one year from date of substantial completion.

PART 2 PRODUCTS

2.03 MANUFACTURERS - FAN COIL UNITS

A. General

1. Manufacturers must participate in the ARI Certification program. Unit performance data must be rated in accordance with ARI Standard 440, and must display the ARI Symbol on all standard units.
2. Units must be UL listed as a Fan Coil Unit and meet UL 883 - Fan-Coil Units Standard for Safety requirements.
3. Units to be as specified on drawings.

2.04 FAN COILS

A. Coils:

1. Evenly spaced aluminum fins mechanically bonded to copper tubes, designed for 300 psi and 200 degrees F.
2. Construct tubes of 3/8 inch O.D. minimum, 0.014 inch wall thickness copper and construct fins of aluminum mechanically bonded to the copper tubes. Coil stuouts are 5/8" OD copper tubing.
3. All coils shall be provided with a manual air vent fitting to allow for coil venting.

B. Drain Pan:

1. Provide a positively sloped, non-corrosive drain pan under cooling coil. Acceptable materials include stainless steel - Galvanized steel & polymer not acceptable.
2. Drain pan shall be easily removable for cleaning, with drain connection and overflow connection without disconnecting piping, wiring or unit removal.
3. Unit manufacturer shall furnish and install a drain pan float switch factory wired for unit shutdown".

C. Cabinet:

1. Construction shall be 18 gauge steel, including framing, exposed panels, and edges rounded, easily removed panels.
2. Discharge Arrangements:
 - a. Units shall have a discharge air grille. Where noted, units shall have integral duct collar outlet and/or inlet.
3. Concealed fan coils, cabinet casing not required.
4. All exposed units shall have fan and filter bottom access panel and shall be attached with quarter turn quick open fasteners to allow for easy removal and access for service.
5. Contractor to refer to schedule in drawings for type fan coils, concealed recessed, cabinet, or concealed. All fan coils to be horizontal type.
6. Provide return air telescoping panel extension as to mount fan coil high in ceiling space above return air panel. Typical all horizontal fan coils. If manufacturer doesn't make extension then contractor shall field fabricate extension from return air opening to unit opening with gasket to allow for hinged panel to seal air tight.

D. Cabinet Insulation:

1. Acceptable cabinet insulation shall include:
 - a. Closed-Cell - Interior surface of unit casing is acoustically and thermally lined with a minimum of 1 inch, R-Value 4.3 1.9 lb./cu. ft. foil face insulation. NFPA-90A, UL 181 and bacteriological standard ASTM C 665.
2. Insulation shall meet the following Underwriters' Laboratories Fire Hazard Classification:

Flame Spread 20
Fuel Contributed 15

- E. Finish: All cabinet parts and exposed recessed panels are cleaned, bonderized, phosphatized, and painted with a baked powder finish available in six decorator colors. Standard finish meets ASTM B117 specifications (salt spray test).
- F. Fans: Centrifugal forward-curved double-width, double inlet corrosion resistant wheels, statically and dynamically balanced, direct driven. Fans shall be in the blow through configuration.
- G. Motor: All motors are to be brushless DC (BLDC)/electronically commutated motors (ECM) factory-programmed and run-tested in assembled units. The motor controller shall be mounted in a touch-safe control box with a built-in integrated user interface and LED tachometer. If adjustments are needed, motor parameters can be adjusted through momentary contact switches accessible without factory service personnel on the motor control board. Motors will soft-ramp between speeds to lessen the acoustics due to sudden speed changes. Motors are to be variable speed. The motor will choose the highest speed if there are simultaneous/conflicting speed requests. All motors have integral thermal overload protection with a maximum ambient operating temperature of 104°F and are permanently lubricated. Motors are capable of starting at 50 percent of rated voltage and operating at 90 percent of rated voltage on all speed settings. Motors can operate up to 10 percent over voltage. All controls equipment including ECM control module, low voltage transformers, safety switches, disconnects, fusing, and terminal strips must be located inside the main unit cabinet.
- H. Valve Cycling Control: Thermostat with Off/Auto/Heat/Cool switch, field wired, electrically tested. Thermostat to be located as indicated.

The temperature control system provider shall furnish & install thermostat as shown on drawings (remote mounted). Thermostat to be wired to 2-way control valves and fan according to unit manufacturer. The local thermostat will open and close the hot water and chilled water valve to maintain set point. The unit mounted thermostat/controller shall have set point adjustment. This contractor shall furnish and install a high limit thermostat in the return air of the unit. Unit manufacturer shall be responsible for proper operation of fan coil units. Thermostat to have adjustable deadband for heat & cool control.
- I. Piping Packages:
 - a. Provide a standard factory assembled valve piping package to consist of a 2 or 3-way, 3-wire floating point fully modulating control valve (fail-in-place), motorized electric control valve, two ball isolation valves, a flow control valve which can be field replaced without disturbing the unit piping and unions, pressure-temperature taps/ports. Control valves shall be piped normally closed to the coil. Maximum entering water temperature on the control valve shall be 200°F, and maximum close-off pressure 25 PSIG. Maximum operating pressure shall be 300 PSIG.
 - b. Not used.
 - c. Piping packages shall be completely factory assembled, including interconnecting pipe, and mounted inside the unit in a serviceable location over the coil and primary drain pan.
- J. Filters: Filters shall be concealed from sight and easily removable. Filters shall be located behind an integral access door on horizontal type units. Filters shall be 1" MERV 13. Units equipped with 1" MERV 13 filters shall have a rating based on ASHRAE Standard 52.2. The average dust spot efficiency is no less than 90 percent efficiency on 1–3 micron particles and greater than 90 percent efficiency on 3–10 micron particles when tested in accordance with ASHRAE Test Standard 52.2.
- K. Disconnects: Fan coil units to come equipped with built-in disconnects.
- L. Fresh Air Damper: Not used.
- M. Controls
 - A. Unit shall be supplied with a digital controls ready interface. This interface is to be located inside the control box internal to the main unit. This interface shall include a

- 24VAC transformer and terminal blocks for connections to fan motor control, sensor control, safety switches, valve actuators, and damper control if applicable.
- B. Unit shall be furnished with a disconnect switch. The disconnect switch shall be operable from the outside of the cabinet to reduce hazards during field service and commissioning.
- C. Fan motor control to be furnished as 0-10VDC.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work and opening dimensions are as indicated on shop drawings.
- B. Verify that required utilities are available, in proper location, and ready for use.
- C. Beginning of installation means installer accepts existing surfaces.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Contractor to figure in bid providing new hangers and supports devices for all new fan coil units. Provide new all-threaded rods, beam clamps, intermediate framing, vibration isolators, etc for a complete and new installation. Contractor to figure in bid removal of ceiling tile and ceiling grid as to accommodate the installation of the new fan coil units (replace/repair ceiling grid/tile at completion of installation of fan coil unit). Top of the exposed fan coils shall be flush with the ceiling tile so that no support rods and/or supports members are exposed to view from the finished space.
- C. Contractor to figure in bid installing all new controls per specification 230900. Provide all new wiring & conduits. Modify/patch walls & ceilings as required to accommodate the installation of the new temperature controls system. Contractor to remove existing thermostats, fan switches, etc. and patch/paint wall to match existing.
- D. Install fan-coil units as indicated. Coordinate to assure correct recess size.
- E. Protect units with protective covers during balance of construction.
- F. Provide hydronic units with shut-off valve on supply and lockshield balancing valve on return piping. If not easily accessible, extend vent to exterior surface of cabinet for easy servicing. For fan coil units provide float operated automatic air vents with stop valve.

3.03 CLEANING

- A. Clean work.
- B. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.
- C. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials available from manufacturer.
- D. Install new filters.

3.04 FAN COIL UNIT SCHEDULE: Refer to Drawings.

END OF SECTION

9-2-25

SECTION 23 82 39 - ELECTRIC HEATING EQUIPMENT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.02 SUMMARY

- A. Work Included:
 - 1. Electric Unit Heaters

1.03 SUBMITTALS

- A. General: All submittals shall comply with the requirements of Division 1 - GENERAL REQUIREMENTS and Section 20 01 00 - GENERAL PROVISIONS.
- B. Product Data: data shall be submitted on the following items:
 - 1. Unit Heaters
- C. Operation and Maintenance Data: Data shall be provided on the following items:
 - 1. Unit Heaters

1.04 QUALITY ASSURANCE

- A. Standards:
 - 1. National Electrical Code (NEC)
 - 2. Underwriter's Laboratories (UL)

PART 2 PRODUCTS

2.01 UNIT HEATERS

- A. Unit heaters shall be UL labeled vertical or horizontal discharge type as indicated on the drawings. Heaters shall have steel housing with baked enamel finish, resistance heating elements, integral fan and motor, discharge louvers, mounting bracket and fan/heater controls.
- B. Elements shall be the finned tubular sheathed type and wired to terminal block.
- C. Fan shall be propeller type with permanently lubricated motor.
- D. Discharge louvers on horizontal units shall be individually adjustable. Discharge louvers on vertical units shall be type indicated on the drawings.
- E. Unit heater controls shall include power contactor(s) automatic reset high limit switch, fan delay relay, control power transformer (24 volts), and built-in thermostat.
- F. Mounting bracket, unless indicated otherwise on the drawings, shall be manufacturer's standard bracket.
- G. Manufacturer and Capacity: refer to drawings.

PART 3 EXECUTION

3.01 STORAGE

- A. Electric heating equipment shall be stored in shipping cartons on wooden pallets or rails. Cartons shall be covered with 6 mil (minimum) polyethylene, taped in place.

3.02 INSTALLATION

- A. Unit Heaters:
 - 1. Unit heaters shall be suspended from structure using hanger rods. Where indicated on the drawings to be wall mounted, bracket shall be bolted to hollow masonry wall with spring wing toggle bolts or to solid masonry wall with self tapping anchors.

END OF SECTION

9-2-25

SECTION 26 0100 - ELECTRICAL GENERAL CONDITIONS

PART 1 – GENERAL

1.1 DESCRIPTION

- A. The General Conditions and all pertinent sections are a part of this specification and the Contractor shall consult them in detail for instructions pertaining to his work. He shall consult all other sections of the specifications to determine if he is required to perform any work relative to that particular section.

1.2 SCOPE OF WORK

- A. The work contemplated under this specification comprises the furnishing of all labor and materials required and necessary for the complete installation of electrical wiring in conduit for lighting control and power from the various panelboards to each ultimate outlet hereinafter specified and/or shown on the accompanying drawings. Said work shall be done in accordance with the latest edition of the National Electrical Code and all local codes and ordinances. The specifications are intended to describe a complete workable system and bidders shall report any discrepancies or omissions preventing such workability prior to the time their bids are submitted.
- B. The work covered by this specification shall be as shown on the plans and called for herein, and shall be comprised generally of the following:
 - 1. Furnish and install all conduit and wiring raceways, conductors, disconnects, panels, etc.
 - 2. Furnish and install feeders and branch circuits.
 - 3. Furnish and install service to all mechanical devices.
 - 4. Furnish and install fire alarm and intercom wiring and devices
 - 5. Furnish and install light fixtures.
 - 6. Furnish and install data cabling system.
 - 7. Furnish and install intrusion detection system.
 - 8. Furnish and install sound system at cafetorium.
- C. All equipment installed by this contractor shall be installed in strict accordance with instructions of the manufacturer.
- D. He shall install his work to meet existing conditions as found at the building site.
- E. The Electrical contractor is referred to the Architectural and Structural details for information in regards to the Architectural details. His work shall be done in strict accordance with local and state ordinances governing this class of work.

1.3 REJECTED WORK AND MATERIALS

- A. Should contractor introduce any materials different from those called for and described in specifications or shown on plans, it must on notification from the engineers, be immediately removed from building or premises.

1.4 SHOP DRAWINGS

- A. Before proceeding with work and/or within thirty (30) days award of the General Contract for this work, the Electrical Contractor shall furnish to the Architect/Engineer, complete shop and working drawings of such apparatus, equipment, controls, insulation, etc. to be provided in this project. These drawings shall give dimensions, weights, mounting data, performance curves, and other pertinent information. Shop drawings to be submitted as listed below.
 - 1. Lighting Fixtures
 - 2. Panelboards, switchboards, disconnects, enclosed breakers, and transfer switches
 - 3. Dry type transformers
 - 4. Fire alarm system
 - 5. Intercom system
 - 6. Data cabling system
 - 7. Intrusion detection
 - 8. Conductors (MC cable not allowed)

- 9. Raceways & connectors
- 10. Sound system
- 11. Counterpoise grounding loop components

- B. The contractor may be required to submit shop drawings on any other material he supplies in construction of this project. These drawings shall be submitted at time requested by Architect/Engineer.

1.5 ADDITIONS AND CHANGES

- A. The accompanying drawings show approximate location of feeders, branch circuits, light and power circuits, etc. Complete and accurate details in regard to location of outlets, apparatus, etc. from location shown shall be made before roughing-in and without additional cost to the owner.

1.6 STANDARDS OF MATERIALS AND WORKMANSHIP

- A. All materials shall be new and listed by UL as conforming to its standards. Work shall be executed in a workmanlike manner and present a neat finished appearance when completed.

1.7 PRIOR APPROVAL AND DRAWINGS

- A. Whenever manufacturers or trade names are mentioned in these plans or specifications, the words "or approved equivalent" shall be assumed to follow whether or not so stated. Manufacturers or trade names are used to establish a standard of quality only and should not in any way be construed to infer a preference. Equivalent products which meet the Engineer's approval will be accepted, however these products must be submitted to the Engineer a minimum of ten (10) days prior to bid date. Submission shall include manufacturer's name, model number, rating table and construction features. Upon receipt and checking of this submittal, the Architect will issue an addendum listing items which are approved as equivalent to those specified. Prior approval of a particular piece of equipment does not mean automatic final acceptance and will not relieve the Contractor of the responsibility of assuring himself that this equipment is in complete accord with plans and specifications and will fit into the space provided. Submit shop drawings on all items of equipment for approval as hereinafter specified. The Engineer's approval of shop drawings shall not relieve the Contractor from the responsibility of incorrectly figured dimensions or any other errors that may be contained in these drawings. The omissions from the shop drawings, or specifications, even though approved by the Engineer, shall not relieve this Contractor from furnishing and erecting same. **Prior Approvals submitted electronically will not be accepted.**

1.8 GUARANTEE

- A. The Contractor for this work shall be required to keep the work installed by him in repair and perfect working order for one year from date of completion and final acceptance; said guarantee shall be based on defective materials and substandard workmanship. Contractor shall furnish, free of cost to owner, all materials and labor necessary to comply with this guarantee.

1.9 LAWS, PERMITS AND INSPECTIONS

- A. This contractor shall at his own cost obtain all necessary permits, pay all legal fees and charges, and comply with all building and safety laws, ordinances and regulations relating to the building and the public health and safety, including NEC, NFPA, IBC and OSHA.

1.10 TESTS

- A. After installation is complete and at such time as the Engineers may direct, Contractor shall conduct an operating test for approval. Equipment shall be demonstrated to operate in accordance with requirements of this specification. The test shall be performed in the presence of Engineers. Contractor shall furnish all instruments and personnel required for the test.

1.11 CUTTING AND PATCHING

- A. Contractor shall do all cutting and patching where necessary at his own expense with approval of the Engineers as to cutting of any structural beams or joists, but all patching shall be done by

crafts whose work is involved. After initial surfacing has been done, all further cutting, patching, and painting shall be done at this contractor's expense.

1.12 SAFETY PRECAUTIONS

- A. Contractor shall furnish and place proper guards for prevention of accidents. He shall provide and maintain any other necessary construction required to secure safety of life or property, including maintenance of sufficient lights during all night hours to secure such protection.

1.13 SUPERVISION

- A. Contractor shall personally, or through an authorized and competent representative, constantly supervise the work done from beginning to completion and final acceptance. To the best of his ability he shall keep the same foreman and workmen throughout the project duration. During the progress of the work, it shall be subject to inspection by the representatives of the Engineers, and at these times, the contractor shall furnish the required information.

1.14 INSERTS AND OPENINGS

- A. Contractor shall furnish and install all inserts and hangers required to support conduit, cables, wireways, disconnect switches, etc.

1.15 OPENINGS THROUGH WALLS AND FLOORS

- A. Provide all slots, sleeved holes and other openings necessary through walls and floors, and through any other parts of the structure. Where conduits pass through walls which are intended as rated fire walls, leave-outs, penetrations or sleeves shall be sealed so as not to interfere with the rating of the wall.

1.16 BACKFILLING

- A. Contractor shall be responsible to backfill any trenches for electrical runs under the building, paving, or any area of the site by backfilling the bottom of the trench-up to the top of the conduit with sand, then placing compacted fill in 4" layers using power tamping equipment.

1.17 RECORD DRAWINGS

- A. The Contractor shall be provided with a set of prints of the original bidding documents by the Architect. The Contractor shall then have a set of sepia (reproducible plans) made.
- B. If the Contractor elects to vary from the contract documents and secures prior approval from the architect for any phase of the work, he shall record in a neat and readable manner, ALL such variances on the print in red. These changes shall then be transferred to the permanent set (sepia) at the completion of the job. Both the sepia and the original print shall be returned to the Engineer for documentation.
- C. All deviations from sizes, locations and from all other features of the installations shown in the Contract Documents shall be recorded.
- D. In addition, it shall be possible using these drawings to correctly and easily locate, identify and establish sizes of all piping, directions, and the like, as well as other features of work which will be concealed underground and/or in the finished building. Locations of underground work shall be established by dimensions to columns, lines or walls, locating all turns, etc. and by properly referenced centerline.
- E. For work concealed in the building, sufficient information shall be given so it can be located with reasonable accuracy and ease. In some cases this may be by dimension. In others, it may be sufficient to illustrate the work on the drawings in relation to the spaces in the building near which it was actually installed. Architect's/Engineer's decision in this matter will be final.
- F. The following requirements apply to all "record" drawings:
 - 1. They shall be maintained at the contractor's expense.
 - 2. All such drawings shall be done carefully and neatly and in a form approved by the Engineer.
 - 3. Additional drawings shall be provided as necessary for clarification.
 - 4. They shall be kept up-to-date during the entire course of the work and shall be available upon request for examination by Engineer and when necessary, to establish clearances for other parts of the work.

5. "Record" drawings shall be returned to the Architect upon completion of the work and are subject to approval of the Engineer.
6. The Contractor shall refer to the Architectural section under "RECORD DRAWINGS" for further requirements and procedures.

END OF SECTION 26 01 00

SECTION 26 05 00 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Raceways.
 - 2. Building wire and connectors.
 - 3. Supporting devices for electrical components.
 - 4. Electrical identification.
 - 5. Electricity-metering components.
 - 6. Concrete equipment bases.
 - 7. Electrical demolition.
 - 8. Cutting and patching for electrical construction.
 - 9. Touchup painting.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. FMC: Flexible metal conduit.
- C. IMC: Intermediate metal conduit.
- D. LFMC: Liquidtight flexible metal conduit.
- E. RNC: Rigid nonmetallic conduit.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70, most recent addition.

1.5 COORDINATION

- A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.
 - 1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.
- B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.
- C. Coordinate electrical service connections to components furnished by utility companies.
 - 1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.
 - 2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.
- D. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces. Access doors and panels are specified in Division 8 Section "Access Doors."
- E. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.
- F. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

PART 2 - PRODUCTS

2.1 RACEWAYS

- A. EMT: ANSI C80.3, zinc-coated steel, compression fittings.
- B. FMC: Zinc-coated steel.
- C. IMC: ANSI C80.6, zinc-coated steel, with threaded fittings.
- D. LFMC: Zinc-coated steel with sunlight-resistant and mineral-oil-resistant plastic jacket.
- E. RNC: NEMA TC 2, Schedule 40 PVC, with NEMA TC3 fittings.
- F. Raceway Fittings: Specifically designed for the raceway type with which used.

2.2 CONDUCTORS

- A. Conductors, No. 10 AWG and Smaller: Solid copper.
- B. Conductors, Larger than No. 10 AWG: Stranded copper. (Except when specified otherwise).
- C. Insulation: Thermoplastic, rated at 75 deg C minimum.
- D. Wire Connectors and Splices: Units of size, ampacity rating, material, type, and class suitable for service indicated.

2.3 SUPPORTING DEVICES

- A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.
- B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.
- C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch- diameter slotted holes at a maximum of 2 inches o.c., in webs.
- D. Slotted-Steel Channel Supports: Comply with Division 5 Section "Metal Fabrications" for slotted channel framing.
 - 1. Channel Thickness: Selected to suit structural loading.
 - 2. Fittings and Accessories: Products of the same manufacturer as channel supports.
- E. Nonmetallic Channel and Angle Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- diameter holes at a maximum of 8 inches o.c., in at least one surface.
 - 1. Fittings and Accessories: Products of the same manufacturer as channels and angles.
 - 2. Fittings and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.
- F. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.
- G. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
- H. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.
- I. Expansion Anchors: Carbon-steel wedge or sleeve type.
- J. Toggle Bolts: All-steel springhead type.
- K. Powder-Driven Threaded Studs: Heat-treated steel.

2.4 ELECTRICAL IDENTIFICATION

- A. Identification Devices: A single type of identification product for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and these Specifications
- B. Raceway and Cable Labels: Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and minimum length of color field for each raceway and cable size
 - 1. Type: Pretensioned, wraparound plastic sleeves. Flexible, preprinted, color-coded, acrylic band sized to suit the diameter of the item it identifies.
 - 2. Type: Preprinted, flexible, self-adhesive, vinyl. Legend is overlaminated with a clear, weather- and chemical-resistant coating.
 - 3. Color: Black letters on orange background.
 - 4. Legend: Indicates voltage.
- C. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape, not less than 1 inch wide by 3 mils thick.

- D. Underground Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape with the following features:
 - 1. Not less than 6 inches wide by 4 mils thick.
 - 2. Compounded for permanent direct-burial service.
 - 3. Embedded continuous metallic strip or core.
 - 4. Printed legend that indicates type of underground line.
- E. Tape Markers for Wire: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.
- F. Color-Coding Cable Ties: Type 6/6 nylon, self-locking type. Colors to suit coding scheme.
- G. Engraved-Plastic Labels, Signs, and Instruction Plates: Engraving stock, melamine plastic laminate punched or drilled for mechanical fasteners 1/16-inch minimum thickness for signs up to 20 sq. in. and 1/8-inch minimum thickness for larger sizes. Engraved legend in black letters on white background.
- H. Interior Warning and Caution Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145. Preprinted, aluminum, baked-enamel-finish signs, punched or drilled for mechanical fasteners, with colors, legend, and size appropriate to the application.
- I. Exterior Warning and Caution Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch, galvanized-steel backing, with colors, legend, and size appropriate to the application. 1/4-inch grommets in corners for mounting.
- J. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.

2.5 TOUCHUP PAINT

- A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.
- B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 – EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

- A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.
- B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.
- C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
- D. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 RACEWAY APPLICATION

- A. Use the following raceways for outdoor installations:
 - 1. Exposed: Rigidsteel.
 - 2. Concealed: IMC.
 - 3. Underground, Single Run: RNC.
 - 4. Underground, Grouped: RNC.
 - 5. Connection to Vibrating Equipment: LFMC.
 - 6. Boxes and Enclosures: NEMA 250, Type 3R or Type 4.
- B. Use the following raceways for indoor installations:
 - 1. Exposed: EMT.
 - 2. Concealed: EMT.
 - 3. Connection to Vibrating Equipment: FMC; except in wet or damp locations, use LFMC.
 - 4. Damp or Wet Locations: IMC.
 - 5. Boxes and Enclosures: NEMA 250, Type 1, unless otherwise indicated.

3.3 RACEWAY AND CABLE INSTALLATION

- A. Conceal raceways and cables, unless otherwise indicated, within finished walls, ceilings, and floors.

- B. Install raceways and cables at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Locate horizontal raceway runs above water and steam piping.
- C. Use temporary raceway caps to prevent foreign matter from entering.
- D. Make conduit bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.
- E. Use raceway and cable fittings compatible with raceways and cables and suitable for use and location.
- F. Install raceways below slabs and leave at least 4-inch concrete cover.
 - 1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
 - 2. Space raceways laterally to prevent voids in concrete.
 - 3. Transition from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.
 - 4. Make bends in exposed parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for exposed parallel raceways.
- G. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of the pull wire.
- H. Install telephone and signal system raceways, 2-inch trade size and smaller, in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements, in addition to requirements above.
- I. Connect motors and equipment subject to vibration, noise transmission, or movement with a maximum of 72-inch flexible conduit. Install LFMC in wet or damp locations. Install separate ground conductor across flexible connections.
- J. Set floor boxes level and trim after installation to fit flush to finished floor surface.

3.4 WIRING METHODS FOR POWER, LIGHTING, AND CONTROL CIRCUITS

- A. Feeders: Type THHN/THWN insulated conductors in raceway.
- B. Underground Feeders and Branch Circuits: Type THWN or single-wire conductors in raceway
- C. Branch Circuits: Type THHN/THWN insulated conductors in raceway.
- D. Remote-Control Signaling and Power-Limited Circuits: Type THHN/THWN insulated conductors in raceway for Classes 1, 2, and 3, unless otherwise indicated.

3.5 WIRING INSTALLATION

- A. Install splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- B. Install wiring at outlets with at least 12 inches of slack conductor at each outlet.
- C. Connect outlet and component connections to wiring systems and to ground. Tighten electrical connectors and terminals, according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

3.6 ELECTRICAL SUPPORTING DEVICE APPLICATION

- A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.
- B. Dry Locations: Steel materials.
- C. Support Clamps for PVC Raceways: Click-type clamp system.
- D. Selection of Supports: Comply with manufacturer's written instructions.
- E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb design load.

3.7 SUPPORT INSTALLATION

- A. Install support devices to securely and permanently fasten and support electrical components.

- B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.
- C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
- D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.
- E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.
- F. Install 1/4-inch- diameter or larger threaded steel hanger rods, unless otherwise indicated.
- G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.
- H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.
- I. Simultaneously install vertical conductor supports with conductors.
- J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.
- K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.
- L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.
- M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:
 - 1. Wood: Fasten with wood screws or screw-type nails.
 - 2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
 - 3. New Concrete: Concrete inserts with machine screws and bolts.
 - 4. Existing Concrete: Expansion bolts.
 - 5. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.
 - 6. Steel: Welded threaded studs or spring-tension clamps on steel.
 - a. Field Welding: Comply with AWS D1.1.
 - 7. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
 - 8. Light Steel: Sheet-metal screws.
 - 9. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.8 IDENTIFICATION MATERIALS AND DEVICES

- A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project
- C. Self-Adhesive Identification Products: Clean surfaces before applying.
- D. Identify raceways and cables with color banding as follows:
 - 1. Bands: Pretensioned, snap-around, colored plastic sleeves or colored adhesive marking tape. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.

2. Band Locations: At changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
3. Colors: As follows:
 - a. Fire Alarm System: Red.
 - b. Security System: See Plans.
 - c. Telecommunication System: See Plans.
- E. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.
- F. Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power and communication lines. Locate 6 to 8 inches below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches, overall, use a single line marker.
- G. Color-code 208/120-V and 240/120-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:
 1. Phase A: Black.
 2. Phase B: Red.
 3. Phase C: Blue.
 4. Neutral: White
- H. Color-code 480/277-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:
 1. Phase A: Brown.
 2. Phase B: Orange.
 3. Phase C: Yellow.
 4. Neutral: Gray
- I. Install warning, caution, and instruction signs where required to comply with 29 CFR, Chapter XVII, Part 1910.145, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
- J. Install engraved-laminated emergency-operating signs with white letters on red background with minimum 3/8-inch- high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

3.9 FIRESTOPPING

- A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Firestopping."

3.10 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated. Use 4000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

3.11 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.12 FIELD QUALITY CONTROL

- A. Inspect installed components for damage and faulty work, including the following:
 1. Raceways.

2. Building wire and connectors.
3. Supporting devices for electrical components.
4. Electrical identification.
5. Electricity-metering components.
6. Concrete bases.
7. Electrical demolition.
8. Cutting and patching for electrical construction.
9. Touchup painting.

3.13 REFINISHING AND TOUCHUP PAINTING

- A. Refinish and touch up paint. Paint materials and application requirements are specified in Division 9 Section "Painting."
 1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
 2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
 3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.14 CLEANING AND PROTECTION

- A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.
- B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION 26 05 00

SECTION 26 05 19 – ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.2 SUBMITTALS

- A. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 CONDUCTORS AND CABLES

- A. Manufacturers:
 - 1. American Insulated Wire Corp.; a Leviton Company.
 - 2. General Cable Corporation.
 - 3. Southwire Company.
- B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.
- C. Conductor Material: Copper; solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger. (Except where otherwise Alum feeders specified).
- D. Conductor Insulation Types: Type THHN-THWN, and XHHW complying with NEMA WC 5 or 7.

2.3 CONNECTORS AND SPLICE

- A. Manufacturers:
 - 1. AFC Cable Systems, Inc.
 - 2. AMP Incorporated/Tyco International.
 - 3. Hubbell/Anderson.
 - 4. O-Z/Gedney; EGS Electrical Group LLC.
 - 5. 3M Company; Electrical Products Division.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

- A. Service Entrance: Type THHN-THWN, single conductors in raceway.
- B. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- C. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspace: Type THHN-THWN, single conductors in raceway.

- D. Exposed Branch Circuits, including in Crawlspace: Type THHN-THWN, single conductors in raceway.
- E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: .
- F. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway
- G. Cord Drops and Portable Appliance Connections: Type SO, hard service cord.
- H. Fire Alarm Circuits: Type THHN-THWN, in raceway.
- I. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- J. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.2 INSTALLATION

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 26 Section "Basic Electrical Materials and Methods."
- F. Seal around cables penetrating fire-rated elements according to Division 7 Section "Through-Penetration Firestop Systems."
- G. Identify and color-code conductors and cables according to Division 26 Section "Basic Electrical Materials and Methods Electrical Identification."
- H. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors
- I. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

3.3 FIELD QUALITY CONTROL

- A. Testing: Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.
- B. Test Reports: Prepare a written report to record the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

END OF SECTION 26 05 19

SECTION 26 05 26 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.
- B. Related Sections include the following:
 - 1. Division 2 Section "Underground Ducts and Utility Structures" for ground test wells.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Data: For the following:
 - 1. Ground rods.
- C. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
- D. Field Test Reports: Submit written test reports to include the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.
 - 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association to supervise on-site testing specified in Part 3.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 - 1. Comply with UL 467.
- C. Comply with NFPA 70; for overhead-line construction and medium-voltage underground construction, comply with IEEE C2.
- D. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Grounding Conductors, Cables, Connectors, and Rods:
 - a. Apache Grounding/Erco Inc.
 - b. Chance/Hubbell.
 - c. Copperweld Corp.
 - d) Erco Inc.; Electrical Products Group.
 - e) Framatome Connectors/Burndy Electrical.
 - f) Harger Lightning Protection, Inc.
 - g) Heary Brothers Lightning Protection Co.
 - h) Kearney/Cooper Power Systems.
 - i) Korn: C. C. Korn Co.; Division of Robroy Industries.
 - j) O-Z/Gedney Co.; a business of the EGS Electrical Group.
 - k) Raco, Inc.; Division of Hubbell.
 - l) Salisbury: W. H. Salisbury & Co.

- m) Superior Grounding Systems, Inc.
- n) Thomas & Betts, Electrical.

2.2 GROUNDING CONDUCTORS

- A. For insulated conductors, comply with Division 26 Section "Conductors and Cables."
- B. Material: Copper.
- C. Equipment Grounding Conductors: Insulated with green-colored insulation.
- D. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.
- E. Grounding Electrode Conductors: Stranded cable.
- F. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.
- G. Bare Copper Conductors: Comply with the following:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Assembly of Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
- H. Copper Bonding Conductors: As follows:
 - 1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4 inch in diameter.
 - 2. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
 - 3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
 - 4. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick
- I. Ground Conductor and Conductor Protector for Wood Poles: As follows:
 - 1. No. 4 AWG minimum, soft-drawn copper conductor.
 - 2. Conductor Protector: Half-round PVC or wood molding. If wood, use pressure-treated fir, or cypress or cedar.
- J. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

2.3 CONNECTOR PRODUCTS

- A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.
- B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.
- C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

2.4 GROUNDING ELECTRODES

- A. Ground Rods: Sectional type; **copper-clad** steel.
 - 1. Size: 3/4 by 120 inches in diameter.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.
- B. In raceways, use insulated equipment grounding conductors.
- C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells.
- D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.
- E. Ground Rod Clamps at Test Wells: Use bolted pressure clamps with at least two bolt
- F. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
 - 1. Use insulated spacer; space 1 inch from wall and support from wall 6 inches above finished floor, unless otherwise indicated.
 - 2. At doors, route the bus up to the top of the door frame, across the top of the doorway, and down to the specified height above the floor

- G. Underground Grounding Conductors: Use copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches below grade or bury 12 inches above duct bank when installed as part of the duct bank.

3.2 EQUIPMENT GROUNDING CONDUCTORS

- A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.
- B. Install equipment grounding conductors in all feeders and circuits
- C. Install insulated equipment grounding conductor with circuit conductors for the following items, in addition to those required by NEC:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.
 - 4. Single-phase motor and appliance branch circuits.
 - 5. Three-phase motor and appliance branch circuits.
 - 6. Flexible raceway runs.
 - 7. Armored and metal-clad cable runs.
- D. Busway Supply Circuits: Install insulated equipment grounding conductor from the grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
- E. Computer Outlet Circuits: Install insulated equipment grounding conductor in branch-circuit runs from computer-area power panels or power-distribution units.
- F. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
- G. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate equipment grounding conductor. Isolate equipment grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
- H. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.
- I. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
 - 1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.
 - 2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal
- J. Metal Poles Supporting Outdoor Lighting Fixtures: Provide a grounding electrode in addition to installing a separate equipment grounding conductor with supply branch-circuit conductors.

3.3 COUNTERPOISE

- A. Ground the steel framework of the building with a driven ground rod at the base of every corner column and at intermediate exterior columns at distances not more than 60 feet apart. Provide a grounding conductor (counterpoise), electrically connected to each ground rod and to each steel column, extending around the perimeter of the building. Use tinned-copper conductor not less than No. 2/0 AWG for counterpoise and for tap to building steel. Bury counterpoise not less than 18 inches below grade and 24 inches from building foundation.

3.4 INSTALLATION

- A. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.

1. Drive ground rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.
2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.
- B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- C. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.
- D. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
- E. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.
- F. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.
- G. Install one test well for each service at the ground rod electrically closest to the service entrance. Set top of well flush with finished grade or floor.

3.5 CONNECTIONS

- A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
 2. Make connections with clean, bare metal at points of contact.
 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
 4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
- D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.
- E. Connections at Test Wells: Use compression-type connectors on conductors and make bolted-and clamped-type connections between conductors and ground rods.
- F. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.
- G. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

- H. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.6 FIELD QUALITY CONTROL

- A. Testing: Perform the following field quality-control testing:
 - 1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
 - 2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.
 - 3. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
 - a. Equipment Rated 500 kVA and Less: 10 ohms.
 - b. Equipment Rated 500 to 1000 kVA: 5 ohms.
 - c. Equipment Rated More Than 1000 kVA: 3 ohms.
 - d. Substations and Pad-Mounted Switching Equipment: 5 ohms.
 - e. Manhole Grounds: 10 ohms.
 - 4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

3.7 GRADING AND PLANTING

- A. Restore surface features, including vegetation, at areas disturbed by Work of this Section. Reestablish original grades, unless otherwise indicated. If sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include application of topsoil, fertilizer, lime, seed, sod, sprig, and mulch. Comply with Division 2 Section "Landscaping." Maintain restored surfaces. Restore disturbed paving as indicated.

END OF SECTION 26 05 26

SECTION 26 05 33 - RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. Related Sections include the following:
 - 1. Division 26 Section "Basic Electrical Materials and Methods" for supports, anchors, and identification products.
 - 2. Division 26 Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. ENT: Electrical nonmetallic tubing.
- C. FMC: Flexible metal conduit.
- D. IMC: Intermediate metal conduit.
- E. LFMC: Liquidtight flexible metal conduit.
- F. LFNC: Liquidtight flexible nonmetallic conduit.
- G. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets
- B. Shop Drawings: Show fabrication and installation details of components for raceways, fittings, boxes, enclosures, and cabinet
- C. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
 - 1. Ceiling suspension assembly members.
 - 2. Method of attaching hangers to building structure.
 - 3. Size and location of initial access modules for acoustical tile.
 - 4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

1.6 COORDINATION

- A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 METAL CONDUIT AND TUBING

- A. Manufacturers:
 - 1. AFC Cable Systems, Inc.
 - 2. Alflec Inc.
 - 3. Anamet Electrical, Inc.; Anaconda Metal Hose.
 - 4. Electri-Flex Co.
 - 5. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
 - 6. LTV Steel Tubular Products Company.
 - 7. Manhattan/CDT/Cole-Flex.
 - 8. O-Z Gedney; Unit of General Signal.
 - 9. Wheatland Tube Co.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. Aluminum Rigid Conduit: ANSI C80.5.
- D. IMC: ANSI C80.6.
- E. Plastic-Coated Steel Conduit and Fittings: NEMA RN 1.
- F. Plastic-Coated IMC and Fittings: NEMA RN 1.
- G. EMT and Fittings: ANSI C80.3.
 - 1. Fittings: Compression type.
- H. FMC: Zinc-coated steel.
- I. LFMC: Flexible steel conduit with PVC jacket.
- J. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

2.3 NONMETALLIC CONDUIT AND TUBING

- A. Manufacturers:
 - 1. American International.
 - 2. Anamet Electrical, Inc.; Anaconda Metal Hose.
 - 3. Arnco Corp.
 - 4. Cantex Inc.
 - 5. Certainteed Corp.; Pipe & Plastics Group.
 - 6. Condux International.
 - 7. ElecSYS, Inc.
 - 8. Electri-Flex Co.
 - 9. Lamson & Sessions; Carlon Electrical Products.
 - 10. Manhattan/CDT/Cole-Flex.
 - 11. RACO; Division of Hubbell, Inc.
 - 12. Spiraldut, Inc./AFC Cable Systems, Inc.
 - 13. Thomas & Betts Corporation.
- B. ENT: NEMA TC 13.
- C. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.
- D. ENT and RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.
- E. LFNC: UL 1660.

2.4 METAL WIREWAYS

- A. Manufacturers:
 - 1. Hoffman.
 - 2. Square D.
- B. Material and Construction: Sheet metal sized and shaped as indicated, NEMA 3R.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.
- E. Wireway Covers: Screw-cover type.
- F. Finish: Manufacturer's standard enamel finish.

2.5 NONMETALLIC WIREWAYS

- A. Manufacturers:
 - 1. Hoffman.
 - 2. Lamson & Sessions; Carlon Electrical Products.

- B. Description: Fiberglass polyester, extruded and fabricated to size and shape indicated, with no holes or knockouts. Cover is gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections are flanged, with stainless-steel screws and oil-resistant gaskets
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

2.6 SURFACE RACEWAYS

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating.
- B. Manufacturers:
 - 1. Airey-Thompson Sentinel Lighting; Wiremold Company (The).
 - 2. Thomas & Betts Corporation.
 - 3. Walker Systems, Inc.; Wiremold Company (The).
 - 4. Wiremold Company (The); Electrical Sales Division.
- C. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

2.7 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers:
 - 1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
 - 2. Emerson/General Signal; Appleton Electric Company.
 - 3. Erickson Electrical Equipment Co.
 - 4. Hoffman.
 - 5. Hubbell, Inc.; Killark Electric Manufacturing Co.
 - 6. O-Z/Gedney; Unit of General Signal.
 - 7. RACO; Division of Hubbell, Inc.
 - 8. Robroy Industries, Inc.; Enclosure Division.
 - 9. Scott Fetzer Co.; Adalet-PLM Division.
 - 10. Spring City Electrical Manufacturing Co.
 - 11. Thomas & Betts Corporation.
 - 12. Walker Systems, Inc.; Wiremold Company (The).
 - 13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.
- B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.
- D. Floor Boxes: Cast metal, fully adjustable, rectangular.
- E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1
- F. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
- G. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
- H. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

2.8 FACTORY FINISHES

- A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard prime-coat finish ready for field painting.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors:

1. Exposed: Rigid steel.
 2. Concealed: Rigid steel or IMC.
 3. Underground, Single Run: RNC.
 4. Underground, Grouped: RNC.
 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 6. Boxes and Enclosures: NEMA 250, Type 3R.
- B. Indoors:
1. Exposed: EMT.
 2. Concealed: EMT.
 3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
 4. Damp or Wet Locations: Rigid steel conduit.
 5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
 - a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.
- C. Minimum Raceway Size: 1/2-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits
- E. Do not install aluminum conduits embedded in or in contact with concrete.

3.2 INSTALLATION

- A. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- B. Complete raceway installation before starting conductor installation.
- C. Support raceways as specified in Division 26 Section "Basic Electrical Materials and Methods."
- D. Install temporary closures to prevent foreign matter from entering raceways.
- E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.
- F. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
 1. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
- H. Raceways Below Slabs: Do not install raceways embedded in slabs.
 1. **Secure raceways to reinforcing rods to prevent sagging or shifting, using stainless steel straps if required by geotechnical study.**
 2. Space raceways laterally to prevent voids in concrete.
 3. Run conduit larger than 1-inch trade size parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
 4. Change from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above the floor.
- I. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
 1. Run parallel or banked raceways together on common supports.
 2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- J. Join raceways with fittings designed and approved for that purpose and make joints tight.
 1. Use insulating bushings to protect conductors.
- K. Tighten set screws of threadless fittings with suitable tools.
- L. Terminations:
 1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
 2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used,

align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.

- M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- N. Telephone and Signal System Raceways, 2-Inch Trade Size and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements
- O. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where otherwise required by NFPA 70.
- P. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.
- Q. Flexible Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures, install jbox above each fixture to transition from conduit to flex; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.
- R. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.
- S. Set floor boxes level and flush with finished floor surface
- T. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.3 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.4 CLEANING

- A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION 26 05 33

SECTION 26 05 53 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes electrical identification materials and devices required to comply with ANSI C2, NFPA 70, OSHA standards, and authorities having jurisdiction.

1.3 SUBMITTALS

- A. Product Data: For each electrical identification product indicated
- B. Schedule of Nomenclature: An index of electrical equipment and system components used in identification signs and labels.
- C. Samples: For each type of label and sign to illustrate color, lettering style, and graphic features of identification products.

1.4 QUALITY ASSURANCE

- A. Comply with ANSI C2.
- B. Comply with NFPA 70.
- C. Comply with ANSI A13.1 and NFPA 70 for color-coding.

PART 2 - PRODUCTS

2.1 RACEWAY AND CABLE LABELS

- A. Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
 - 1. Color: Black letters on orange field.
 - 2. Legend: Indicates voltage and service
- B. Adhesive Labels: Preprinted, flexible, self-adhesive vinyl with legend overlaminated with a clear, weather- and chemical-resistant coating.
- C. Underground-Line Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape.
 - 1. Not less than 6 inches wide by 4 mils thick.
 - 2. Compounded for permanent direct-burial service.
 - 3. Embedded continuous metallic strip or core.
 - 4. Printed legend indicating type of underground line.
- D. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.
- E. Aluminum, Wraparound Marker Bands: Bands cut from 0.014-inch- thick aluminum sheet, with stamped or embossed legend, and fitted with slots or ears for permanently securing around wire or cable jacket or around groups of conductors.
- F. Plasticized Card-Stock Tags: Vinyl cloth with preprinted and field-printed legends. Orange background, unless otherwise indicated, with eyelet for fastener.

2.2 NAMEPLATES AND SIGNS

- A. Safety Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145.
- B. Engraved Plastic Nameplates and Signs: Engraving stock, melamine plastic laminate, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.
 - 1. Engraved legend with black letters on white face.
 - 2. Punched or drilled for mechanical fasteners.
- C. Exterior, Metal-Backed, Butyrate Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for the application. 1/4-inch grommets in corners for mounting.

- D. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32, stainless-steel machine screws with nuts and flat and lock washers.

2.3 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking, Type 6/6 nylon cable ties.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength: 50 lb minimum.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: According to color-coding.
- B. Paint: Formulated for the type of surface and intended use.
 - 1. Primer for Galvanized Metal: Single-component acrylic vehicle formulated for galvanized surfaces.
 - 2. Primer for Concrete Masonry Units: Heavy-duty-resin block filler.
 - 3. Primer for Concrete: Clear, alkali-resistant, binder-type sealer.
 - 4. Enamel: Silicone-alkyd or alkyd urethane as recommended by primer manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations in the Contract Documents or with those required by codes and standards. Use consistent designations throughout Project.
- C. Sequence of Work: If identification is applied to surfaces that require finish, install identification after completing finish work.
- D. Install painted identification according to manufacturer's written instructions and as follows:
 - 1. Clean surfaces of dust, loose material, and oily films before painting.
 - 2. Prime surfaces using type of primer specified for surface.
 - 3. Apply one intermediate and one finish coat of enamel
- E. Color Banding Raceways and Exposed Cables: Band exposed and accessible raceways of the systems listed below:
 - 1. Bands: Pretensioned, wraparound plastic sleeves; colored adhesive tape; or a combination of both. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.
 - 2. Band Locations: At changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
 - 3. Apply the following colors to the systems listed below:
 - a. Security System: See Plans.
 - b. Mechanical and Electrical Supervisory System: See Plans.
 - c. Telecommunication System: See Plans.
- F. Caution Labels for Indoor Boxes and Enclosures for Power and Lighting: Install pressure-sensitive, self-adhesive labels identifying system voltage with black letters on orange background. Install on exterior of door or cover
- G. Circuit Identification Labels on Boxes: Install labels externally.
 - 1. Exposed Boxes: Pressure-sensitive, self-adhesive plastic label on cover.
 - 2. Concealed Boxes: Plasticized card-stock tags.
 - 3. Labeling Legend: Permanent, waterproof listing of panel and circuit number or equivalent.
- H. Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communication lines, install continuous underground plastic line marker located directly above line at 6 to 8 inches below finished grade. Where width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches overall, use a single line marker. Install line marker for underground wiring, both direct-buried cables and cables in raceway.

- I. Color-Coding of Secondary Phase Conductors: Use the following colors for service, feeder, and branch-circuit phase conductors:
 - 1. 208/120-V and 240/120-V Conductors:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.
 - d. Neutral: White
 - 2. 480/277-V Conductors:
 - a. Phase A: Brown
 - b. Phase B: Orange
 - c. Phase C: Yellow
 - d. Neutral: Gray
 - 3. Factory apply color the entire length of conductors, except the following field-applied, color-coding methods may be used instead of factory-coded wire for sizes larger than No. 10 AWG:
 - a. Colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Use 1-inch-wide tape in colors specified. Adjust tape bands to avoid obscuring cable identification markings.
 - b. Colored cable ties applied in groups of three ties of specified color to each wire at each terminal or splice point starting 3 inches from the terminal and spaced 3 inches apart. Apply with a special tool or pliers, tighten to a snug fit, and cut off excess length.
- J. Power-Circuit Identification: Metal tags or aluminum, wraparound marker bands for cables, feeders, and power circuits in vaults, pull and junction boxes, manholes, and switchboard rooms.
 - 1. Legend: 1/4-inch- steel letter and number stamping or embossing with legend corresponding to indicated circuit designations.
 - 2. Tag Fasteners: Nylon cable ties.
 - 3. Band Fasteners: Integral ears.
- K. Apply identification to conductors as follows:
 - 1. Conductors to Be Extended in the Future: Indicate source and circuit numbers.
 - 2. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color-coding to identify circuits' voltage and phase.
 - 3. Multiple Control and Communication Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color-coding, or cable marking tape.
- L. Apply warning, caution, and instruction signs as follows:
 - 1. Warnings, Cautions, and Instructions: Install to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
 - 2. Emergency Operation: Install engraved laminated signs with white legend on red background with minimum 3/8-inch- high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.
- M. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment, including central or master unit of each system. This includes power, lighting, communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Unless otherwise indicated, provide a single line of text with 1/2-inch- high lettering on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high. Use white lettering on black field. Apply labels for each unit of the following categories of equipment using mechanical fasteners:
 - 1. Panelboards, electrical cabinets, and enclosures.
 - 2. Access doors and panels for concealed electrical items.

3. Electrical switchgear and switchboards.
4. Emergency system boxes and enclosures.
5. Disconnect switches.
6. Enclosed circuit breakers.
7. Push-button stations.
8. Power transfer equipment.
9. Contactors.
10. Dimmers.
11. Transformers.
12. Clock/program master equipment.
13. Call system master station.
14. Fire alarm master station or control panel.
15. Security-monitoring master station or control panel.

END OF SECTION 26 05 53

SECTION 26 09 23 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following lighting control devices:
 - 1. Time switches.
 - 2. Outdoor and indoor photoelectric switches.
 - 3. Switch-box occupancy sensors.
 - 4. Indoor occupancy sensors.
 - 5. Outdoor motion sensors.
 - 6. Multipole contactors.
- B. Related Sections include the following:
 - 1. Division 26 Section "Wiring Devices" for wall-box dimmers and manual light switches.

1.3 DEFINITIONS

- A. LED: Light-emitting diode.
- B. PIR: Passive infrared.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show installation details for occupancy and light-level sensors.
 - 1. Lighting plan showing location, orientation, and coverage area of each sensor.
 - 2. Interconnection diagrams showing field-installed wiring.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.6 COORDINATION

- A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 GENERAL LIGHTING CONTROL DEVICE REQUIREMENTS

- A. Line-Voltage Surge Protection: An integral part of the devices for 120- and 277-V solid-state equipment. For devices without integral line-voltage surge protection, field-mounting surge protection shall comply with IEEE C62.41 and with UL 1449.

2.3 TIME SWITCHES

- A. Manufacturers:
 - 1. Area Lighting Research, Inc.
 - 2. Fisher Pierce.
 - 3. Grasslin Controls Corporation.
 - 4. Intermatic, Inc.
 - 5. Leviton Mfg. Company Inc.
 - 6. Lightolier Controls; a Genlyte Company.
 - 7. Lithonia Lighting.
 - 8. Paragon Electric Co.
 - 9. Square D.
 - 10. TORK.
 - 11. Touchplate Technologies, Inc.
 - 12. Watt Stopper (The).
- B. Digital Time Switches: Electronic, solid-state programmable units with alphanumeric display complying with UL 917.
 - 1. Contact Configuration: As indicated.
 - 2. Contact Rating: As indicated..
 - 3. Program: Single channel, 2 on-off set points on a 24-hour schedule with skip-a-day weekly schedule.
 - 4. Circuitry: Allow connection of a photoelectric relay as substitute for on and off function of a program.
 - 5. Astronomical Time: All channels.
 - 6. Battery Backup: For schedules and time clock.

2.4 OUTDOOR PHOTOELECTRIC SWITCHES

- A. Manufacturers:
 - 1. Area Lighting Research, Inc.
 - 2. Fisher Pierce.
 - 3. Grasslin Controls Corporation.
 - 4. Intermatic, Inc.
 - 5. Lithonia Lighting.
 - 6. Novitas, Inc.
 - 7. Paragon Electric Co.
 - 8. Square D.
 - 9. TORK.
 - 10. Touchplate Technologies, Inc.
 - 11. Watt Stopper (The).
- B. Description: Solid state, with DPST dry contacts rated for 1800-VA tungsten or 1000-VA inductive, to operate connected relay, contactor coils, microprocessor input, and complying with UL 773A.

1. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of photocell to prevent fixed light sources from causing turn-off.
2. Time Delay: 15-second minimum, to prevent false operation.
3. Surge Protection: Metal-oxide varistor type, complying with IEEE C62.41 for Category A1 locations.
4. Mounting: Twist lock complying with IEEE C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the North sky exposure.

2.5 INDOOR PHOTOELECTRIC SWITCHES

A. Manufacturers:

1. Allen-Bradley/Rockwell Automation.
2. Area Lighting Research, Inc.
3. Cutler-Hammer; Eaton Corporation.
4. Fisher Pierce.
5. Grasslin Controls Corporation.
6. Intermatic, Inc.
7. Lithonia Lighting.
8. MicroLite Corporation.
9. Novitas, Inc.
10. Paragon Electric Co.
11. Square D.
12. TORK.
13. Touchplate Technologies, Inc.
14. Watt Stopper (The).

B. Ceiling-Mounting Photoelectric Switch: Solid-state, light-level sensor unit, with separate relay unit mounted on luminaire, to detect changes in lighting levels that are perceived by the eye. Cadmium sulfide photoresistors are not acceptable.

1. Sensor Output: Contacts rated to operate the associated relay, complying with UL 773A. Sensor shall be powered from the relay unit.
2. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
3. Light-Level Monitoring Range: 10 to 200 fc, with an adjustment for turn-on and turn-off levels within that range.
4. Time Delay: Adjustable from 5 to 300 seconds to prevent cycling, with deadband adjustment.
5. Indicator: Two LEDs to indicate the beginning of on and off cycles.

C. Skylight Photoelectric Sensors: Solid-state, light-level sensor; housed in a threaded, plastic fitting for mounting under skylight, facing up at skylight; with separate relay unit mounted on luminaire, to detect changes in lighting levels that are perceived by the eye. Cadmium sulfide photoresistors are not acceptable.

1. Sensor Output: Contacts rated to operate the associated relay, complying with UL 773A. Sensor shall be powered from the relay unit.
2. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
3. Light-Level Monitoring Range: 1000 to 10,000 fc, with an adjustment for turn-on and turn-off levels within that range.
4. Time Delay: Adjustable from 5 to 300 seconds to prevent cycling, with deadband adjustment.
5. Indicator: Two LEDs to indicate the beginning of on and off cycles.

2.6 SWITCH-BOX OCCUPANCY SENSORS

A. Manufacturers:

1. Bryant Electric; a Hubbell Company.

2. Hubbell Lighting Inc.
 3. Leviton Mfg. Company Inc.
 4. Lightolier Controls; a Genlyte Company.
 5. Lithonia Lighting.
 6. MYTECH Corporation.
 7. Novitas, Inc.
 8. RAB Electric Manufacturing, Inc.
 9. Sensor Switch, Inc.
 10. TORK.
 11. Unenco Electronics; a Hubbell Company.
 12. Watt Stopper (The).
- B. Description: PIR type with integral power-switching contacts rated for 800 W at 120-V ac, suitable for incandescent light fixtures, fluorescent light fixtures with magnetic or electronic ballasts, or 1/6-hp motors; and rated for 1000 W at 277-V ac, suitable for incandescent light fixtures, fluorescent light fixtures with magnetic or electronic ballasts, or 1/3-hp motors, minimum.

2.7 INDOOR OCCUPANCY SENSORS

- A. Manufacturers:
1. Hubbell Lighting Inc.
 2. Leviton Mfg. Company Inc.
 3. Lithonia Lighting.
 4. MYTECH Corporation.
 5. Novitas, Inc.
 6. RAB Electric Manufacturing, Inc.
 7. Sensor Switch, Inc.
 8. TORK.
 9. Unenco Electronics; a Hubbell Company.
 10. Watt Stopper (The).
- B. General Description: Wall- or ceiling-mounting, solid-state units with a separate relay unit.
1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
 3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
 4. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
 5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
 6. Bypass Switch: Override the on function in case of sensor failure.
 7. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; keeps lighting off when selected lighting level is present.
 8. FailSafe: In case of sensor failure, lighting fixtures shall remain on.
- C. Dual-Technology Type: Ceiling mounting; detect occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage. Particular technology or combination of technologies that controls on and off functions shall be selectable in the field by operating controls on unit.
1. Sensitivity Adjustment: Separate for each sensing technology.
 2. Detector Sensitivity: Detect occurrences of 6-inch minimum movement of any portion of a human body that presents a target of at least 36 sq. in., and detect a person of average

size and weight moving at least 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.

3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.

2.8 OUTDOOR MOTION SENSORS (PIR)

- A. Manufacturers:
 1. Bryant Electric; a Hubbell Company.
 2. Hubbell Lighting Inc.
 3. Lithonia Lighting.
 4. Paragon Electric Co.
 5. RAB Electric Manufacturing, Inc.
 6. TORK.
 7. Watt Stopper (The).
- B. General Description: Suitable for operation in ambient temperatures ranging from minus 40 deg F to 130 deg F, UL 773A rated as raintight.
 1. Operation: Turn lights on when sensing infrared energy changes between background and moving body in area of coverage; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 2. Sensor Output: Suitable for switching 300 W of tungsten load at 120- or 277-V ac. Lampholders shall comply with UL 1571 for wet locations.
 3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
 4. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
 5. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outdoor junction box.
 - b. Relay: Internally mounted in a standard weatherproof electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
 6. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
 7. Bypass Switch: Override the on function in case of sensor failure.
 8. Automatic Light-Level Sensor: Adjustable from 1 to 20 fc; keeps lighting off during daylight hours.
- C. Detector Sensitivity: Detect occurrences of 6-inch minimum movement of any portion of a human body that presents a target of at least 36 sq. in.

2.9 MULTIPOLE CONTACTORS

- A. Manufacturers:
 1. Allen-Bradley/Rockwell Automation.
 2. ASCO Power Technologies, LP; a division of Emerson Electric Co.
 3. Cutler-Hammer; Eaton Corporation.
 4. Fisher Pierce.
 5. GE Industrial Systems; Total Lighting Control.
 6. Grasslin Controls Corporation.
 7. Hubbell Lighting Inc.
 8. Lithonia Lighting.
 9. MicroLite Corporation.
 10. TORK.
 11. Touchplate Technologies, Inc.
 12. Watt Stopper (The).
- B. Description: Electrically operated and electrically held, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
2. Control-Coil Voltage: Match control power source.

2.10 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG, complying with Division 26 Section "Conductors and Cables."
- B. Install unshielded, twisted-pair cable for control and signal transmission conductors, complying with Division 27 Section "General Technology Specifications for APSB Projects."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

- A. Install and aim sensors in locations to achieve at least 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 WIRING INSTALLATION

- A. Wiring Method: Comply with Division 26 Section "Conductors and Cables." Minimum conduit size shall be ½ inch.
- B. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- C. Install field-mounting transient voltage suppressors for lighting control devices in Category A locations that do not have integral line-voltage surge protection.
- D. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.
- E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.
- F. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 IDENTIFICATION

- A. Identify components and power and control wiring according to Division 26 Section "Electrical Identification."
- B. Label time switches and contactors with a unique designation.

3.4 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
 2. Operational Test: Verify actuation of each sensor and adjust time delays.
- B. Remove and replace lighting control devices where test results indicate that they do not comply with specified requirements.
- C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.5 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to site outside normal occupancy hours for this purpose.

END OF SECTION 26 09 23

SECTION 26 22 01 - DRY-TYPE TRANSFORMERS (600 V AND LESS)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following types of dry-type transformers rated 600 V and less, with capacities up to 1000 kVA:
 - 1. Control and signal transformers.

1.3 SUBMITTALS

- A. Product Data Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer indicated.
- B. Shop Drawings: Wiring and connection diagrams
- C. Source quality-control test reports.
- D. Output Settings Reports: Record of tap adjustments specified in Part 3.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with IEEE C 57.12.91
- C. Energy-Efficient Transformers Rated 15 kVA and Larger: Certified as meeting NEMA TP 1, Class 1 efficiency levels when tested according to NEMA TP 2.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

1.6 COORDINATION

- A. Coordinate size and location of concrete bases.
- B. Coordinate installation of wall-mounting and structure-hanging supports.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton.
 - 2. Square D/Groupe Schneider NA.
 - 3. GE

2.2 MATERIALS

- A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.
- B. Cores: Grain-oriented, non-aging silicon steel.
- C. Coils: Continuous windings without splices, except for taps.
 - 1. Internal Coil Connections: Brazed or pressure type.
 - 2. Coil Material: Copper.

2.3 DISTRIBUTION TRANSFORMERS

- A. Comply with NEMA ST 20, and list and label as complying with UL 1561
- B. Cores: One leg per phase.
- C. Enclosure: Ventilated, raintight, NEMA 250, Type 3R.
 - 1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.
- D. Indoor Transformer Enclosure Finish: Comply with NEMA 250 for "Indoor Corrosion Protection."
 - 1. Finish Color: Gray.
- E. Outdoor Transformer Enclosure Finish: Comply with NEMA 250 for "Outdoor Corrosion Protection."
 - 1. Finish Color: Gray
- F. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 115 deg C rise above 40 deg C ambient temperature.
- G. Taps for Transformers Smaller Than 3 kVA: None.
- H. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.
- I. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.
- J. K-Factor Rating: Transformers indicated to be K-factor rated shall comply with UL 1561 requirements for nonsinusoidal load current-handling capability to the degree defined by designated K-factor.
 - 1. Unit shall not overheat when carrying full-load current with harmonic distortion corresponding to designated K-factor.
 - 2. Indicate value of K-factor on transformer nameplate
- K. Wall Brackets: Manufacturer's standard brackets.
- L. Fungus Proofing: Permanent fungicidal treatment for coil and core.
- M. Low-Sound-Level Requirements: Minimum of 3 dBA less than NEMA ST 20 standard sound levels when factory tested according to IEEE C57.12.91.

2.4 BUCK-BOOST TRANSFORMERS

- A. Description: Self-cooled, two-winding dry type, rated for continuous duty and with wiring terminals suitable for connection as autotransformer. Transformers shall comply with NEMA ST 1 and shall be listed and labeled as complying with UL 506 or UL 1561.
- B. Enclosure: Ventilated, NEMA 250, Type 2.
 - 1. Finish Color: Gray.

2.5 SOURCE QUALITY CONTROL

- A. Test and inspect transformers according to IEEE C57.12.91.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.
- B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.
- C. Examine walls and floors for suitable mounting conditions where transformers will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.
- B. Install floor-mounting transformers level on concrete bases. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit and 4 inches high.

3.3 CONNECTIONS

- A. Ground equipment according to Division 26 Section "Grounding and Bonding."

- B. Connect wiring according to Division 26 Section "Electrical Power Conductors and Cables."
- C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 ADJUSTING

- A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower than nameplate voltage minus 5 percent. Submit recording and tap settings as test results.
- B. Adjust buck-boost transformers to provide nameplate voltage of equipment being served, plus or minus 5 percent, at secondary terminals.
- C. Output Settings Report: Prepare a written report recording output voltages and tap settings.

END OF SECTION 26 22 01

SECTION 26 24 16 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Distribution panelboards.
 - 2. Lighting and appliance branch-circuit panelboards.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. RFI: Radio-frequency interference.
- D. RMS: Root mean square.
- E. SPDT: Single pole, double throw.

1.4 SUBMITTALS

- A. Product Data: For each type of panelboard, overcurrent protective device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
 - a. Enclosure types and details for types other than NEMA 250, Type 1.
 - b. Bus configuration, current, and voltage ratings.
 - c. Short-circuit current rating of panelboards and overcurrent protective devices.
 - d. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 2. Wiring Diagrams: Power, signal, and control wiring.
- C. Field quality-control test reports including the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- D. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.
- E. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals.
 - 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
 - 2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories through one source from a single manufacturer.
- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of panelboards and are based on the specific system indicated

- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Comply with NEMA PB 1.
- E. Comply with NFPA 70.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:
 1. Ambient Temperature: Not exceeding 104 deg F.
 2. Altitude: Not exceeding 6600 feet.

1.7 COORDINATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Keys: Six spares for each type of panelboard cabinet lock.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:
 - a. General Electric Co.; Electrical Distribution & Protection Div.
 - b. Square D.
 - c. Eaton

2.2 MANUFACTURED UNITS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Division 26 Section "Seismic Controls for Electrical Work."
- B. Enclosures: Flush- and surface-mounted cabinets. NEMA PB 1, Type 1.
 1. Rated for environmental conditions at installed location.
 - a. Outdoor Locations: NEMA 250, Type 3R.
 - b. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
 - c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
 2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
 3. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
 4. Directory Card: With transparent protective cover, mounted in metal frame, inside panelboard door.
- C. Phase Neutral and Ground Buses:
 1. Material: Hard-drawn copper, 98 percent conductivity.
 2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.
 3. Isolated Equipment Ground Bus: Adequate for branch-circuit equipment ground conductors; insulated from box.
- D. Conductor Connectors: Suitable for use with conductor material.
 1. Main and Neutral Lugs: Compression type.
 2. Ground Lugs and Bus Configured Terminators: Compression type.
- E. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.

2.3 PANELBOARD SHORT-CIRCUIT RATING

- A. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.4 DISTRIBUTION PANELBOARDS

- A. Doors: Secured with vault-type latch with tumbler lock; keyed alike. Omit for fused-switch panelboards.
- B. Main Overcurrent Protective Devices: Circuit breaker.
- C. Branch Overcurrent Protective Devices:
 - 1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
 - 2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.5 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units
- B. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.6 OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker: UL 489, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
 - 3. Electronic trip-unit circuit breakers shall have RMS sensing; field-replaceable rating plug; and with the following field-adjustable settings:
 - a. Instantaneous trip.
 - b. Long- and short-time pickup levels.
 - c. Long- and short-time time adjustments.
 - d. Ground-fault pickup level, time delay, and I^2t response.
 - 4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
 - 5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.
 - 6. GFCI Circuit Breakers: Single- and two-pole configurations with 5-mA trip sensitivity.
- B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.
 - 1. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - 2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
 - 3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - 4. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at **[55] [75]** percent of rated voltage.
 - 5. Multipole units enclosed in a single housing or factory-assembled to operate as a single unit.

2.7 ACCESSORY COMPONENTS AND FEATURES

- A. Furnish accessory set including tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

2.8 TVSS DEVICES

- A. Integrally mounted.
- B. See Specification 26 43 13 "Transient Voltage Suppression," for requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install panelboards and accessories according to NEMA PB 1.1.
- B. Mount top of trim 74 inches above finished floor, unless otherwise indicated.
- C. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.
- D. Install overcurrent protective devices and controllers.
 - 1. Set field-adjustable switches and circuit-breaker trip ranges.
- E. Install filler plates in unused spaces
- F. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade
- G. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.
- H. **ALL panel cans and covers with-in the same space shall be the same height.**

3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Electrical Identification."
- B. Create a directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable. Provide room being served identification for each circuit.
- C. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.3 CONNECTIONS

- A. Ground equipment according to Division 26 Section "Grounding and Bonding."
- B. Connect wiring according to Division 26 Section "Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:
- C. Perform the following field tests and inspections and prepare test reports:
 - 1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest
- D. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.
 - 1. Measure as directed during period of normal system loading.
 - 2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
 - 3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
 - 4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

- E. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scanning of each panelboard. Remove panel fronts so joints and connections are accessible to portable scanner.
 - 1. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - 2. Record of Infrared Scanning: Prepare a certified report that identifies panelboards checked and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
 - 3. Follow-up Infrared Scanning at 11 months post substantial completion by owner.

3.5 CLEANING

- A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 26 24 16

SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Single and duplex receptacles, ground-fault circuit interrupters, integral surge suppression units, and isolated-ground receptacles.
 - 2. Single- and double-pole snap switches and dimmer switches.
 - 3. Device wall plates.
 - 4. Pin and sleeve connectors and receptacles.
 - 5. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. PVC: Polyvinyl chloride.
- D. RFI: Radio-frequency interference.
- E. TVSS: Transient voltage surge suppressor.
- F. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates
- C. Samples: One for each type of device and wall plate specified, in each color specifies
- D. Field quality-control test reports.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device through one source from a single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

1.6 COORDINATION

- A. Receptacles for Owner-Furnished Equipment: Match plug configurations.
 - 1. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Wiring Devices:
 - a. Bryant Electric, Inc./Hubbell Subsidiary.
 - b. Eagle Electric Manufacturing Co., Inc.
 - c. Hubbell Incorporated; Wiring Device-Kellems.
 - d. Leviton Mfg. Company Inc.
 - e. Pass & Seymour/Legrand; Wiring Devices Div.

2. Wiring Devices for Hazardous (Classified) Locations:
 - a. Crouse-Hinds/Cooper Industries, Inc.; Arrow Hart Wiring Devices.
 - b. EGS/Appleton Electric Company.
 - c. Killark Electric Manufacturing Co./Hubbell Incorporated.
3. Multioutlet Assemblies:
 - a. Hubbell Incorporated; Wiring Device-Kellems.
 - b. Wiremold Company (The).
2. Poke-Through, Floor Service Outlets and Telephone/Power Poles:
 - a. Hubbell Incorporated; Wiring Device-Kellems.
 - b. Pass & Seymour/Legrand; Wiring Devices Div.
 - c. Square D/Groupe Schneider NA.
 - d. Thomas & Betts Corporation.
 - e. Wiremold Company (The).

2.2 RECEPTACLES (Leviton 5362 or approved equal)

- A. Straight-Blade-Type Receptacles: Comply with NEMA WD 1, NEMA WD 6, DSCC W-C-596G, and UL 498.
- B. Straight-Blade and Locking Receptacles: Heavy-Duty grades
- C. GFCI Receptacles: Straight blade, non-feed-through type, Heavy-Duty grade, with integral NEMA WD 6, Configuration 5-20R duplex receptacle; complying with UL 498 and UL 943. Design units for installation in a 2-3/4-inch- deep outlet box without an adapter. (Leviton Model # GFNT2 or approved equal)
- D. Isolated-Ground Receptacles: Straight blade, Heavy-Duty grade, duplex receptacle, with equipment grounding contacts connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. (Leviton Model # 5362-IG or approved equal)
 1. Devices: Listed and labeled as isolated-ground receptacles.
 2. Isolation Method: Integral to receptacle construction and not dependent on removable parts.
- E. TVSS Receptacles: Straight blade, NEMA WD 6, Configuration 5-20R, with integral TVSS in line to ground, line to neutral, and neutral to ground.
 1. TVSS Components: Multiple metal-oxide varistors; with a nominal clamp level rating of 500 volts and minimum single transient pulse energy dissipation of 140 J line to neutral, and 70 J line to ground and neutral to ground.
 2. Active TVSS Indication: Visual only with light visible in face of device to indicate device is "active" or "no longer in service."
 3. Identification: Distinctive marking on face of device to denote TVSS-type unit.
- F. Industrial Heavy-Duty Pin and Sleeve Devices: Comply with IEC 309-1.
- G. Hazardous (Classified) Location Receptacles: Comply with NEMA FB 11.
- H. Hospital Grade/GFI: Leviton Model N7899-HGI or approved equal
- I. Tamper Resistant (TR) Leviton Model TBR20 or approved equal.
- J. USB: Leviton Model T5832-I or approved equal.

2.3 PENDANT CORD/CONNECTOR DEVICES

- A. Description: Matching, locking-type plug and receptacle body connector, NEMA WD 6, Configurations L5-20P and L5-20R, Heavy-Duty grade.
 1. Body: Nylon with screw-open cable-gripping jaws and provision for attaching external cable grip.
 2. External Cable Grip: Woven wire-mesh type made of high-strength galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.4 CORD AND PLUG SETS

- A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.
 1. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.

2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.5 SWITCHES (Leviton Models 1221-2, 1222-2, 1223-2 and 1224-2 or approved equal)

- A. Single- and Double-Pole Switches: Comply with DSCC W-C-896F and UL 20.
- B. Snap Switches: Heavy-Duty grade, quiet type.
- C. Combination Switch and Receptacle: Both devices in a single gang unit with plaster ears and removable tab connector that permit separate or common feed connection.
 1. Switch: 20 A, 120/277-V ac.
 2. Receptacle: NEMA WD 6, Configuration 5-15R.
- D. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on/off switches and audible frequency and EMI/RFI filters.
 1. Control: Continuously adjustable toggle switch; with single-pole or three-way switching to suit connections.
 2. LED Compatible

2.6 WALL PLATES (Hubbell or approved equal)

- A. Single and combination types to match corresponding wiring devices.
 1. Plate-Securing Screws: Metal with head color to match plate finish.
 2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
 3. Material for Unfinished Spaces: Galvanized steel.
 4. Material for Wet Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

2.7 FLOOR SERVICE FITTINGS

- A. Type: Modular, flush-type, dual-service units suitable for wiring method used.
- B. Compartments: Barrier separates power from voice and data communication cabling.
- C. Service Plate: Rectangular, with satin finish.
- D. Power Receptacle: NEMA WD 6, Configuration 5-20R, gray finish, unless otherwise indicated.
- E. Voice and Data Communication Outlet: Two modular, keyed, color-coded, RJ-45 Category 6 jacks for UTP cable.

2.8 MULTIOUTLET ASSEMBLIES

- A. Components of Assemblies: Products from a single manufacturer designed for use as a complete, matching assembly of raceways and receptacles
- B. Raceway Material: Metal, with manufacturer's standard finish.
- C. Wire: No. 12 AWG.

2.9 FINISHES

- A. Color:
 1. Wiring Devices Connected to Normal Power System: **As selected by Architect, unless otherwise indicated or required by NFPA 70.**
 2. Wiring Devices Connected to Emergency Power System: Red.
 3. TVSS Devices: Blue.
 4. Isolated-Ground Receptacles: As specified above, with orange triangle on face.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install devices and assemblies level, plumb, and square with building lines.
- B. Install wall dimmers to achieve indicated rating after derating for ganging according to manufacturer's written instructions.
- C. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' written instructions

- D. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
- E. Remove wall plates and protect devices and assemblies during painting.
- F. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 IDENTIFIATION

- A. Comply with Division 26 Section "Electrical Identification."
 - 1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 CONNECTIONS

- A. Ground equipment according to Division 26 Section "Grounding and Bonding."
- B. Connect wiring according to Division 26 Section "Electrical Power Conductors and Cables."
- C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
 - 2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.
- B. Remove malfunctioning units, replace with new units, and retest as specified above.

END OF SECTION 26 27 26

SECTION 26 28 16 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following individually mounted, enclosed switches and circuit breakers:
 - 1. Fusible switches.
 - 2. Nonfusible switches.
 - 3. Molded-case circuit switches.
 - 4. Molded-case switches.
 - 5. Enclosures.

1.3 DEFINITIONS

- A. GD: General duty.
- B. GFCI: Ground-fault circuit interrupter.
- C. HD: Heavy duty.
- D. RMS: Root mean square.
- E. SPDT: Single pole, double throw.

1.4 SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
 - 1. Enclosure types and details for types other than NEMA 250, Type 1.
 - 2. Current and voltage ratings.
 - 3. Short-circuit current rating.
 - 4. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section include the following:
 - 1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
 - 2. Time-current curves, including selectable ranges for each type of circuit breaker.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.
- C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:
 - 1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
 - 2. Altitude: Not exceeding 6600 feet.

1.7 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Spares: For the following:
 - a. Potential Transformer Fuses: 1% but not less than one of each type.
 - b. Control-Power Fuses: 1% but not less than one of each type.
 - c. Fuses and Fusible Devices for Fused Circuit Breakers: 1% but not less than one of each type.
 - d. Fuses for Fusible Switches: 1% but not less than one of each type.
 - e. Fuses for Fused Power Circuit Devices: 1% but not less than one of each type.
 - 2. Spare Indicating Lights: Six of each type installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FUSIBLE AND NONFUSIBLE SWITCHES

- A. Manufacturers:
 - 1. General Electric Co.; Electrical Distribution & Control Division.
 - 2. Square D/Group Schneider.
 - 3. Eaton
- B. Fusible Switch, 1200 A and Smaller: NEMA KS 1, Type HD, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
- C. Nonfusible Switch, 1200 A and Smaller: NEMA KS 1, Type HD, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
- D. Accessories:
 - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded, and bonded; and labeled for copper and aluminum neutral conductors.
 - 3. Auxiliary Contact Kit: Auxiliary set of contacts arranged to open before switch blades open.

2.3 FUSED POWER CIRCUIT DEVICES

- A. Bolted-Pressure Contact Switch: UL 977; operating mechanism shall use a rotary-mechanical-bolting action to produce and maintain high-clamping pressure on the switch blade after it engages the stationary contacts.
 - 1. Manufacturers:
 - a. Boltswitch, Inc.
 - b. Pringle Electrical Mfg. Co.
 - c. Square D/Group Schneider.
- B. High-Pressure, Butt-Type Contact Switch: UL 977; operating mechanism shall use butt-type contacts and a spring-charged mechanism to produce and maintain high-contact pressure when switch is closed.
 - 1. Manufacturers:
 - a. General Electric Co.; Electrical Distribution & Control Division.
 - b. Square D/Group Schneider.

2. Main Contact Interrupting Capability: Twelve times the switch current rating, minimum.
3. Operating Mechanism: Manual handle operation to close switch stores energy in mechanism for closing and opening.
 - a. Electrical Trip: Operation of lever or push-button trip switch, or trip signal from ground-fault relay or remote-control device, causes switch to open.
 - b. Mechanical Trip: Operation of mechanical lever or push button or another device causes switch to open.
4. Auxiliary Switches: Factory installed, SPDT, with leads connected to terminal block, and including one set more than quantity required for functional performance indicated.
5. Service-Rated Switches: Labeled for use as service equipment.
6. Ground-Fault Relay: Comply with UL 1053. Self-powered type with mechanical ground-fault indicator, test function, tripping relay with internal memory, and three-phase current transformer/sensor.
 - a. Configuration: Remote-mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground fault indicator.
 - b. Internal Memory: Integrates the cumulative value of intermittent arcing ground-fault currents and uses the effect to initiate tripping.
 - c. No-Trip Relay Test: Operation of "no-trip" test control permits ground-fault simulation test without tripping switch.
 - d. Test Control: Simulates ground fault to test relay and switch (or relay only if "no-trip" mode is selected).
7. Open-Fuse Trip Device: Arranged to trip switch open if a phase fuse opens.

2.4 MOLDED-CASE CIRCUIT BREAKERS AND SWITCHES

- A. Manufacturers:
 1. General Electric Co.; Electrical Distribution & Control Division.
 2. Square D/Group Schneider.
 3. Eaton
- B. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.
 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
 3. Electronic Trip-Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:
 - a. Instantaneous trip.
 - b. Long- and short-time pickup levels.
 - c. Long- and short-time time adjustments.
 - d. Ground-fault pickup level, time delay, and I^2t response.
 4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller and let-through ratings less than NEMA FU 1, RK-5.
 5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.
 6. GFCI Circuit Breakers: Single- and two-pole configurations with 5-mA trip sensitivity.
- C. Molded-Case Circuit-Breaker Features and Accessories:
 1. Standard frame sizes, trip ratings, and number of poles.
 2. Lugs: Mechanical style suitable for number, size, trip ratings, and conductor material.
 3. Application Listing: Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
 4. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 5. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.

6. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
 7. Auxiliary Switch: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
 8. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
 9. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
- D. Molded-Case Switches: Molded-case circuit breaker with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.
- E. Molded-Case Switch Accessories:
- Lugs: Mechanical style suitable for number, size, trip ratings, and material of conductors.
 2. Application Listing: Type HACR for heating, air-conditioning, and refrigerating equipment.
 3. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage. Provide "dummy" trip unit where required for proper operation.
 4. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay. Provide "dummy" trip unit where required for proper operation.
 5. Auxiliary Switch: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
 6. Key Interlock Kit: Externally mounted to prohibit operation; key shall be removable only when switch is in off position.

2.5 ENCLOSURES

- A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.
1. Outdoor Locations: NEMA 250, Type 3R.
 2. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
 3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
 4. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.
- B. Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated. Anchor floor-mounting switches to concrete base
- C. Comply with mounting and anchoring requirements specified in Division 26 Section "Seismic Controls for Electrical Work."
- D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Electrical Identification."
- B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate as specified in Division 26 Section "Electrical Identification."

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including connections. Report results in writing.

1. Inspect mechanical and electrical connections.
 2. Verify switch and relay type and labeling verification.
 3. Verify rating of installed fuses.
- B. Perform the following field tests and inspections and prepare test reports:
1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 3. Infrared Scanning:
 - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Open or remove doors or panels so connections are accessible to portable scanner.
 - b. Follow-Up Infrared Scanning: Perform an additional follow-up infrared scan of each unit 11 months after date of Substantial Completion.
 - c. Instruments, Equipment and Reports:
 - 1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - 2) Prepare a certified report that identifies enclosed switches and circuit breakers included and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

- A. Set field-adjustable switches and circuit-breaker trip ranges.

3.6 CLEANING

- A. On completion of installation, vacuum dirt and debris from interiors; do not use compressed air to assist in cleaning.
- B. Inspect exposed surfaces and repair damaged finishes.

END OF SECTION 26 28 16

SECTION 264313 - TRANSIENT VOLTAGE SUPPRESSION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes transient voltage surge suppressors for low-voltage power, control, and communication equipment.
- B. Related Sections include the following:
 - 1. Division 26 Section "Switchboards" for factory-installed transient voltage surge suppressors.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.
- B. Maintenance Data: For transient voltage suppression devices to include in maintenance manuals specified in Division 1.
- C. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain suppression devices and accessories through one source from a single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Architect not less than two weeks in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's written permission.
- B. Service Conditions: Rate surge protective devices for continuous operation under the following conditions, unless otherwise indicated:
 - 1. Maximum Continuous Operating Voltage: Not less than 115 percent of nominal system operating voltage.
 - 2. Operating Temperature: 30 to 120 deg F.
 - 3. Humidity: 0 to 85 percent, noncondensing.
 - 4. Altitude: Less than 20,000 feet above sea level.

1.6 COORDINATION

- A. Coordinate location of field-mounted surge suppressors to allow adequate clearances for maintenance.

1.7 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Replaceable Protection Modules: One of each size and type installed.

PART 2 - PRODUCTS

2.1 SERVICE ENTRANCE SUPPRESSORS:

- A. Surge Protective Device Description: Modular design with field-replaceable modules and the following features and accessories:
 - 1. Fabrication using bolted compression lugs for internal wiring.
 - 2. Integral disconnect switch.
 - 3. Redundant suppression circuits.
 - 4. Redundant replaceable modules.
 - 5. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
 - 6. Red and green LED indicator lights for power and protection status.
 - 7. Audible alarm, with silencing switch, to indicate when protection has failed.
 - 8. One set of dry contacts rated at 5 A and 250-V ac, for remote monitoring of protection status. Coordinate with building power monitoring and control system.
 - 9. Surge-event operations counter.
- B. Peak Single-Impulse Surge Current Rating: 400 kA per phase. (unless stated otherwise on panel schedules)
- C. Connection Means: Permanently wired.
- D. Protection modes clamping voltage for grounded wye circuits with voltages of 480Y/277 and 208Y/120; 3-phase, 4-wire circuits, shall be as follows:
 - 1. Line to Neutral: 800 V for 480Y/277 and 400 V for 208Y/120.
 - 2. Line to Ground: 800 V for 480Y/277 and 400 V for 208Y/120.
 - 3. Neutral to Ground: 800 V for 480Y/277 and 400 V for 208Y/120.

2.2 CONTROL AND DATA TERMINALS

- A. Protectors for copper data and telephone conductors entering the building from the outside shall be as recommended by the manufacturer for the type of line being protected.

2.3 ENCLOSURES

- A. NEMA 250, with type matching the enclosure of panel or device being protected.

PART 3 - EXECUTION

3.1 INSTALLATION OF SURGE PROTECTIVE DEVICES

- A. Install devices at service entrance on load side, with ground lead bonded to service entrance ground.
- B. Install devices for panelboard and auxiliary panels with conductors between suppressor and points of attachment as short and straight as possible. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.
 - 1. Provide multipole, 15-A circuit breaker as a dedicated disconnect for the suppressor, unless otherwise indicated or recommended by the suppressor manufacturer.

3.2 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.

3.3 FIELD QUALITY CONTROL

- A. Testing: Perform the following field quality-control testing:
 - 1. After installing surge protective devices, but before electrical circuitry has been energized, test for compliance with requirements.
 - 2. Complete startup checks according to manufacturer's written instructions.
 - 3. Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.19. Certify compliance with test parameters.
- B. Repair or replace malfunctioning units. Retest after repairs or replacements are made.
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.

1. Verify that electrical wiring installation complies with manufacturer's installation requirements.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain surge protective devices.
 1. Train Owner's maintenance personnel on procedures and schedules for maintaining suppressors.
 2. Review data in maintenance manuals. Refer to Specification Section "Contract Closeout".
 3. Review data in maintenance manuals. Refer to Specification Section "Operation and Maintenance Data".
 4. Schedule training with Owner, through Architect, with at least seven days' advance notice.

END OF SECTION 26 43 13

SECTION 26 5119 - LED LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior and exterior solid-state luminaires that use LED technology.
 - 2. Lighting fixture supports.
- B. Related Requirements:
 - 1. Section 26 09 23 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.2 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. LED: Light-emitting diode.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product, arranged by designation.
- B. Shop Drawings: For nonstandard or custom luminaires.
 - 1. Include plans, elevations, sections, and mounting and attachment details.
 - 2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include diagrams for power, signal, and control wiring.
- C. Product Schedule: For luminaires and lamps. (**See Plans.**)

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale and coordinated with each other, using input from installers of the items involved:
- B. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.
- C. Product Certificates: For each type of luminaire.
- D. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.6 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: **Five (5)** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LUMINAIRE 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. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.

- C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- D. Recessed Fixtures: Comply with NEMA LE 4.
- E. CRI of **minimum 80**. CCT of **4100 K**. (Specified in schedule sheet E6.0).
- F. Rated lamp life of **50,000** hours. (Minimum lamp hours per specified fixtures. See Sheet E6.0).
- G. Lamps dimmable from 100 percent to 0 percent of maximum light output.
- H. Internal driver.
- I. Nominal Operating Voltage: **277 V ac**. (See schedule and plans for verification: LED theatrical lighting 120V).
- J. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.

2.2 MATERIALS

- A. Metal Parts:
 - 1. Free of burrs and sharp corners and edges.
 - 2. Sheet metal components shall be steel unless otherwise indicated.
 - 3. Form and support to prevent warping and sagging
- B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- C. Diffusers, and Globes:
 - 1. Acrylic: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - 2. Glass: Annealed crystal glass unless otherwise indicated.
 - 3. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.

2.3 METAL FINISHES

- A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.4 LUMINAIRE SUPPORT COMPONENTS

- A. Comply with Division 26 Section "Basic Electrical Materials and Methods" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
- C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel.
- D. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.
- E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.
- F. Wires For Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.
- G. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- H. Aircraft Cable Support: Use cable, anchorages, and intermediate supports recommended by fixture manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports: Sized and rated for luminaire weight.
- E. Flush-Mounted Luminaire Support: Secured to outlet box.
- F. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
 2. Stem-Mounted, Single-Unit Luminaires: Suspend with four-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
 3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and **rod** for suspension for each unit length of luminaire chassis, including one at each end.
 4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.
- G. Ceiling-Grid-Mounted Luminaires:
1. Secure to any required outlet box.
 2. Secure luminaire using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
- H. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Electrical Identification".

3.2 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
 2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION 26 5119

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and division 1 Specification Sections, apply to this section.

SUMMARY

- A. This section includes general requirements specifically applicable to the Ascension Parish School Board voice and data Infrastructure-Division 16741.
1. This section includes: Equipment, materials, labor, and services to provide telephone and data distribution systems including, but not limited to:
 - a. Raceway, boxes, and cable tray
 - b. Telephone and data cabling terminations
 - c. Optical fiber and terminations
 - d. Telecommunications outlets
 - e. Terminal blocks/cross-connect systems
 - f. Equipment racks and cabinets
 - g. System testing
 - h. Documentation and submissions
 - i. Removal of abandoned cable
- B. Work Specifically Excluded from Project:
1. Incoming common carrier services
 2. Private Branch Exchange Systems
 3. Wide Area Network Systems
 4. Materials provided by the owner as identified in the Contract Documents.
- C. The Cabling Contractor shall be responsible for:
1. Providing all additional materials, and the necessary labor and services required to ensure all components of the system are completely installed in accordance with the intent of the Contract Documents.
 2. Furnishing and installing all incidental items not actually shown or specified, but which are required by good practice to provide complete functional systems.

3. Coordinating the details of facility equipment and construction for all specification divisions that affect the work covered under this Division.
4. Coordinating all activities with the overall construction schedule.
5. Developing bill of materials, performing material management and efficiently using the materials whether they are issued by the General Contractor, the owner, or purchased by the Cabling Contractor.
6. Ensure materials, in excess of those required to complete the project, are kept in their original condition and packaging for restocking.
7. Furnish and install firewall penetrations, where applicable.

D. Intent of Drawings:

1. Communications plan drawings show only general locations of equipment, devices, raceways, cable trays, boxes, etc. All dimensioned locations and elevations are approximate. The Cabling Contractor is responsible for the field coordination of communications work with the other trades prior to beginning work.
2. The Cabling Contractor shall be responsible for the proper placement and routing of equipment, cable, raceways, cable tray, and related components; according to the Contract Documents and subject to prior review by the General Contractor.

Refer all conflicts between Contract Documents to Contractor for resolution.

REFERENCES

- A. Design, manufacture, test, and install telecommunications cabling networks per manufacturer's requirements and in accordance with NFPA-70 (2005 edition of the National Electrical Code®), IEEE C2 2007 (NESC 2007), state codes, local codes, requirements of authorities having jurisdiction, and particularly the following standards:
 1. ANSI/NECA/BICSI-568-2006—*Standard for Installing Commercial Building Telecommunications Cabling ANSI/TIA/EIA Standards*
 2. ANSI/TIA/EIA-568-B.1—*Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements* ANSI/TIA/EIA-569-B—*Commercial Building Standard for Telecommunications Pathways and Spaces*
 3. ANSI/TIA/EIA-568-B.2—*Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted Pair Cabling Components*
 4. ANSI/TIA/EIA-568-B.3—*Optical Fiber Cabling Components Standard*

5. ANSI/TIA/EIA-606 (A)—*The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings*
6. ANSI-J-STD-607 (A)—*Commercial Building Grounding and Bonding Requirements for Telecommunications*
7. TIA-526-7-OFSTP-7—*Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant*
8. TIA-526-14A-OFSTP-14—*Optical Power Loss Measurement of Installed Multimode Fiber Cable Plant*
9. ANSI/TIA/EIA-758(A)—*Customer-Owned Outside Plant Telecommunications Cabling Standard*
10. TIA-TSB-140—*Additional Guidelines for Field Testing Length, Loss and Polarity of Optical Fiber Cabling Systems*

B. Install Cabling in accordance with the most recent edition of BICSI publications:

1. BICSI®—Telecommunications Distribution Methods Manual
2. BICSI®—Installation Transport Systems Information Manual
3. BICSI®—Network Design Reference Design Manual
4. BICSI®—Outside Plant Design Reference Manual
5. BICSI®—Wireless Design Reference Manual
6. BICSI®—Electronic Safety and Security Design Reference Manual
7. Infocomm/BICSI—AV Design Reference Manual

C. Federal, state, and local codes, rules, regulations, and ordinances governing the work, are as fully part of the specifications as if herein repeated or hereto attached. If the Cabling Contractor should note items in the drawings or the specifications, construction of which would be code violations, promptly call them to the attention of the owner's representative in writing. Where the requirements of other sections of the specifications are more stringent than applicable codes, rules, regulations, and ordinances, the specifications shall apply.

DEFINITIONS

- A. Active Equipment: Electronic equipment used to develop various WAN and LAN services.
- B. BICSI: Building industry consulting service international.
- C. Backbone: A cable or conductors and its pathway between any of the following:
telecommunications rooms, telecommunications enclosures, common telecommunications

rooms, floor-serving terminals, entrance facilities, equipment rooms, and common equipment rooms.

- D. Bonding: Permanent joining of metallic parts to form an electrically conductive path which will assure electrical continuity and the capacity to conduct safely any current likely to be imposed on it.
- E. Building Equipment Room (BER) (Also referred to as IDF or equipment closets): Room in each building used to distribute networking and communication services throughout the building. (These locations allow remote connections away from the Main Equipment Room. Typically, the BER contains passive equipment used for electrical protection (protectors) and building cross-connect, and active network equipment used for LANs. The BER may also serve the function of a Telecommunications room (TR).
- F. Cabinet: Freestanding, floor-mounted, modular enclosure designed to house and protect rack-mounted electronic equipment.
- G. Cable Tray: Vertical or horizontal open supports usually made of aluminum or steel that is fastened to a building ceiling or wall. Cables are laid in and fastened to the trays. A cable tray is not a raceway.
- H. Campus: Grounds or buildings of a multi-building premises environment.
- I. Channel: The end-to-end transmission path between two points at which application specific equipment is connected; may include one or more lines, cross-connect jumper and/or patch cords, and work area station cords. Does not include connection to active equipment.
- J. Communications Equipment Room: See Telecommunications Room (TR)
- K. Cross-Connect: Equipment used to terminate and tie together communications circuits.
- L. Cross-Connect Jumper: A cluster of twisted-pair conductors without connectors used to establish a circuit by linking two cross-connect termination points.
- M. EMI: ElectroMagnetic Interference
- N. Fiber Optic Distribution Unit (FDU): Cabinet with terminating equipment used to develop fiber optic cross-connect facilities.
- O. Grounding: A conducting connection to earth, or to some conducting body that serves in place of earth.
- P. Hinged Cover Enclosure: Wall-mounted box with a hinged cover that is used to house and protect electrical devices.
- Q. Horizontal Cabling: Cabling between and including the telecommunications outlet/connector and the horizontal cross-connect. Also the cabling between and including the building

automation system outlet or the first mechanical terminations on the horizontal connection point and the horizontal; cross-connect.

- R. Horizontal: Pathway facilities and media connecting MER, BER and TR to Telecommunications Outlets (TO).
- S. IDC: Insulation Displacement connector
- T. Jack: Receptacle used in conjunction with a plug to make electrical contact between communications circuits, e.g., eight-position/eight-contact modular jacks.
- U. Link: A transmission path between two points, not including terminal equipment, work area cables, and equipment cables; one continuous section of conductors or fiber, including the connecting hardware at each end.
- V. Local Area Network (LAN): Data transmission facility connecting a number of communicating devices, e.g., serial data, Ethernet, token ring, etc. Typically, the network is limited to a single site.
- W. Main Equipment Room (MER): The room used to distribute communication services to all Building Equipment Rooms (BER's) on the premises, and to interconnect premises services with the telephone companies. Typically, the MER contains passive equipment used for electrical protection (protectors) and main campus cross-connect, and active equipment used for telecommunications services, WAN, and LAN.
- X. Media: Twisted-pair, coaxial, and fiber optic cable or cables used to provide signal transmission path.
- Y. Mounting Frame: Rectangular steel framework which can be a free standing equipment rack or wall mounted rack to support wiring blocks, path panels, and other communications equipment.
- Z. Passive Equipment: Non-electrical hardware and apparatus, e.g., equipment racks, cable trays, electrical protection, wiring blocks, fiber optic termination hardware, etc.
- AA. Patch Cords: A length of wire or fiber cable with connectors on one or both ends used to join communications circuits at a cross-connect.
- BB. Patch Panel: System of terminal blocks or connectors used with patch cords that facilitate administration of cross-connect fields.
- CC. Pathway: Facility for the placement of communications cable. A pathway facility can be composed of several components including conduit, wireway, cable tray, surface raceway, underfloor systems, raised floor, ceiling support wires, etc.

- DD. Private Branch Exchange (PBX): Private communications switching system located on the user's premises. A PBX switches voice and data calls within a building or premises and between the premises and facilities provided by public common carrier networks.
- EE. Protectors: Electrical protection devices used to limit foreign voltages on metallic communications circuits.
- FF. Raceway: An enclosed channel designed expressly for holding wires or cables; may be of metal or insulating material. The term includes conduit, tubing, wireway, underfloor raceway, and surface raceway; does not include cable tray.
- GG. Racks: An open, freestanding, floor-mounted structure, typically made of aluminum or steel, used to mount equipment; usually referred to as an equipment rack.
- HH. Rack Unit (RU): A unit of measure of vertical space in an equipment rack. One rack unit is equal to 45mm (1.75 in).
- II. RCDD: registered communications Distribution Designer
- JJ. Telecommunications Outlet (TO): Connecting device mounted in a work area used to terminate horizontal cable and interconnect cabling with station equipment.
- KK. Telecommunications Room (TR): Distributes communications services to users within a serving zone and interconnects with the BER. Typically, the TER contains passive equipment used for cross-connect and active network equipment used for LANs. TR is sometimes referred to as the communications equipment room.
- LL. UTP: Unshielded Twisted Pair
- MM. Wide Area Network (WAN): A data communications system that uses telecommunications circuits to link LAN's that are distributed over large geographic distances.
- NN. Wiring Block: Punch down terminating equipment used to develop twisted-pair cross-connect facilities.

PERFORMANCE REQUIREMENTS:

- A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIS-568-B.1, when tested according to test procedures of this standard.

SYSTEM DESCRIPTION:

- A. The owner will implement a comprehensive integrated communications distribution system, as described in paragraph B below, to provide wiring infrastructure which may be used to support one or more of the following services and systems:

1. Data and Voice Telecommunications.
 2. Wireless systems.
 3. Facilities management systems.
- B. The communications distribution system consists of the following major subsystems, as specified elsewhere:
1. Interbuilding Backbone: The interbuilding subsystem refers to all fiber optic backbone communications cabling connecting the Main Equipment Room (MER) to each building equipment room (BER) in all buildings on the campus.
 2. Intrabuilding Backbone: The intrabuilding subsystem refers to all twisted-pair and fiber optic backbone communications cabling connecting the Building Equipment Room (BER) to each Telecommunication Room (TR) in the buildings.
 3. Communication Rooms: The communications room contains the distribution subsystem comprised of the passive components used to terminate cabling subsystems and distribute communications services. This subsystem includes installations in the Main Equipment Room (MER), Building Equipment Rooms (BERs), Telecommunications Rooms (TRs) and Telecommunications Enclosure (TEs).
 4. Horizontal Distribution: The horizontal distribution subsystem refers to all infra-building twisted-pair and fiber optic communications cabling connecting telecommunications rooms (TRs) to telecommunications outlets (TOs) located at individual work areas.
 5. Work Area Distribution Subsystem: Patch cords, adapters, and devices located between the TO and station equipment.
- C. The communications distribution system is based on a combination of the following communications transmission technologies:
1. 4-pair unshielded twisted-pair cable (Cat 6)
 2. 4-pair unshielded twisted-pair cable (Cat 6a)
 3. Multi-pair unshielded twisted-pair cable (Cat 3)
 4. 9/125-micron single-mode fiber optic cable
 5. 8-position telecommunications jacks (Cat 6 and Cat 6a)
 6. 8-position telecommunications patch panels -(Modular) (Cat 6 and Cat 6a)
 7. Insulation displacement connector (IDC) type field terminated wiring blocks
 8. Factory Terminated copper patch cords
 9. Rack mount fiber optic hardware
 10. Wall mounted fiber optic hardware

- 11. Fiber optic connectors (typically LC)
- 12. Factory terminated optic patch cords
- D. The work locations and limits of work should be shown on the drawings.
- E. The telecommunication system described in this document should not include an intercom system integrated with a Voice-over-Internet-Protocol (VOIP) system. The intercom system should remain a separate communication system independent of the primary telecommunications system.

SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:
 - 1. Include dimensioned plan and elevation views of telecommunications equipment rooms, labeling each individual component. Show equipment rack assemblies, method of field assembly, workspace requirements, and access for cable connectors.
 - 2. Include counts of the number of drops in total and terminated in each MER and BER.
 - 3. Include counts of the number of cameras and wireless access points (WAP) being used at the site.
 - 4. System Labeling Schedules: Copy of labeling schedules.
 - 5. Overall system block diagram.
- C. General:
 - 1. Provide ongoing inspection and permit certificates and certificates of final inspection and acceptance from the authority having jurisdiction.
 - 2. Manufacturer's standardized schematic diagrams and catalog cuts shall not be acceptable unless applicable portions of it are clearly indicated and non-applicable portions clearly deleted or crossed out.
 - 3. When the specifications include product descriptions, model numbers, part numbers, etc. that have been superseded, changed, or discontinued, the Contractor shall submit a comparable substitution prior to the bid process for review by The Ascension Parish School Board Telecommunications.
 - 4. The contractor shall be a Panduit's Certified Installer (PCI), and hold current certificate stating that the Cabling Contractor is in good standing in the Panduit PCI program. (Or certified on equivalent, approved substation.)
 - 5. Contractor shall provide a minimum 2-year manufacturer warranty on all cabling and connectivity.
- D. Provide all applicable portions of the following information with the Bid:

1. Documentation establishing qualifications to perform installation functions as required in 1.5.
2. Statement demonstrating an understanding of project scope and schedule which includes the following information:
 - a. Where (city, office) the project will be staffed.
 - b. Project organizational chart with team member names; e.g., project manager, principal skilled technicians, and contractors.
- E. Provide all applicable portions of the following information within 10 days after award of Subcontract:
 1. Project schedule in hard copy. Include, at a minimum, major tasks, milestones, dependencies, staffing, and durations for each task.
 2. Contractor shall then work with the General Contractor to merge this schedule into the overall construction schedule.
 3. Provide the following information for materials, components, and equipment to be furnished by the Contractor:
 - a. Descriptive literature, manufacturer's specification data sheets, and manuals.
 - b. Individual price and delivery schedules.
 - c. Manufacturer's product test data with indicator arrows.
 - d. Final Performance testing criteria and data for communications distribution system cabling systems.

QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency or contractor staff with the experience and capability and equipment to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7.
- B. Please provide APSB with a diagram/map of all fiber paths. (Internal and External)
- C. 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.
- D. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.
- E. Grounding: Comply with ANSI-J-STD-607-A.
- F. The following manufacturers listed have been approved for use in APSB construction and should be considered the minimum standard of quality. Approval of equivalents

must be obtained prior to the Cabling Contractor submitting a proposal. A representative of APSB will determine the approval of equivalents.

1. Multi-pair cable
 - a. General Cable
 2. Station Voice and Data Cable
 - a. General Cable
 3. Copper Termination Products
 - a. Panduit-Jacks and Patch Panels (Modular patch panels are required.)
 4. Fiber Optic Cabling
 - a. Corning Cabling Systems
 5. Wall Mount Racks
 - a. Hubbell Premise Wiring
 - b. Great Lakes Case and Cabinet
- G. When requesting substitutions, it is the responsibility of the contractor to submit alternate specifics showing comparability to the parts or design listed to the Architect and APSB staff.
- H. The contractor should be a Panduit Certified Installer (PCI.)
- I. The contractor shall have worked satisfactorily for a minimum of five (5) years on systems of this type and size.
- J. The contractor will be certified to install and terminate both copper and fiber.
- K. Upon request by the owner, engineer or designer; furnish a list of references with specific information regarding type of project and involvement in providing equipment and systems.
- L. Equipment and materials of the type for which there are independent standard testing requirements, listings, and labels, shall be listed and labeled by the independent testing laboratory.
- M. Where equipment and materials have industry certification, labels, or standards (i.e., NEMA-National Electrical Manufacturers Association), this equipment shall be labeled as certified or complying with standards.

- N. Material and equipment shall be new, and conform to grade, quality, and standards specified. Equipment and materials of the same type shall be a product of the same manufacturer throughout.
- O. Subcontractors shall assume all rights and obligations toward the contractor that the contractor assumes toward the owner and engineer/designer.
- P. All work and equipment shall conform to the appropriate portions of the specifications, codes and regulations as listed in Section 1.3.

WARRANTY

- A. Minimum two years for parts and labor on all cable and connectors.

COORDINATION

- A. Coordinate layout and installation of voice and data communication cabling with the Owner's telecommunications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local exchange carriers.
 - 1. Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and owners to exchange information and agree on details of equipment arrangements and installation interfaces.
 - 2. Record agreements reached in meetings.
 - 3. Adjust arrangements and locations of distribution frames and cross-connect and patch panels in equipment rooms and wiring closets to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.

DELIVERY, STORAGE AND HANDLING

- A. The Cabling Contractor shall protect equipment during transit, storage, and handling to prevent damage, theft, soiling, and misalignment. Coordinate with the owner for secure storage of equipment and materials. Do not store equipment where conditions fall outside manufacturer's recommendations for environmental conditions. Do not install damaged equipment; remove from site and replace damaged equipment with new equipment.

PRODUCTS

SYSTEM REQUIREMENTS

- A. Coordinate the features of materials and equipment so they form an integrated system. Match components and interconnections for optimum performance.

MANUFACTURERS

- A. The products of manufacturers named in individual articles below are considered the minimum standard of quality unless prior approval has been obtained.
 - 1. Provide products of manufacturers as named in individual articles
 - 2. Where no manufacturer is specified, provide products of manufacturers in compliance with requirements.
- B. FABRICATION
 - 1. Fabricate custom-made equipment with careful consideration given to aesthetic, technical, and functional aspects of equipment and its installations.
- C. SUITABILITY
 - 1. Provide products that are suitable for intended use, including, but not limited to, environmental, regulatory, and electrical.

PATHWAYS

- A. Cable Support: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
 - 1. Support brackets with cable ties slots for fastening cable ties to brackets.
 - 2. Lacing bars, spools, J-hooks, and D-Rings.
 - 3. Straps and other devices.
- B. Conduit and Boxes: Comply with requirements in Division 26 Section “Raceway and Boxes for Electrical Systems.”
 - 1. Outlet boxes shall be single-gang unless noted otherwise on drawings.
 - 2. 2 - 4 inch conduits from MDF to outside locations determined by the utility company.
 - 3. 2 - 2 inch conduits from MDF to outside location for future growth of the campus within a communications box.

INSIDE TELEPHONE FEEDER CABLE

- A. Inside telephone feeder cable shall be multi-pair telephone cable designed for inside wiring. *(This should only be provided where specifically requested by owner. Most phones are VoIP.)* The cable shall have the following characteristics:
1. Conductors shall be solid, 24-gauge, annealed copper. Strands shall be individually insulated, polyethylene insulated cable, and twisted into pairs.
 2. Number of pairs in cable shall be noted for each job.
 3. Individual conductors shall be color-coded.
 4. The cable shall have an overall jacket/sheath rated, per NEC code, for use in a plenum space, a "CMP" rated.
 5. Cables shall be one of the following products or prior approved equal:
 - a. General Cable
 - Part designation 752785 (25 pair cable)
 - Part designation 752793 (50 pair cable)
 - Part designation 752819 (100 pair cable)
 - (Available in a 25-pair cable to a 300-pair cable)

CABLING COLOR QUICK REFERENCE (Horizontal Cabling)

A) Category 6

PART NUMBERS

Standard packaging: 1000' Pull-Pac® II

Jacket Color	Pull-Pac® II		Spool-Pac®		Spool	
	CMR (Non-Plenum)	CMP (Plenum)	CMR (Non-Plenum)	CMP (Plenum)	CMR (Non-Plenum)	CMP (Plenum)
 Blue	7133800	7131800	7133840	7131840	7133860	7131860
 White	7133801	7131801	7133841	7131841	7133861	7131861
 Yellow	7133802	7131802	7133842	7131842	7133862	7131862
 Gray	7133803	7131803	7133843	7131843	7133863	7131863
 Red	7133804	7131804	7133844	7131844	7133864	7131864
 Orange	7133805	7131805	7133845	7131845	7133865	7131865
 Green	7133806	7131806	7133846	7131846	7133866	7131866
 Black	7133807	7131807	7133847	7131847	7133867	7131867
 Pink	7133808	7131808	7133848	7131848	7133868	7131868
 Purple	7133809	7131809	7133859	7131859	7133869	7131869

B) Category 6A

PART NUMBERS

Standard packaging: 1000' Pull-Pac or spool. Spool-Pac by special order.

Jacket Color	CMP (Plenum)		CMR (Non-Plenum)	
	Spool	Pull-Pac®	Spool	Pull-Pac®
 Blue	7141819	7141800	7143819	7143800
 White	7141820	7141801	7143820	7143801
 Yellow	7141822	7141802	7143822	7143802
 Gray	7141821	7141803	7143821	7143803
 Red	7141824	7141804	7143824	7143804
 Orange	7141826	7141805	7143826	7143805
 Green	7141823	7141806	7143823	7143806
 Black	7141828	7141807	7143828	7143807
 Pink	7141827	7141808	7143827	7143808
 Purple	7141825	7141809	7143825	7143809

PATCH CABLE COLOR QUICK REFERENCE (IDFs)

Monoprice SlimRun Cat6A Ethernet Patch Cable

	Blue	White	Green	Grey	Black	Orange	Purple
1 foot	15150	15152	16315	15151	15149	16316	16318
3 foot	15154	15156	16320	15155	15153	16321	16323
5 foot	15158	15160	16345	15159	15157	16346	16348
7 foot	15162	15164	16325	15163	15161	16326	16328

PATCH CABLE COLOR QUICK REFERENCE (WAOs)

QUIKTRON (LEGRAND) Copper Patch Cables, Cat 6 OR-576-

	Blue	White	Green	Grey	Black	Orange	Purple	Red
1 ft	110-001	125-001	120-001	100-001	135-001	140-001	145-001	130-001
7 ft	110-007	125-007	120-007	100-007	135-007	140-007	145-007	130-007
10 ft	110-010	125-010	120-010	100-010	135-010	140-010	145-010	130-010
14 ft	110-014	125-014	120-014	100-014	135-014	140-014	145-014	130-014
25 ft	110-025	125-025	120-025	100-025	135-025	140-025	145-025	130-025
50 ft	110-050	125-050	120-050	100-050	135-050	140-050	145-050	130-050
100 ft	110-100	125-100	120-100	100-100	135-100	140-100	145-100	130-100

PANDUIT MODULAR JACK QUICK REFERENCE

Jack Color	Part Number
Black	CJ688TPBL
Blue	CJ688TPBU
Grey	CJ688TPIG
Green	CJ688TPGR
Orange	CJ688TPOR
White	CJ688TPWH
Red	CJ688TGRD

COLOR ASSIGNMENT QUICK REFERENCE

Color	Assigned Use	Example Devices
Blue	General Data	Teacher/Student devices, desktops, printers
White	Wireless Access Points (WAPs)	Ceiling-mounted APs, Wi-Fi 6/6E devices
Green	IP Video / Surveillance	Security cameras (indoor/outdoor)
Orange	Building Automation Systems (BAS)	HVAC controllers, BMS gateways
Purple	Miscellaneous / Time Clocks	Bell clocks, network-synced timers
Yellow	Access Control Systems	Badge readers, door controllers, mag locks
Gray	Interactive Boards / Intercom Controllers	Promethean/Smart boards, intercom head-ends
Black	Digital Signage	Wall/ceiling-mounted displays, content players

WORK AREA OUTLETS (WAO)/DATA STATION CABLING

- A. Classroom/Teacher Stations
1. Shall consist of a single gang 1 Port faceplate with two (2) Category 6 RJ-45 data jacks through 1 inch conduit at each location wired T568B.
 2. Please provide 3 blue 7ft patch cords: Part=OR-576-110-007
- B. Office Workstations
1. Shall consist of a single gang 1 Port faceplate with three (3) Category 6 RJ-45 data jacks through 1 inch conduit at each location wired T568B as follows:
 - a. 3 blue snapin's and color cable for data and phone connections
 2. Please provide 3 - 7ft patch cords:
 - a. 3 blue Part=OR-576-110-007
- C. Data station cables shall be Category 6 compliant with ANSI/TIA/EIA-568-C.2-1, 100 ohms, four-pair, 24-gauge copper, plenum or riser-rated where specified, unshielded twisted pair cables. The outer jacket of the cable shall be **BLUE** in color. Cable shall be one of the following products or a prior approved equal:

1. General Cable part numbers (See chart above clarification):
 - a. Genspeed 6 CMR-7133840 (Blue)
 - b. Genspeed 6 CMP-7131840 (Blue)
- D. Data jack shall match the color of the cable.
- E. Both wall and raceway-mounted WAO shall be mounted in single gang utility boxes.
- F. Labeling of all WAO'S is required.
- G. WAO jacks shall be a Category 6, 8-pin 8-Conductor modular jack, wired T568B and shall be from the same manufacturer as the face plates.
 1. Panduit part number:
 - a. CJ688TPBU (Blue)
- H. WAO faceplates shall be capable of accepting a variety of snap-in inserts such as RJ-45 Mini-Com modules for UTP, Fiber Optic inserts and Audio/Video inserts. Face plates must be from the same manufacturer as the jacks.
 1. Panduit part number or prior approved equal:
 - a. Two Port-CFPE2EIY
 - b. Four Port-CFPE4EIY

INTERACTIVE BOARD CABLING

- A. Interactive board cables shall be Category 6 compliant with ANSI/TIA/EIA-568-C-2.1, 100 ohms, four-pair, 24-gauge copper, plenum or riser-rated where specified, unshielded with twisted pair cables. The outer jacket of the cable shall be **GRAY** in color. Cable shall be one of the following products or a prior approved equal:
 1. General Cable part numbers:
 - a. Genspeed 6 CMR-7133843
 - b. Genspeed 6 CMP-7131843
 2. Data jack shall match the color of the cable.

WIRELESS ACCESS POINT CABLING (WAP)

- A. Wireless Access for cables shall be Category 6A compliant with ANSI/TIA/EIA-568-C.2-1, 100 ohms, four-pair, 24-gauge copper, plenum or riser-rated where specified, unshielded twisted pair cables. The outer jacket of the cable shall be

WHITE in color. Cable shall be one of the following products or a prior approved equal:

1. General Cable part numbers:
 - a. Genspeed 6A CMR-7133820
 - b. Genspeed 6A CMP-7131820
 2. General Cable for outdoor Wireless Access Points:
 - a. GenSPEED®10 UTP Category 6A Cable
- B. Bus Lanes should have a maximum of 3 Cat 6A Cables to provide outdoor wireless access. Reference section A above for cable specs.
- C. WAP shall be terminated at the patch panel with a Panduit Cat6A White data jack, and wired T568B.
1. Panduit Part numbers:
 - a. Cat6A White Jack-CJ6X88TGWH
- D. WAP shall be terminated at the device end with a Panduit Cat6A White data jack, and wired T568B. For ceiling grid WAP installation, Cat6A jack shall be mounted within a 2-Port surface biscuit and placed above ceiling with a 10ft service loop. Wall Mount installations will follow installation and parts of section 2.8 with Cat6A jacks. Surface box shall be labeled in accordance with section 3.8.
1. Panduit Part numbers:
 - a. Cat6A White Jack-CJ6X88TGWH
 - b. 2-Port Surface Box-CBX2EI-X
- E. Wireless Access Point locations should not exceed 10 feet from the floor/ground to allow for future serviceability. Any questions regarding height or any deviations should be directed to the APSB Technology department.

IP VIDEO CABLING

- A. IP video/CCTV cables shall be Category 6 compliant with ANSI/TIA/EIA-568-C-2.1, 100 ohms, four-pair, 24-gauge copper, plenum or riser-rated where specified, unshielded

with twisted pair cables. The outer jacket of the cable shall be **GREEN** in color. Cable shall be one of the following products or a prior approved equal:

1. General Cable part numbers:
 - a. Genspeed 6 CMR-7133846
 - b. Genspeed 6 CMP-7131846
 2. Data jack shall match the color of the cable.
 3. These specifications also apply to video security cameras for elevators.
- B. Video camera locations should not exceed 16 feet from the floor/ground to allow for future serviceability. Any questions regarding height or any deviations should be directed to the APSB Technology department.

IP DIGITAL SIGNAGE (mounted TVs)

- A. IP video/CCTV cables shall be Category 6 compliant with ANSI/TIA/EIA-568-C-2.1, 100 ohms, four-pair, 24-gauge copper, plenum or riser-rated where specified, unshielded with twisted pair cables. (Jack and electrical power should be located at the height the TV will be installed. Typically it is 6 to 7 ft above the floor, but maybe higher in large spaces. The outer jacket of the cable shall be **BLACK** in color. Cable shall be one of the following products or a prior approved equal:
1. General Cable part numbers:
 - a. Genspeed 6 CMR-7133847
 - b. Genspeed 6 CMP-7131847
 2. Data jack shall match the color of the cable.

IP ACCESS CONTROLS CABLING

- B. Video cables shall be Category 6 compliant with ANSI/TIA/EIA-568-C-2.1, 100 ohms, four-pair, 24-gauge copper, plenum or riser-rated where specified, unshielded with twisted pair cables. The outer jacket of the cable shall be **YELLOW** in color. Cable shall be one of the following products or a prior approved equal:
1. General Cable part numbers:

- a. Genspeed 6 CMR-7133842
 - b. Genspeed 6 CMP-7131842
2. Data jack shall match the color of the cable.

IP INTERCOM SYSTEM CABLING (IF SPECIFIED)

- A. IP Intercom System cables shall be Category 6 compliant with ANSI/TIA/EIA-568-C.2-1, 100 ohms, four-pair, 24-gauge copper, plenum or riser-rated where specified, unshielded twisted pair cables. The outer jacket of the cable shall be **GRAY** in color. Cable shall be one of the following products or a prior approved equal:
 1. General Cable part numbers:
 - a. Genspeed 6 CMR-7133843
 - b. Genspeed 6 CMP-7131843
 2. Data jack shall match the color of the cable.

PATCH PANELS/PATCH CORDS

- A. All data station cabling and wireless access point cabling shall terminate on rack mounted, modular 24-port or 48-port patch panels. Panels shall be 19" rack mounted and capable of accepting a variety of snap in inserts such as RJ-45 Category 6 modules for UTP, Fiber Optic inserts and Audio/Video inserts. Multiple patch panels must be installed with 1 rack space between them. Drops in patch panels shall be installed in the order they physically land in the building. For example, a classroom's wall drops, WAP drop, ActivPanel drop, and any nearby camera drops shall be installed together. This pattern shall continue for all patch panels. Wall drops, WAP drops, camera drops, etc. are not to be installed in groups. Please see the technology department if you have any questions.
- B. Panduit Patch Panel part number or prior approved equal
 - a. 24-port-CPPL24WBLY
 - b. 48-port-CPPL48WBLY

Note: Snap-in modules shall be color coded to match the corresponding cabling. See above for colors.

- C. Panduit Patch Cord Part number or approved equal
 - a. See quick reference above for part numbers.
 - b. Patch cords for IDFs shall be 1 foot in length, see quick reference for part numbers.

FIBER OPTIC CABLING

- A. Singlemode Fiber, 9/125um core, OS2 Indoor/Outdoor, OFNR Riser Rated, all dielectric construction, UV resistant, jacketing suitable for installation in aerial, duct or riser applications. Must be a gel-free construction utilizing a water-swellable yarn. Individual fiber strands shall be color-coded per telecommunications industry practice. Unless otherwise noted, all fiber installations shall include a strand count of 12.

- 1. Transmission Performance Characteristics as follows:

Wavelength	1310nm	1550nm
Maximum attenuation (db/km)	1.0	.75
Serial Gigabit Ethernet Distance (m)	5000	-
Serial 10 Gigabit Ethernet Distance (m)	10000	40000

- 2. Corning Cabling Systems Part Numbers or prior approved equal:
 - a. OFNR

xxxESF-T4101D20
 - b. xxx Denotes strand count

- B. Connections for additional services outside of the APSB Technology department will require separate fiber.

FIBER OPTIC CONNECTORS

- A. Fiber optic connectors shall be Corning Unicam, Singlemode, OS2 LC style.
 - 1. Corning Part Number:
 - a. 95-200-99
- B. Fiber optic connectors shall meet or exceed the performance specifications in ANSI/TIA/EIA-568-C.3

FIBER OPTIC DISTRIBUTION UNITS

- A. Fiber Distribution Units (FDU) shall be 19” rack mountable with cable strain relief, grounding lugs, slack storage and front and rear access doors. (Sometimes also referred to as LIU (Lightguide Interconnect Units).
- B. The FDU at the Intermediate Cross-Connect (IC) shall include the bulkhead panel and blanks for the unused panel ports. The FDU at the Main Cross-Connect (MC) shall have the appropriate number of bulkheads to accommodate the FDU’s at the IC and blanks for the unused panel ports. The bulkhead panels shall be loaded with Singlemode, **LC Duplex** couplers with phosphor bronze split sleeves.
- C. The FDU shall be sized to accommodate the appropriate number of fiber connectors.
- D. Fiber distribution panels shall be labeled with each strand marked permanently with the corresponding Transmit and Receive appropriately marked.
- E. Bulkheads panels must be from the same manufacturer as the FDU.
- F. Corning part number or prior approved equal:
 - 1. FDU-CCH-01U
 - 2. FDU bulkheads-CCH-CP12-A9

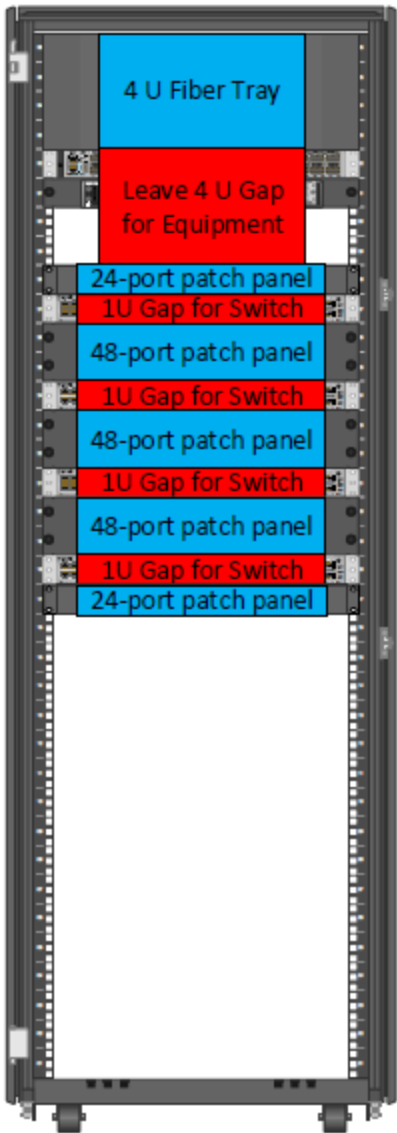
SIZING STANDARD FOR MAIN AND INTERMEDIATE DISTRIBUTIVE FRAMES

- A. Main Distributive Frames or Main Communication Room should be 14 feet in width and 14 feet in depth. There should be sufficient room for two (2) server cabinets near the center of the room. There should be sufficient space for wall-mount equipment, including but not limited to ISP hardware and intercom hardware. There shall be sufficient climate control that is separate from the rest of the facility to ensure that equipment is cooled properly. Any deviation from this standard shall be approved by the architect and the APSB Technology Department.
- B. Intermediate Distributive Frames or Intermediate Communication Rooms should be 7 feet in width and 7 feet in depth. There should be sufficient space for the APSB-specified wall-mount cabinet to open fully. There shall be sufficient climate control that is separate from the rest of the facility to ensure that equipment is cooled properly. Any deviation from this standard shall be approved by the architect and the APSB Technology Department.

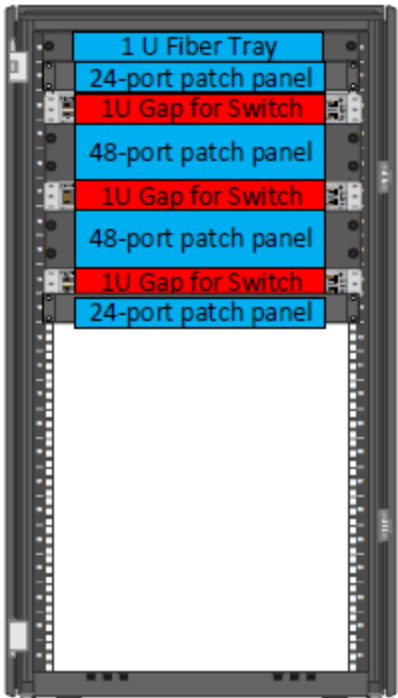
FREE STANDING EQUIPMENT RACKS (Use must be approved by APSB Tech Dept.)

- A. 45 RMU, 7 feet high, 19 inches wide, 3 inch channel depth, EIA free-standing rack, 1000lb capacity, UL listed. (HPE 42U 800mmx1200mm G2 Enterprise Pallet Rack or equivalent. Any substitution must be approved by APSB Technology Department and MUST include the additional wire management space provided in this cabinet. The UPS will be provided by APSB and will require an L6-30 twist lock plug to support it. (If needed, this unit can be an owner provided/contractor installed component. Check documentation.)
- B. Furnish and install Panduit Tack-Tape, Velcro or approved equal cable wraps for wire management. **Plastic, nylon or metal tie wraps are not allowed.**
- C. Hardware shall be installed as shown on the following page. Fiber Distribution Units (FDU) shall be installed in the top-most rack unit (RU) of the cabinet. In the MDF, a 4 RU gap shall be left immediately under the FDU to accommodate network equipment. In IDFs, the first patch panel shall be installed immediately under the FDU. In both MDFs and IDFs, the first patch panel shall have 24 ports. After each patch panel, a 1 RU gap shall be left to accommodate network equipment. This pattern shall continue for all patch panels in the cabinet as shown below. If the operation of the FDU is hindered by the structure of the cabinet, the top-most RU may be left empty and the

hardware installed starting in the next RU. The vertical rail in the cabinet shall be adjusted to allow the FDU to operate without interference from the cabinet door.



MDF Cabinet



IDF Cabinet

CABINETS

- A. The cabinet specifications described here are for APSB network equipment only. Other systems, like intercoms, are managed by other departments. Specifications for those systems and their respective installation options are to be determined by those departments. Cabinets for APSB network equipment shall remain clear of other systems in order to accommodate future expansion without the need for downtime for those other systems.
- B. Wall mounted cabinets/enclosures will be used in classrooms when added to existing buildings. Vertical Hubble cabinets supporting 96 drops should be used in applications requiring less than 80 drops (Hubbell RE4XB) with adequate space. Great Lakes enclosures.
- C. Wall mounted cabinets should be located in air-conditioned closets or equipment rooms in new construction and can use cabinets or racks based on the security of the room.
- D. Wall mounted cabinets will be 19" rack mountable, 2-pair of 12-24 EIA/TIA tapped rails, swing out, either 24" or 36" high, Plexiglass front door and vented sides. Cabinets shall be suitable for front mounting of patch panels and/or owner furnished switches. Depth of cabinet should be confirmed with APSB staff to support current POE switches in use. Great Lakes Case & Cabinets part number or prior approved equal:
 - 1. 24" wall mount - GL24WDM
 - 2. 36" wall mount - GL36WDM
 - 3. 48" wall mount - GL48WDM
- E. Hubble Cabinets part number or prior approved equal. Depth of cabinet should be confirmed with APSB staff to support current POE switches in use.
 - 1. Hubbell RE4XB Vertical Cabinets supporting 96 drops

- F. The Main Equipment/Communications Room (MER or Server Room) shall use an HPE 42U 800mmx1200mm G2 Enterprise Pallet Rack or equivalent. Any substitution must be approved by APSB Technology Department and MUST include the additional wire management space provided in this cabinet. The UPS will be provided by APSB and will require an L6-30 twist lock plug to support it.
- G. Furnish and install Panduit Tack-Tape, Velcro or approved equal cable wraps for wire management. **Plastic, nylon or metal tie wraps are not allowed.**
- H. Cabinets should be installed on the wall with a rigidly fixed ¾” trade size, A-C grade plywood, preferably free of voids and capable of supporting attached equipment. Plywood should be either fire rated and/or covered with two coats of fire retardant paint.

CONDUIT AND RACEWAY

- A. Indoor:
 - 1. **ORANGE** Inner-duct is required for unexposed, indoor installations of fiber.
 - 2. Raceway shall be Panduit raceway system and will include all elbows, T’s, boots, and connectors needed for any exposed indoor fiber.
 - 3. Installation must include a trace wire to be installed in the Inner-duct.
- B. Outdoor:
 - 1. Rigid conduit shall be used for above-ground installation and attachment to and between walkways or buildings.
 - 2. For underground installations PVC shall be a non-metallic, conduit intended for power and communications applications and suitable for the application.
 - a. Installation must include a trace wire to be installed in the conduit.

UPS POWER

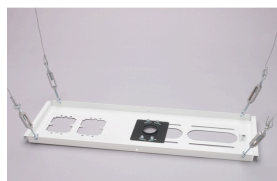
- A. The UPS in the Main Equipment/Communications Room will be provided by APSB and will require an L6-30 twist lock plug to support it.

SURGE PROTECTION

- A. Protect components from voltage surges originating external to equipment housing and entering through power, communication or control leads. There is to be two levels of protection as follows:
 - 1. All incoming 120 volt circuits.
 - 2. Protect communication and control, and low voltage power lines as they leave the control box and route to another separate building and as they enter the control box in the other separate building.

PROJECTORS - Caf, lib, special room. Non classroom

- A. In media centers, cafeterias and other spaces that have non-standard ceiling heights or types, the contractor must provide the mounting, wiring and all necessary components for the functioning of audio and video in those spaces. All Media Centers and Cafeterias must have audio and visual capabilities and these should be discussed with the school principal and the technology department.
- B. In new construction, when requested, a Chief CMA440 **** mounting plate should be provided by the contractor for installation of the power outlet for a projector standard ceiling rooms that are not classrooms when requested by the APSB Technology Department or school staff. APSB will provide the remaining mounting components, HDMI cabling, and projector.



- C. One Cat6 drop and 120V power should be provided to each projector location.
- D. The projector location will be 6 to 8 feet from the designated “presenting” wall.
- E. HDMI may also be provided from a projector and through 1.5 inch conduit to a box and plate to be located at or near the space allocated for the interactive board. The contractor should provide the conduit and boxes and cover with blank plates.

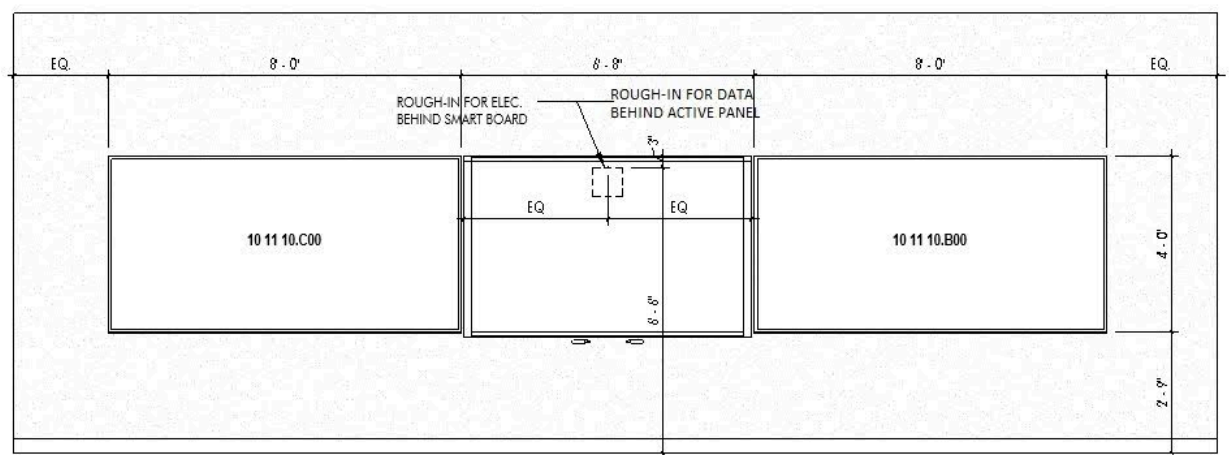
APSB may use the components specified below where required:

- 1. Quicktron Decora Wall Plate HDMI Pass Through-White (2225-39710-000)

2. Quicktron Single Gang Decora Wall Plate-White (2601-03725-000)
3. Quicktron 35ft Select in wall HDMI SS w/Ethernet (2101-50634-035)
4. Quicktron 50ft Select in wall HDMI SS w/Ethernet (2101-50636-050)
5. Quicktron Single Gang Aluminum 1 ½ Grommet Faceplate (2225-40489-ADT)

Classroom Interactive Boards

- A. The interactive boards location will be centered on the teaching wall. A space of 80 inches should be available for mounting the active panel.
- B. 120V power and Cat 6 cable (GRAY) will also be provided to the active panel through 1 inch conduit to a box and plate to be located at or near the power outlet to each active panel at the specified location below:



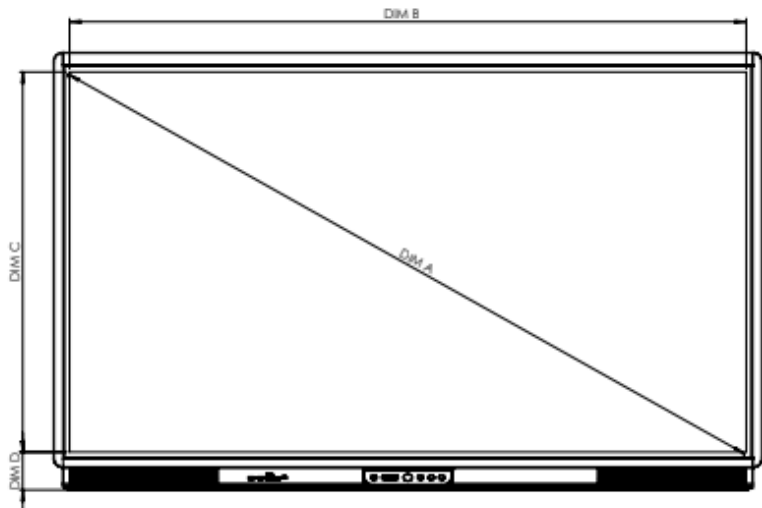
NOTE: ALIGN TOP OF ALL WALL MOUNTED SMART BOARDS, WHITEBOARDS AND TACKBOARDS - ALL WALLS

Note: Contractor must check with the school principal and technology department for final height requirements. See below for panel technical details and specifications.

TECHNICAL DRAWINGS

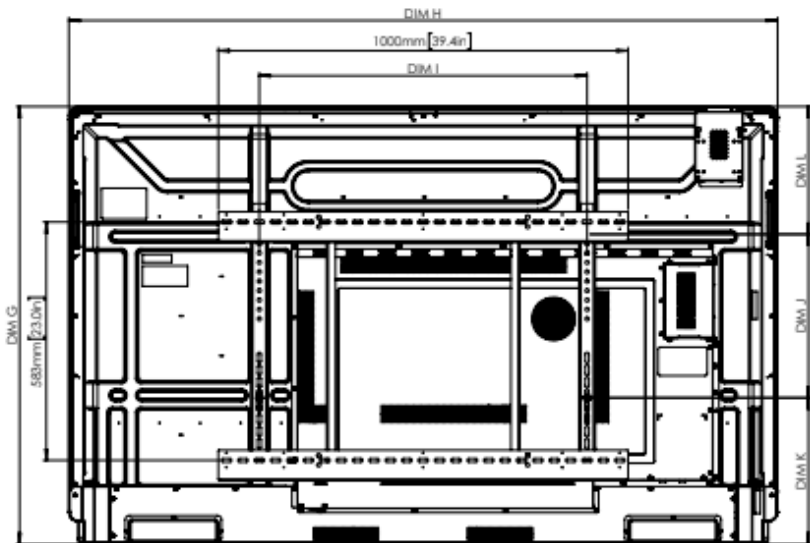
75"

Front



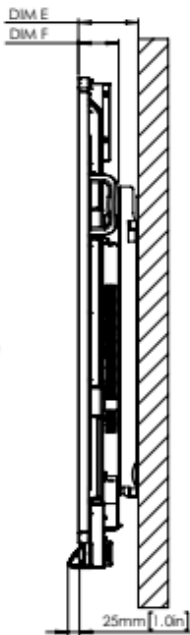
DIM	DIMENSION (mm)
A	1897mm [74.7in]
B	1652mm [65.0in]
C	930mm [36.61in]
D	93mm [3.6in]

Back



DIM ID	DIMENSION
E	130mm [5.1in]
F	88mm [3.5in]
G	1070mm [42.1in]
H	1730mm [68.1in]
I	800mm [31.5in]
J	400mm [15.75in]
K	357.6mm [14.1in]
L	312.6mm [12.31in]

Side



PHYSICAL SPECIFICATIONS

Panel Dimensions	65": 1509 x 946 x 113 mm (59.4 x 37.2 x 4.4 in) 75": 1730 x 1070 x 113 mm (68.1 x 42.1 x 4.4 in) 86": 1975 x 1208 x 113 mm (77.8 x 47.6 x 4.4 in)
Packed Dimensions	65": 1660 x 1045 x 220 mm (65.4 x 41.1 x 8.7 in) 75": 1900 x 1160 x 225 mm (74.8 x 45.7 x 8.9 in) 86": 2160 x 1310 x 225 mm (85 x 51.6 x 8.9 in)
Panel Net Weight	65": 43.2 kg (95.3 lb) 75": 55.3 kg (121.9 lb) 86": 69.6 kg (153.4 lb)
Packed Weight	65": 58.6 kg (129.2 lb) 75": 73 kg (160.9 lb) 86": 91.6 kg (201.9 lb)
Wall Mount Dimensions	1010 x 720 x 52 mm (39.8 x 28.3 x 2.0 in)
VESA Mount Point	65": 600 x 400 mm (23.6 x 15.7 in) 75": 800 x 400 mm (31.5 x 15.7 in) 86": 800 x 600 mm (31.5 x 23.6 in)

POWER STRIPS

- A. For mounting in the racks, with 20-A, 120V AC, IU
 - 1. 10 Outlet NEMA 5-20
 - 2. 12ft Power Cable
 - 3. Color Black
 - 4. APC Part Number: AP9563 or approved equal.

EXECUTION

3.1 ENTRANCE FACILITIES A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

3.2 WIRING METHODS

- A. Wiring Method: Install cables in raceways except within equipment cabinets, and except in accessible ceiling spaces. Raceways shall be provided in walls, in spaces with exposed ceilings, and in inaccessible ceiling areas. Conceal raceway and cables except in unfinished spaces.
 - 1. Install plenum cable in environmental air spaces, including plenum ceilings.
 - 2. Minimum 3/4" conduit for voice/data cabling.
- B. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

PRE-INSTALLATION SITE SURVEY

- A. Prior to the start of systems installation, meet at the project site with the owner's representative and representatives of trades performing related work to coordinate efforts. Review areas of potential interference and resolve conflicts before proceeding with the work. Facilitation with the General Contractor will be necessary to plan the crucial scheduled completions of the equipment room and telecommunications closets.
- B. Examine areas and conditions under which the system is to be installed. Do not proceed with the work until satisfactory conditions have been achieved.

EXAMINATION

- A. The Cabling Contractor must request an inspection by the owner's representative (Network Administrator) prior to completion. Agreed upon punch list items must be completed and re-inspected by the owner's representative for final approval.

HANDLING AND PROTECTION OF EQUIPMENT AND MATERIALS

- A. The Cabling Contractor is responsible for the safekeeping of your own and your subcontractors' property, such as equipment and materials, on the job site. The owner assumes no responsibility for protection of the above named property against fire, theft, and environmental conditions.

PROTECTION OF OWNER'S FACILITIES

- A. Effectively protect the owner's facilities, equipment, and materials from dust, dirt, and damage during construction.
- B.. Remove protection at completion of the work.

FIELD QUALITY CONTROL

- A. The Cabling Contractor shall be experienced in the design, fabrication, and installation of communications premise distribution systems of similar size and scope to this project. Installation technicians shall be manufacturer certified. Installer must be a PCI (Panduit Certified Installer) in good standing in the Panduit PCI program.
- B. The Communications Contractor must have installation and service facilities within a 200-mile radius of the project site. All qualifications, including the firm's facilities, shall be available for inspection by any school board official.

INSTALLATION

- A. Receive, check, unload, handle, store, and adequately protect equipment and materials to be installed as part of the contract. Store in areas as directed by the owner's representative. Include delivery, unloading, setting in place, fastening to walls, floors, ceilings, or other structures where required, interconnecting wiring of system components, equipment alignment and adjustment, and other related work whether or not expressly defined herein.
- B. Install materials and equipment in accordance with applicable standards, codes, requirements, and recommendations of national, state, and local authorities having jurisdiction, and National Electrical Code® (NEC) 2005 and with manufacturer's printed instructions.
- C. Adhere to manufacturer's published specifications for pulling tension, minimum bend radii, and sidewall pressure when installing cables.
 - 1. Where the manufacturer does not provide bending radii information, minimum-bending radius shall be 15 times cable diameter. Arrange and mount equipment and materials in a manner acceptable to the engineer and the owner.

- D. Penetrations through floor and fire-rated walls shall utilize intermediate metallic conduit (IMC) or galvanized rigid conduit (GRC) sleeves and shall be firestopped after installation and testing, utilizing a firestopping assembly approved for that application.
- E. Install station cabling to the nearest telecommunications room (TR), unless otherwise noted.
- F. Installation shall conform to the following basic guidelines:
 - 1. Use of approved wire, cable, and wiring devices
 - 2. Neat and uncluttered wire termination
- G. Attach cables to permanent structure with suitable attachments at intervals of 48 to 60 inches. Support cables installed above removable ceilings
- H. Install adequate support structures for 10ft of service slack at each TR.
- I. Support riser cables every three (3) floors and at top of run with cable grips.
- J. Limit number of four-pair data riser cables per grip to fifty (50).
- K. Install cables in one continuous piece. Splices shall not be allowed except as indicated on the drawings or noted below:
 - 1. Provide overvoltage protection on both ends of cabling exposed to lightning or accidental contact with power conductors.
- L. Voice and Data cables shall be routed above the ceilings with cables neatly bundled with Panduit Tack-Tape, Velcro or approved equal cable wraps for wire management.
 - 1. **Plastic, nylon or metal tie wraps are not allowed.**
 - 2. No more than 24 cables shall be bundled together in the ceiling.
 - 3. Cable ties must not distort the outer jacket of the cable.
 - 4. Cables suspended above the ceiling shall not rest on ceiling tiles or lightning fixtures.
- M. All strands of Fiber Optic Cabling shall be terminated
 - 1. Terminate using LC type connectors except where legacy enclosures or equipment require other type connectors.

GROUNDING

- A. Grounding shall conform to ANSI-J-STD 607(A)-Commercial Building Grounding and Bonding Requirements for Telecommunications, National Electrical Code® (2005), ANSI/NECA/BICSI-568-2006 and manufacturer's grounding requirements as minimum.
- B. Bond and ground equipment racks, housings, messenger cables, and raceways.
- C. Connect cabinets, racks, and frames to single-point ground which is connected to building ground system via #6 AWG green insulated copper grounding conductor.
 - 1. Telecommunication grounding must be isolated from other grounds.
 - a. The grounding connection shall not be made to electrical conduits, power distribution box grounds or neutral busses.

LABELING

- A. Labeling shall conform to the ANSI/TIA/EIA-606(A) standards. In addition, provide the following:
 - 1. Label each outlet with permanent self-adhesive label with minimum 3/16 in high characters.
 - 2. Label each cable with permanent self-adhesive label with minimum 1/8 in high characters, in the following locations:
 - a. Inside the receptacle box at the work area.
 - b. Behind the communication closet patch panel or punch block.
 - 3. Use labels on the face of data patch panels. Provide facility assignment records in a protective cover at each telecommunications closet location that is specific to the facilities terminated therein.
 - 4. Use color-coded labels for each termination field that conforms to ANSI/TIA/EIA-606(A) standard color codes for termination blocks.

5. Mount termination blocks on color-coded backboards.
6. Labels shall be machine-printed. **Hand-lettered labels shall not be acceptable.**
7. Label cables, outlets, patch panels, and punch blocks with room number in which outlet is located. Each cable shall be labeled to identify the room number and outlet to which it corresponds.
 - a. Example: Room 121 has 4 drops. The numbers would be 121.1, 121.2, 121.3, and 121.4. **(If this were a lab with 33 drops the last cable drop would end with 121.33).**
8. Mark up floor plans showing outlet locations, type, and cable marking of cables. Turn these drawings over to the owner two (2) weeks prior to move in to allow the owner's personnel to connect and test owner-provided equipment in a timely fashion.
9. The Cabling Contractor shall deliver three (3) sets of as-built drawings to the owner within four (4) weeks of acceptance of the project by the owner. A set of as-built drawings shall be provided to the owner in electronic form and utilizing CAD software that is acceptable to the owner. The Cabling Contractor shall deliver the electronic media to the owner within six (6) weeks of acceptance of the project by the owner.

TESTING

- A. Testing shall conform to the ANSI/TIA/EIA-568-B.2-1 standard. Testing shall be accomplished using Level III or higher field testers.
- B. Test each pair and shield of each cable for opens, shorts, grounds, and pair reversal. Correct grounded, and reversed pairs. Examine open and shorted pairs to determine if problem is caused by improper termination. If termination is proper, tag bad pairs at both ends and note on termination sheets.
 1. Perform testing of copper cables with tester meeting ANSI/TIA/EIA-568-B.2-1 requirements.

2. If the horizontal cable contains bad conductors or shield then remove and replace cable.
- C. Test optical cable with a light source and power meter utilizing procedures as stated in ANSI/TIA/EIA-526-14A: OFSTP-14A Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant. Measured results shall be plus/minus 1db of submitted loss budget calculations. If loss figures are outside this range, test cable with optical time domain reflectometer to determine cause of variation. Correct improper splices and replace damaged cables at no charge to the owner.
1. Cables shall be tested at 1310nm and 1550 nm for singlemode optical fiber cables.
 2. Testing procedures shall utilize “Method B”-One jumper reference.
 3. Bi-directional testing of optical fibers is required.
- D. Where any portion of the system does not meet the specifications, correct deviation and repeat applicable testing at no additional cost to the owner.
- E. All test data shall be provided with the “as built” drawings upon completion.

3.10 INSTALLATION OF PATHWAYS

- A. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.
- B. Install manufactured conduit sweeps and long-radius elbows whenever possible.
- C. Pathway Installation in Communications Equipment Rooms:
1. Position conduit ends adjacent to a corner on the backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
 2. Secure conduits to the backboard when entering room from overhead.
 3. Extend conduits 3 inches above the finished floor.
 4. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

- D. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.
- E. Prepare wall penetrations and verify the penetrations of fire rated walls are made using products labeled for use of wall penetrations.

3.11 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
5. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
6. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
8. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
10. At communication outlets, install a loop in each cable within the box before making the final termination.

11. In the communications equipment room, install a 10-foot-long service loop on each end of the cable.
12. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pulls tensions.

C. UTP Cable Installation:

1. Comply with TIA/EIA-568-B.2.
2. Do not untwist UTP cables more than ½ inch from the point of termination to maintain cable geometry.

D. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

E. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569-A for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
 - c. Electrical Equipment Rating More Than 5kVA: A minimum of 24 inches.
3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: No requirement
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
5. Separation between Communications Cables and Electrical Motors and Transformers, 5kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Cleaning site of debris, grass, trees, and other plant life in preparation for site or building earthwork.
 - 2. Protection of existing structures, trees, or vegetation indicated on the Construction Drawings to remain.
- B. Related Requirements:
 - 1. Louisiana Department of Transportation and Development (DOTD) Standards and Specifications (LSSRB), latest edition.
 - 2. Section 02220 – Site Demolition: Demolition and removal of structures, paving, utilities and other improvements.
 - 3. Section 02300 – Earthwork: Stripping and removal of topsoil.
 - 4. Section 02370 - Erosion And Sedimentation Control (Including SWPPP)

1.2 ENVIRONMENTAL REQUIREMENTS

- A. Construct temporary erosion and sediment control systems as shown on Construction Drawings and as directed by the "Storm Water Pollution Prevention Plan" (SWPPP) to protect adjacent properties and water resources from erosion and sedimentation.
- B. In event that sitework on this project will disturb one or more acres, starting work shall be strictly governed by the sequence of construction as specified in Section 02370 and SWPPP site maps. Contractor shall not begin construction without "National Pollution Discharge Elimination System" (NPDES) permit governing discharge of storm water from site for entire construction period. NPDES permit requires SWPPP to be in place during construction.
- C. Contractor shall conduct storm water management practices in accordance with the project SWPPP and applicable NPDES permit and shall enforce action taken or imposed by Federal or State agencies, including cost of fines, construction delays, and remedial actions resulting from Contractor's failure to comply with provisions of NPDES permit.

1.3 PROJECT CONDITIONS

- A. Conditions existing at time of inspection for bidding purposes will be maintained by Owner as reasonably practical.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 PREPARATION

- A. Identify existing plant life that is to remain and verify clearing limits are clearly tagged, identified, and marked in such manner as to ensure their protection throughout construction operations.

3.2 PROTECTION

- A. Locate, identify, and protect existing utilities that are to remain.
- B. Protect trees, plant growth, and features designated to remain as part of final landscaping.

- C. Conduct operations with minimum interference to public or private accesses and facilities. Maintain ingress and egress at all times and clean or sweep roadways daily as required by SWPPP or governing authority. Dust control shall be provided with sprinkling systems or equipment provided by Contractor.
- D. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by a licensed land surveyor and replaced, as necessary, in kind.
- E. Provide traffic control as required, in accordance with the US Department of Transportation's "Manual on Uniform Traffic Control Devices" and applicable state highway department requirements.

3.3 EQUIPMENT

- A. Material shall be transported to and from the project site using well-maintained and operating vehicles. Transporting vehicles operating on site shall stay on designated haul roads and shall not endanger improvements by rutting, overloading, or pumping.

3.4 CLEARING

- A. Clear areas required for access to site and execution of work.
- B. Unless otherwise indicated on Construction Drawings, remove trees, shrubs, grass, other vegetation, improvements, or obstructions interfering with installation of new construction. Removal includes digging out stumps and roots. Depressions caused by clearing and grubbing operations shall be filled to subgrade elevation to avoid ponding of water. Satisfactory fill material shall be placed in accordance with Section 02300.
- C. Remove grass, trees, plant life, stumps, and other construction debris from site to dump site that is suitable for handling such material according to state laws and regulations.
- D. Cut heavy growths of grass from areas before stripping and topsoil removal and remove cuttings with remainder of cleared vegetative material.

END OF SECTION

SECTION 312000 - EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Excavation, filling, and backfilling for structures, pavement, and outparcels.
 - 2. Trenching and backfilling for utilities.
 - 3. Dewatering.
 - 4. Boring under crossings.
- B. Related Requirements:
 - 1. Louisiana Department of Transportation and Development (DOTD) Standards and Specifications (LSSRB), latest edition.
 - 2. Section 02318 - Rock Excavation.
 - 3. Section 02340 - Soil Stabilization.
 - 4. Section 02370 - Erosion Control and Sedimentation. Temporary and permanent erosion control.
 - 5. Section 02375 - Stone Protection. Rip-rap stone for slope protection.

1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. ASTM International (ASTM)
 - 1. ASTM D422 - Particle Size Analysis of Soil.
 - 2. ASTM D698 - Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN.m/m³)).
 - 3. ASTM D1557 - Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 Kn.m/m³)).
 - 4. ASTM D2487 - Classification of Soils for Engineering Purposes (Unified Soil Classification System).
 - 5. ASTM D2488 - Description and Identification of Soils (Visual-Manual Procedures).
 - 6. ASTM D4318 - Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
 - 7. ASTM D6938 - In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
- C. American Association of State Highway and Transportation Officials (AASHTO)
 - 1. AASHTO T 88 - Particle Size Analysis of Soils.
- D. Louisiana Department of Transportation and Development (DOTD):
 - 1. Louisiana Department of Transportation and Development (DOTD) Standards and Specifications (LSSRB), latest edition.
- E. National Fire Protection Association (NFPA)
 - 1. NFPA 70 - National Electrical Code.
- F. American Water Works Association (AWWA)
 - 1. AWWA C200 - Standard for Steel Water Pipe - 6 In. (150 mm) and Larger.
 - 2. AWWA C206 - Field Welding Of Steel Water Pipe.
 - 3. Fill material shall further conform to the plasticity index and liquid limits (PI and LL) specified in Paragraph FILLING hereinafter.
 - 4. Satisfactory materials shall be free of rock or gravel larger than allowed for fill or backfill material as specified hereinafter or as shown on the drawings.

5. Satisfactory materials shall contain no debris, waste, frozen materials, vegetation, and other deleterious matter.
6. Unless specifically stated otherwise on the Drawings, the following table stipulates maximum allowable values for plasticity index (PI) and liquid limit (LL) of satisfactory materials to be used as fill in specified areas:

<u>Location</u>	<u>PI</u>	<u>LL</u>
All Building and Parking areas (below upper four feet)	20 (max)	40 (max)

- G. Unsatisfactory Materials: Materials which do not comply with the requirements for satisfactory materials are unsatisfactory.
 1. Unsatisfactory materials also include man-made fills; trash; refuse; backfills from previous construction; and material classified as satisfactory materials which contains root and other organic matter or frozen material. The CTL shall be notified of any contaminated materials.
 2. Unsatisfactory materials also include satisfactory materials not maintained within 2 percent of optimum moisture content at time of compaction.
- H. Rock: Rock shall be as defined in Section 02318.

1.3 SUBMITTALS

- A. Submit 30-pound sample of each type of off-site fill material that is to be used at the site in airtight containers to the independent testing laboratory or submit gradation and certification of aggregate material that is to be used at the site to the independent testing laboratory for review.
- B. Submit name of each material supplier and specific type and source of each material. Change in source throughout project requires approval of Owner.
- C. Submit Dewatering Plans upon request by Owner.
- D. Shop drawings or details pertaining to excavating and filling are not required unless otherwise shown on the Drawings or if contrary procedures to Construction Documents are proposed.
- E. Shop drawings or details pertaining to site utilities are not required unless required by regulatory authorities or unless uses of materials, methods, equipment, or procedures that are contrary to The Drawings or Specifications are proposed. Do not perform work until Owner has accepted required shop drawings.
- F. Contact utility companies and determine if additional easements will be required to complete project. Provide written confirmation of the status of all easements to Owner at time of Preconstruction Conference or no later than 90 days prior to project possession date.

PART 2 - PRODUCTS

2.1 SOIL AND ROCK MATERIALS

- A. Fill and Backfill. Satisfactory materials excavated from the site.
- B. Imported Fill Material: Satisfactory material provided from offsite borrow areas when sufficient satisfactory materials are not available from required excavations.
- C. Trench Backfill: ASTM D2321 unless otherwise specified or shown on the drawings.
- D. Building Subbase Material: Subbase for building and appurtenances slabs on ground shall be reference the structural fill from the grading plan here..

- E. Bedding: Aggregate Type as indicated on the plans or naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No.200 sieve.
- F. Drainage Fill: As specified on the plans or granular fill (sand) placed in lifts not exceeding 8 inches and compacted to 95 percent of the dry density as determined by ASTM D698.
- G. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No.4 sieve.
- H. Topsoil: Topsoil shall consist of stripping material excavated from the site or approved equal. Topsoil shall consist of organic surficial soil found in depth of not more than 6-inches.

2.2 APPURTENANT MATERIALS

- A. Stabilization fabrics and geogrids: As specified in Section 02340.
- B. Filter and drainage fabrics: As specified in Section 02340.
- C. Steel Casing Pipe: Comply with AWWA C200 minimum grade B, size, and wall thickness as indicated on The Drawings.
- D. Trench Utility Locator Tape: Heavy duty 6" wide underground warning tape. Tape shall be made from polyethylene material, 3.5 mils thick, with a minimum tensile strength of 1,750 psi. Place the tape at one-half the minimum depth of cover for the utility line or a maximum of 3 feet, whichever is the less, but never above the top of subgrade. Color of tape shall be determined by as follows:
 - 1. Natural Gas or Propane – Yellow.
 - 2. Electric – Red.
 - 3. Telephone – Orange.
 - 4. Water – Blue.
 - 5. Sanitary Sewer – Green.

2.3 EQUIPMENT

- A. Transport off-site materials to project using well-maintained and operating vehicles. Once on site, transporting vehicles shall stay on designated haul roads and shall at no time endanger improvements by rutting, overloading, or pumping.

2.4 SOURCE QUALITY CONTROL

- A. The Contractor shall provide samples of material obtained off-site.
- B. Perform California Bearing Ratio (CBR) or Limerock Bearing Ratio (LBR) tests in outparcels and areas to receive pavement for each type of material that is imported from off-site. CBR or LBR value shall be equal to or above pavement design subgrade CBR or LBR value indicated on Construction Drawings.
- C. Following tests shall be performed on each type of on-site or imported soil material used as compacted fill:
 - 1. Moisture and Density Relationship: ASTM D698 or ASTM D1557.
 - 2. Mechanical Analysis: AASHTO T88 or ASTM D422.
 - 3. Plasticity Index: ASTM D4318.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Identify required lines, levels, contours, datum, elevations, and grades necessary for construction as shown on the drawings.
- B. Notify utility companies to remove or relocate public utilities that are in conflict with proposed improvements.
- C. Protect plant life, lawns, fences, existing structures, sidewalks, paving, and curbs, unless otherwise noted on the drawings from excavating equipment and vehicular traffic.
- D. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by licensed land surveyor and replaced, as necessary, by same.
- E. Remove from site, material encountered in grading operations that is unsatisfactory material or undesirable for backfilling, subgrade, or foundation purposes. Dispose of in manner satisfactory to Owner and local governing agencies. Backfill areas with layers of satisfactory material and compact as specified herein.
- F. Prior to placing fill in low areas, such as previously existing creeks, ponds, or lakes, perform following procedures:
 - 1. Drain water out by gravity with ditch having flow line lower than lowest elevation in low area. If drainage cannot be performed by gravity ditch, use adequate pump to obtain the same results.
 - 2. After drainage of low area is complete, remove muck, mud, debris, and other unsatisfactory material by using acceptable equipment and methods that will keep natural soils underlying low area dry and undisturbed.
 - 3. All muck, mud, and other materials removed from low areas shall be dried on-site by spreading in thin layers for observation. Material shall be inspected and, if found to be satisfactory for use as fill material, shall be incorporated into lowest elevation of site filling operation, but not under building subgrade or within 5'-0" of perimeter of building subgrade, paving or outparcel subgrade. If, after observation, material is found to be unsatisfactory, it shall be removed from site.
- G. Locate and identify utilities that have previously been installed and protect from damage.
- H. Locate and identify existing utilities that are to remain and protect from damage.
- I. Maintain in operating condition existing utilities, previously installed utilities, and drainage systems encountered in utility installation. Repair surface or subsurface improvements shown on the Drawings.
- J. Verify location, size, elevation, and other pertinent data required making connections to existing utilities and drainage systems as indicated on the Drawings.
- K. Over excavate and properly prepare areas of subgrade that are not capable of supporting proposed systems. Stabilize these areas by using acceptable geotextile fabrics or aggregate material placed and compacted as specified in Section 02340.

3.2 DEWATERING

- A. General:
 - 1. Dewatering activities shall conform to applicable provisions in 02370.
 - 2. Provide dewatering systems as required for excavations.
 - 3. Design and provide dewatering system using accepted and professional methods consistent with current industry practice to eliminate water entering the excavation under hydrostatic head from the bottom or sides. Design system to prevent differential hydrostatic head, which would result in floating out soil particles in a manner, termed as a "quick" or "boiling" condition. System shall not be dependent solely upon sumps or pumping water from within the excavation where differential head would result in a quick condition, which would continue to worsen the integrity of the excavation's stability.
 - 4. Provide dewatering system of sufficient size and capacity to prevent ground and surface water flow into the excavation and to allow Work to be installed in a dry condition.
 - 5. Control, by acceptable means, all water regardless of source. Contractor shall be responsible for disposal of the water.
 - 6. Control groundwater in a manner that preserves strength of foundation soils, does not cause instability or raveling of excavation slopes, and does not result in damage to existing structures. Where necessary, lower

water level in advance of excavation utilizing wells, wellpoints, jet educators, or similar positive methods. The water level as measured by piezometers shall be maintained a minimum of 3 feet below prevailing excavation level.

7. Commence dewatering prior to any appearance of water in excavation and continue until Work is complete to the extent that no damage results from hydrostatic pressure, flotation, or other causes.
8. Open pumping with sumps and ditches will be allowed provided it does not result in boils, loss of fines, softening of the ground, or instability of slopes.
9. Install wells or wellpoints, if required, with suitable screens and filters so that continuous pumping of fines does not occur. Arrange discharge to facilitate collection of samples by the Owner. During normal pumping and upon development of wells, levels of fine sand or silt in the discharge water shall not exceed 5 ppm. Install sand tester on discharge of each pump during testing to verify that levels are not exceeded.
10. Control grading around excavations to prevent surface water from flowing into excavation areas.
11. No additional payment will be made for any supplemental measures to control seepage, groundwater, or artesian head.

B. Design:

1. Designate and obtain the services of a qualified dewatering specialist to provide dewatering plan as may be necessary to complete the Work.
2. Contractor shall be responsible for the accuracy of the drawings, design data, and operational records required.
3. Contractor shall be responsible for the design, installation, operation, maintenance, and any failure of any component of the system.

C. Damages:

1. Contractor shall be responsible for and shall repair any damage to work in place, other contractor's equipment, utilities, residences, highways, roads, railroads, private and municipal well systems, adjacent structures, natural resources, habitat, existing wells, and the excavation. Contractor responsibility shall also include, damage to the bottom due to heave and including but not limited to, removal and pumping out of the excavated area that may result from Contractor's negligence, inadequate or improper design and operation of the dewatering system, and any mechanical or electrical failure of the dewatering system.
2. Remove subgrade materials rendered unsatisfactory by excessive wetting and replace with approved backfill material at no additional cost to the Owner.

D. Maintaining Excavation in Dewatering Condition:

1. Dewatering shall be a continuous operation. Interruptions due to power outages or any other reason will not be permitted.
2. Continuously maintain excavation in a dry condition with positive dewatering methods during preparation of subgrade, installation of pipe, and construction of structures until the critical period of construction or backfill is completed to prevent damage of subgrade support, piping, structure, side slopes, or adjacent facilities from flotation or other hydrostatic pressure imbalance.
3. Provide standby equipment on site, installed, wired, and available for immediate operation if required to maintain dewatering on a continuous basis in the event any part of the system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, perform such work as may be required to restore damaged structures and foundation soils at no additional cost to Owner.
4. System maintenance shall include but not be limited to 24-hour supervision by personnel skilled in the operation, maintenance, and replacement of system components and any other work required to maintain excavation in dewatered condition.

E. System Removal: Upon completion of the work, remove dewatering equipment from the site, including related temporary electrical service.

F. Wells shall be removed or cut off a minimum of 3 feet below final ground surface, capped, and abandoned in accordance with regulations by agencies having jurisdiction.

3.3 TOPSOIL EXCAVATION

- A. Cut heavy growths of grass from areas before stripping and remove cuttings with remainder of cleared vegetative material.
- B. Strip topsoil to a depth of not less than 6 inches from areas that are to be filled, excavated, landscaped, or re-graded to such depth that it prevents intermingling with underlying subsoil or questionable material.
- C. Stockpile topsoil in storage piles in areas shown on The Drawings or where directed by Owner. Construct storage piles to freely drain surface water. Cover storage piles as required to prevent windblown dust. Dispose of unsuitable topsoil as specified for waste material, unless otherwise specified by Owner. Remove excess topsoil from site unless specifically noted otherwise on the Drawings.

3.4 GENERAL EXCAVATION

- A. Classification of Excavation: The Contractor shall assure himself by site investigation or other necessary means that he is familiar with the type, quantity, quality, and character of excavation work to be performed. Excavation shall be considered unclassified excavation, except as indicated in the Contract Documents.
- B. When performing grading operations during periods of wet weather, provide adequate dewatering, drainage and ground water management to control moisture of soils.
- C. Shore, brace, and drain excavations as necessary to maintain excavation as safe, secure, and free of water at all times.
- D. Excavate building areas to line and grade as shown on the Drawings being careful not to over excavate beyond elevations needed for building subgrades.
- E. Place satisfactory excavated material into project fill areas.
- F. Unsatisfactory excavated material shall be disposed of in manner and location that is acceptable to Owner and local governing agencies.
- G. Perform excavation using capable, well-maintained equipment and methods acceptable to Owner and local governing agencies.

3.5 ROCK EXCAVATION

- A. Rock excavation is specified in Section 02318.

3.6 TRENCHING EXCAVATION FOR UTILITIES

- A. Contact local utility companies before excavation begins. Dig trench at proper width and depth for laying pipe, conduit, or cable. Cut trench banks vertical, if possible, and remove stones from bottom of trench as necessary to avoid point-bearing. Over-excavate wet or unstable soil, if encountered, from trench bottom as necessary to provide suitable base for continuous and uniform bedding. Replace over-excavation with satisfactory material and dispose of unsatisfactory material.
- B. Trench excavation sidewalls shall be sloped, shored, sheeted, braced, or otherwise supported by means of sufficient strength to protect workmen in accordance with applicable rules and regulations established for construction by the Department of Labor, Occupational Safety and Health Administration (OSHA), and by local ordinances. Lateral travel distance to exit ladder or steps shall not be greater than 25 feet in trenches 4 feet or deeper.
- C. Perform trench excavation as indicated on the Drawings for specified depths. During excavation, stockpile materials suitable for backfilling in orderly manner far enough from bank of trench to avoid overloading, slides, or cave-ins.
- D. Remove excavated materials not required or not satisfactory as backfill or embankments and waste off-site or at on-site locations approved by the Owner and in accordance with governing regulations. Dispose of structures discovered during excavation as specified in Section 02220.

- E. Prevent surface water from flowing into trenches or other excavations by temporary grading or other methods, as required. Remove accumulated water in trenches and other excavations as specified.
- F. Open cut excavation with trenching machine or backhoe. Where machines other than ladder or wheel-type trenching machines are used, do not use clods for backfill.
- G. Accurately grade trench bottom to provide uniform bearing and support for each section of pipe on bedding material at every point along entire length except where necessary to excavate for bell holes, proper sealing of pipe joints, or other required connections. Dig bell holes and depressions for joints after trench bottom has been graded. Dig no deeper, longer, or wider than needed to make joint connection properly.
- H. Trench width below top of pipe shall not be less than 12 inches nor more than 18 inches wider than outside surface of pipe or conduit that is to be installed to designated elevations and grades. Other trench width for pipe, conduit, or cable shall be least practical width that will allow for proper compaction of trench backfill.
- I. Trench depth requirements measured from finished grade or paved surface shall meet the following requirements or applicable codes and ordinances, whichever is more stringent, unless noted otherwise on the Construction Drawings:
 - 1. Water Mains: 30 inches to top of pipe barrel or 6 inches below frost line, established by local building official, whichever is deeper.
 - 2. Sanitary Sewer: Elevations and grades as indicated on the drawings and as specified in Section 02535.
 - 3. Storm Sewer: Elevations and grades as indicated on the Drawings.
 - 4. Electrical Conduits: 24 inches minimum to top of conduit or as required by NEC 300-5, NEC 710-36 codes, or local utility company requirements, whichever is deeper.
 - 5. TV Conduits: 18 inches minimum to top of conduit or as required by local utility company, whichever is deeper.
 - 6. Telephone Conduits: 18 inches minimum to top of conduit, or as required by local utility company, whichever is deeper.
 - 7. Gas Mains and Service: 30 inches minimum to top of pipe, or as required by local utility company, whichever is deeper.

3.7 SUBGRADE PREPARATION

- A. Scarification and Compaction: Areas exposed by excavation or stripping and on which subgrade preparations are to be performed shall be scarified to minimum depth of 8 inches and compacted as specified hereinafter.
- B. Proofrolling: Subgrades shall be proofrolled to detect areas of insufficient compaction and soft pocket, or areas of excess yielding. Proofrolling shall be accomplished by making minimum of two complete passes with fully-loaded tandem-axle dump truck with a minimum weight of 15-20 tons, or approved equal, in each of two perpendicular directions. Limit vehicle speed to three mph. Areas of failure such as soft spots, unsatisfactory soils, and areas of excessive pumping or rutting shall be excavated and re-compacted as specified herein. Continual failure areas shall be stabilized in accordance with Section 02340 at no additional cost to Owner. Subgrade exposed longer than 48 hours or on which precipitation has occurred shall be re-proofrolled. Document proofrolling procedure, specific locations, deficiencies, and corrective measures for review by Owner or Owner's CTL upon request.

3.8 FILLING

- A. Fill areas to contours and elevations shown on the Drawings with materials deemed satisfactory.
- B. Place fills in continuous lifts specified herein.
- C. Fill within proposed building subgrade, paving subgrade, and outparcel subgrades shall not contain rock or stone greater than 6 inches in any dimension.
- D. Unless otherwise specified for rock fill, rock or stone less than 6-inches in largest dimension may be used in fill below structures, paving, outparcels, and graded areas, up to 24 inches below surface of proposed subgrade or finish grade of graded areas when mixed with satisfactory material. Rock or stone less than 2 inches in largest dimension

may be used in fill within the upper 24 inches of proposed subgrade or finish grade of graded areas when mixed with satisfactory material.

- E. Fill materials used in preparation of subgrade shall be placed in lifts or layers not to exceed 8 inches loose measure and compacted as specified hereinafter.
- F. Material imported from off-site shall have CBR or LBR value equal to or above pavement design subgrade CBR or LBR value indicated on The Drawings.
- G. Building area subgrade pad shall be that portion of site directly beneath and 5 feet beyond building and appurtenances, including limits of future building expansion areas as shown on the Drawings.
- H. Prepare building area subgrade pad in strict accordance with "Foundation Subsurface Preparation" as shown on the Drawings. The Foundation Subsurface Preparation provisions shall take precedence over the provisions of this section whenever duplication or conflict occurs.

3.9 ROCK FILL

- A. Rock fill shall include on-site excavated material classified as rock excavation as specified in Section 02318. Rock fill may be utilized in fill up to 48 inches below top of subgrade or finish grade of graded areas outside the proposed building, paving, and outparcel areas. Rock fill shall consist of rock having a maximum dimension not greater than 12 inches in any dimension. Rock fill shall be placed in successive horizontal layers of loose material having a thickness of approximately the maximum size of the larger rock in the lift, but not greater than 12 inches. Each layer of material shall be spread uniformly, completely saturated, and compacted. Shot rock shall not be dumped into place, but shall be distributed in horizontal lifts by blading and dozing in such a manner as to ensure proper placement into final position in the embankment. Voids shall be filled with finer material including shot rock fines and limited soil fines during the spreading operation. Successive layers shall not be placed until all voids of the current lift are filled and the lift is compacted. Each successive layer of material shall adequately bond to the material on which it is placed. Compaction shall be accomplished with vibratory compactors, heavy rubber-tired rollers, or steel-wheeled rollers. Compaction shall be by uniform passes of compaction equipment in sufficient number of passes, but not less than two passes, such that no further consolidation is evident.

3.10 PIPE BEDDING

- A. Excavate trenches for pipe or conduit to 4 inches below bottom of pipe and to the width as specified herein. Place 4 inches of bedding material, compact in bottom of trench, and shape to conform to lower portion of pipe barrel, unless noted otherwise on the Construction Drawings.
- B. Place geotextile fabric as specified on the Drawings and in accordance with Section 02340.

3.11 TRENCH BACKFILLING

- A. Materials used for trench backfill shall comply with requirements as specified herein.
- B. Backfill and compact in accordance with fill and compaction requirements in ASTM D2321 unless otherwise shown on the drawings.
- C. Do not backfill trenches until required tests are performed and utility systems comply with and are accepted by applicable governing authorities.
- D. Backfill trenches to contours and elevations shown on the Drawings.
- E. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

3.12 BORINGS AND CASINGS UNDER ROADS, HIGHWAYS, AND RAILROAD CROSSINGS

- A. When indicated by the Drawings, street, road, highway, or railroad crossings for utility mains installed by jacking and boring method shall be in accordance with area specifications and governing authorities.
- B. Excavation of approach pits and trenches within right-of-way of street, road, highway, or railroad shall be of sufficient distance from paving or railroad tracks to permit traffic to pass without interference. Tamp backfill for approach pits and trenches within right-of-way in layers not greater than 6-inches thick for entire length and depth of trench or pit. Compact backfill to 98 percent of maximum density in accordance with ASTM D698, (or 95 percent of maximum density, in accordance with ASTM D1557) obtained at optimum moisture as determined by AASHTO T180. Mechanical tampers may be used after cover of 6 inches has been obtained over top of barrel of pipe.
- C. Accomplish boring operation using commercial type boring rig. Bore hole to proper alignment and grade. Bore hole shall be within 2 inches of same diameter as largest outside joint diameter of pipe installed. Install pipe in hole immediately after bore has been made and in no instance shall hole be left unattended while open.
- D. In event subsurface operations result in failure or damage to pavement or railroad tracks within 1 year of construction, make necessary repairs to pavement or railroad tracks. If paving cracks on either side of pipe line or is otherwise disturbed or broken due to construction operations, repair or replace disturbed or broken area.
- E. Clean, prime, and line interior and exterior of casing pipe with two coats of asphalt coating in accordance with and governing authorities.
- F. Butt weld steel casing. Welds shall be full penetration single butt-welds in accordance with AWWA C206.
- G. Install casing and utility pipe with end seals, vent pipe, and other special equipment in accordance with area specifications and governing authorities.

3.13 COMPACTION

- A. Compact as follows:

<u>Location</u>	<u>Percent of Maximum Laboratory Density ASTM D698</u>
Subgrade & Fill below Structures, Pavement and Outparcels	95
Subgrade & Fill in All other Areas	95

- B. Maintain moisture content of not less than 1 percent below and not more than 3 percent above optimum moisture content of fill materials to attain required compaction density.
- C. Exercise proper caution when compacting immediately over top of pipes or conduits. Water jetting or flooding is not permitted as method of compaction.
- D. Corrective Measures for Non-Complying Compaction: Remove and recompact deficient areas until proper compaction is obtained. Continual failure areas shall be stabilized in accordance with Section 02340 at no additional cost to Owner.

3.14 MAINTENANCE OF SUBGRADE

- A. Verify finished subgrades to ensure proper elevation and conditions for construction above subgrade.
- B. Protect subgrade from excessive wheel loading during construction, including concrete trucks, dump trucks, and other construction equipment.
- C. Remove areas of finished subgrade found to have insufficient compaction density to depth necessary and replace in manner that will comply with compaction requirements by use of material with CBR or LBR equal to or better than that specified on the drawings. Surface of subgrade after compaction shall be firm, uniform, smooth, stable, and true to grade and cross-section.

- D. Construct temporary ditches and perform such grading as necessary to maintain positive drainage away from subgrade at all times.

3.15 BORROW AND SPOIL SITES

- A. Comply with NPDES and local erosion control permitting requirements for any and all on-site and off-site, disturbed spoil and borrow areas. Upon completion of spoil or borrow operations, clean up spoil or borrow areas in a neat and reasonable manner to the satisfaction of Owner or off-site property owner, if applicable.

3.16 FINISH GRADING

- A. Check grading of building subgrades by string line from grade stakes (blue tops) set at not more than 50-foot centers. Allowable tolerance shall be plus or minus 0.10 feet from plan grade. Provide engineering and field staking as necessary for verification of lines, grades, and elevations.
- B. Grade areas where finish grade elevations or contours are indicated on the Drawings, other than paved areas, outparcels, and buildings, including excavated areas, filled and transition areas, and landscaped areas. Graded areas shall be uniform and smooth, free from rock, debris, or irregular surface changes. Ground surfaces shall vary uniformly between indicated elevations. Grade finished ditches to allow for proper drainage without ponding and in manner that will minimize erosion potential. For topsoil, sodding, and seeding requirements refer to Section 02900.
- C. Correct settled and eroded areas within 1 year after date of completion at no additional expense to Owner. Bring grades to proper elevation.

3.17 FIELD QUALITY CONTROL

- A. Unless noted otherwise on the Construction Drawings, the quality control testing and inspection specified below will be conducted by the Owner's Construction Testing Laboratory (CTL). The Contractor shall perform additional quality control testing and inspections as considered necessary.
- B. Classification of Materials: Perform test for classification of materials used and encountered during construction in accordance with ASTM D2488 and ASTM D2487.
- C. Laboratory Testing of Materials: Perform laboratory testing of materials (Proctor, Sieve Analysis, Atterberg Limit, Consolidation Test, etc.) as specified,
- D. Proof rolling: Document and explain proof rolling inspection procedures and result in the laboratory inspection report.
- E. Field Density Test:
 - 1. Building Subgrade Areas: Including 10'-0" outside of the exterior building lines, in cut areas, not less than 1 compaction test for every 2,500 sq. ft. Fill areas shall have the same rate of testing for each 8-inch lift, measured loose.
 - 2. Paving Areas and other Areas of Construction Exclusive of Building Subgrade: Contractor shall perform in cut areas not less than 1 compaction test for every 10,000 sq. ft. Fill areas shall have the same rate of testing for each 8-inch lift, measured loose.
 - 3. Utility Trench Backfill: Intervals not exceeding 200 feet of trench for the first lift and every other 8 inch lift of compacted trench backfill.
 - 4. Test Method: In-place nuclear density, ASTM D 2922 (Method B-Direct Transmission)
 - a. Density tests on top of building or paving subgrade shall be performed within 48 hours prior to placement of overlying materials. If inclement weather occurs after testing, retest prior to placement of overlying materials.

END OF SECTION

SECTION 31 31 16 – TERMITE CONTROL

PART 1 - GENERAL

1.1 SCOPE

- A. Work to be done under this heading includes the furnishing of all labor and materials for complete termite treatment of the new construction only hereinafter described.
- B. All termite treatment work shall be done by a bonded contractor, licensed by the State of Louisiana, or whose principal business is extermination and who has a record of at least five (5) years of successful operation in this field.
- C. Shop drawings shall include treating specifications and detailed drawings (to scale) of each and every building which requires treatment. These drawings shall show the work to be performed and the proper treating specification for building, as indicated in Contract Documents. Each building shall include the following information:
 - 1. Locations of termite infestation. (if any)
 - 2. Locations of termite damage. (if any)
 - 3. Location of moisture conditions that exist. (if any)
 - 4. Location and amounts in gallons per linear feet and gallon per square feet.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. The chemical to be used shall be one which is accepted by the Structural Pest Control Commission or the U.S. Department of Agriculture, Division of Insecticides and Fungicides as having prolonged effectiveness as a toxicant against subterranean termites. In no event shall the anticipated effective duration of the termite chemical be for less than five years. The chemical shall be applied at the dosage rate recommended by the manufacturer and acceptable to the Structural Pest Control Commission.
- B. The following chemicals are termiticides and manufacturers approved by the Structural Pest Control Commission for termite control work when applied according to manufacturer's labels and minimum standards. (see listing at the end of this specification section)

2.2 APPLICATION

- A. General
 - 1. The General Contractor shall remove all wood stakes, form boards, leveling pegs and other wood or organic materials from the building area prior to treatment.
 - 2. Treatment shall not be made when the soil or fill is excessively wet or immediately after heavy rains, to avoid surface flow of the toxicant from application site.
 - 3. Unless the treated areas are to be immediately covered, precautions shall be taken to prevent disturbance of the treatment by human or animal contact with the treated soil.
 - 4. All openings around pipes that penetrate concrete floor slabs of filled foundations shall be sealed with a termite resistant mastic or cement grout. The mastic joint sealer shall be hot poured coat tar pitch, or a similar approved material that is equally resistant to penetration by termites. The joint sealer shall be applied in such a way as to provide a termite proof seal between the cement of the floor and the outer surface of the pipe or pipes.

- B. Guarantee: The following statements 1, 2, 3, & 4 shall be printed verbatim on the letterhead stationery of the successful soil poisoning subcontractor along with the signature of the person who signs the guarantee. (This shall be provided in a sample form as shop drawings. Refer to Section 01 33 23 - Samples and Shop Drawings.)
1. The cost of this work is to include the issuance of a \$300,000 termite control repair and guarantee for an initial period of two years with stipulated renewal rights at the sole option of the Owner for a five year guaranteed renewal on the building. This renewal, in the third year, shall not exceed 18% of the initial treatment price. Renewal insurance in the fourth year and each year thereafter for the life of the building shall be increased no more than the annual 10% per year or more than the annual rate of inflation (as measured by the consumer price index) whichever is greater. No failure on the part of the buyer to request reinspection shall, in any way, effect the buyer's rights under this contract. This contract cannot be cancelled by any other way except the following:
 2. The Owner's written request.
 3. Failure of Owner to pay insurance premium within 4 months after renewal date. Written notice must be given to the Owner, once a month, within this 4 month period indicating that the premium is due or delinquent.
 4. This blanket repair guarantee shall state the responsibility of the termite contractor to apply to the premises any necessary additional treatment and to make repairs or replacements to remedy damaged areas caused by subterranean termite reinfestation at no extra cost to the Owner. If there is more than one building on a project, and these buildings do not connect, the issuance of a separate guarantee shall be provided, but in no event shall the accumulated totals of insurance premiums for the third year exceed 18% of the total price of the initial cost.

2.3 EXISTING SLAB-TYPE CONSTRUCTION

- A. Trench and treat the entire perimeter of the slab foundation. Rate of application shall be recommended on manufacturer's label.
- B. Treat all traps and other openings in the slab.
- C. Treat all expansion joints, cracks and other voids in slab by rodding under or drilling through slab and thoroughly saturating the area beneath the slab where the above stated conditions exist. When the slab is drilled, the holes must not be more than 18" apart along the above stated areas, unless manufacturer's label requires closer distance.
- D. Treat all other obvious points of entry according to the best of the individual operator's ability.

2.4 PRE-TREATMENT OF SLABS

- A. Chemical shall be applied to the area under the inside of the foundation of the building after the final grade has been reached but either before or after the gravel fill has been spread at the following rates:
 1. Overall treatment of area under slab at the rate as recommended on manufacturers label.
 2. Along inside of exterior foundation wall on monolithic slabs at rate as recommended on manufacturer's label.
 3. Along outside / perimeter of exterior foundation wall on monolithic slabs at rate indicated on manufacturer's label. (This means trench and treat or drill and treat

around the entire perimeter of structure before substantial completion. Drill and treat will only be utilized if the contractor pours sidewalks, parking or drives before soil poisoning subcontractor is allowed to spray soil before pouring concrete.)

4. Along all expansion and/or construction joints at the rate as recommended on manufacturer's label.
5. Critical areas under slab such as around plumbing, electrical conduits, air conditioning vents, chimney bases, etc., at the rate as recommended on manufacturer's label.

NOTE: Items 2, 3, and 4 are in addition to overall treatment outlined in item 1.

B. If, during the treatment of any area which will be beneath a slab foundation, the operator must leave the site for any reason prior to the completion of the application as specified in §141.E.1 above, the operator must prominently display a poster, to be furnished by the Louisiana Department of Agriculture and Forestry, which states that the treatment of the area under the slab is not complete.

C. All pre-treatment of slabs must be called or faxed in to the Department of Agriculture and Forestry District Office in which the pretreat occurs, a minimum of one hour prior to beginning the application of termiticides. The information provided shall include a street address, city, parish, directions to the property being pre-treated, and time of beginning the application of termiticides to the property. All pest control operators must keep a log of all pretreats including the information noted. The following is a list of parishes in which the seven Department of Agriculture and Forestry Districts operate. Pre-treatments in those parishes shall be called into the corresponding District Office.

1. Shreveport District - Caddo, Bossier, Webster, Claiborne, Bienville, Red River, and Desoto.
2. Monroe District - Union, Morehouse, West Carroll, East Carroll, Madison, Richland, Ouachita, Lincoln, Jackson, Winn, Caldwell, Franklin, Tensas, Concordia, and Catahoula.
3. Alexandria District - Sabine, Natchitoches, Grant, LaSalle, Avoyelles, Rapides, and Vernon.
4. Crowley District - Beauregard, Allen, Acadia, Jefferson Davis, Cameron, Calcasieu.
5. Opelousas District - Evangeline, St. Landry, St. Martin, Iberia, St. Mary, Vermillion, and Lafayette.
6. Baton Rouge District - Point Coupee, West Feliciana, East Feliciana, St. Helena, Tangipahoa, Washington, St. Tammany, Livingston, St. James, Lafourche, Terrebonne, Assumption, Ascension, Iberville, West Baton Rouge, and East Baton Rouge.
7. New Orleans District - St. John the Baptist, St. Charles, Jefferson, Orleans, St. Bernard, and Plaquemines.

APPROVED TERMITICIDES AND MANUFACTURERS

<u>PRODUCT</u>	<u>PERCENTAGE</u>	<u>MANUFACTURER</u>
AggresZor 75 WSP (Imidacloprid)	0.05% - 0.10%	Speckoz
Baseline (Bifenthrin)	0.06% - 0.12%	FMC
Bifen XTS (Bifenthrin)	0.06% - 0.12%	Control Solutions

Bifen IT (Bifenthrin)	0.06% - 0.12%	Control Solutions
Bifen PT (Bifenthrin)	0.06% - 0.12%	Control Solutions
Bifenthrin Pro Multi-Insecticide (Bifenthrin)	0.06% - 0.12%	BASF
Bifenthrin TC (Bifenthrin)	0.06% - 0.12%	Control Solutions
Bifenthrin Termiticide/Insecticide (Bifenthrin)	0.06% - 0.12%	Speckoz
Biflex TC (Bifenthrin)	0.06% - 0.12%	FMC
Bora-Care (Disodium Octaborate Tetrahydrate)	23%	Nisus
BOR-RAM (Disodium Octaborate Tetrahydrate)	23%	Sostram Corp.
Centerfire 75 WSP (Imidacloprid)	0.05% - 0.10%	Bayer
Cyper TC (Cypermethrin)	0.25% - 1.00%	Control Solutions
Cypermethrin G-Pro (Cypermethrin)	0.25% - 1.00%	GRO-PRO
Demon (Cypermethrin)	0.25% - 1.00%	Zeneca
Demon MAX (Cypermethrin)	0.25% - 1.00%	Syngenta
Dominion 2L (Imidacloprid)	0.05% - 0.10%	Control Solutions
Dominion 75 WSP (Imidacloprid)	0.05% - 0.10%	Control Solutions
Dragnet FT (Permethrin)	0.50% - 2.00%	FMC
Dragnet SFR (Permethrin)	0.50% - 2.00%	FMC
Imida E-Pro 2F (Imidacloprid)	0.05% - 0.10%	Etigra
Imida E-Pro 75 WSP (Imidacloprid)	0.05% - 0.10%	Etigra
Impasse Termite System (Lambda-cyhalothrin)		Syngenta
Impasse Termite Blocker (Lambda-cyhalothrin)		Syngenta
MasterLine (Bifenthrin)	0.06% - 0.12%	Univar
MasterLine I Maxx Pro WSP (Imidacloprid)	0.05% - 0.10%	Bayer
MasterLine I Maxx Pro 2F (Imidacloprid)	0.05% - 0.10%	Bayer
Maxxthor SC (Bifenthrin)	0.06% - 0.12%	Ensystex
Permasteer 380 (Permethrin)	0.50% - 2.00%	LG Chemical
Permethrin SFR (Permethrin)	0.50% - 2.00%	Control Solutions
Permethrin TC (Permethrin)	0.50% - 2.00%	Mirco-Flo
Phantom (Chlorfenapyr)	0.063% - 0.25%	BASF
Prelude (Torpedo)(Permethrin)	0.50% - 2.00%	AMVAC
Premise 75 WSP (Imidacloprid)	0.05% - 0.10%	Bayer
Premise 0.5SC (Imidacloprid)	0.05% - 0.10%	Bayer
Premise II (Imidacloprid)	0.05% - 0.10%	Bayer
Premise Pre-construction (Imidacloprid)	0.05% - 0.10%	Bayer
**Premise Gel (Imidacloprid)	0.001%	Bayer
Premise Pro (Imidacloprid)	0.05% - 0.10%	Bayer
Prevail (Cypermethrin)	0.25% - 1.00%	FMC
Prevail TC (Cypermethrin)	0.30% - 0.60%	FMC
Prevail FT (Cypermethrin)	0.25% - 1.00%	FMC
Prevail Pretreat (Cypermethrin)	0.25% - 1.00%	FMC
Pro-Build TC (Cypermethrin)	0.25% - 1.00%	Syngenta
Prothor SC 2 (Imidacloprid)	0.05% - 0.10%	Ensystex IV
Prothor WP (Imidacloprid)	0.05% - 0.10%	Ensystex III
Prothor WSP (Imidacloprid)	0.05% - 0.10%	Ensystex III
Talstar P (Bifenthrin)	0.06% - 0.12%	FMC
Talstar Pretreat (Bifenthrin)	0.06% - 0.12%	FMC
Talstar (Bifenthrin)	0.06% - 0.12%	FMC
Talstar One Multi-Insecticide (Bifenthrin)	0.06% - 0.12%	FMC
Tengard SFR (Permethrin)	0.50% - 2.00%	United Phosphorus
Termidor (Fipronil)	0.06% - 0.125%	BASF
Termidor 80WG (Fipronil)	0.06% - 0.125%	BASF
Thermidor SC (Fipronil)	0.06% - 0.125%	BASF
Transport (Acetamiprid)(Bifenthrin)	0.11%	FMC
ValueLine Bifenthrin TC (Bifenthrin)	0.06% - 0.12%	FMC
Wisdom TC Flowable (Bifenthrin)	0.06% - 0.12%	AMVAC

NOTES: ** Premise Gel is approved for targeted (spot) application only.

PART 3 - EXECUTION (Not Used)

END OF SECTION 31 31 16

SECTION 313200 - SOIL STABILIZATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Excavation, treatment, and backfilling of subgrade for lime, cement, fly ash, or bridge lift stabilization.
 - 2. Geotextile fabric and geogrid for stabilization of subgrade.
- B. Related Requirements:
 - 1. Louisiana Department of Transportation and Development (DOTD) Standards and Specifications (LSSRB), latest edition.
 - 2. Section 02300 – Earthwork

1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. ASTM International (ASTM):
 - 1. ASTM C150 - Portland Cement.
 - 2. ASTM C618 - Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete.
 - 3. ASTM C977 - Quicklime and Hydrated Lime for Soil Stabilization.
- C. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. AASHTO M216 - Lime for Soil Stabilization.
- D. National Lime Association (NLA):
 - 1. NLA Bulletin 326 - Lime Stabilization Construction Manual.
- E. Louisiana Department of Transportation (LA DOTD):
 - 1. Louisiana Department of Transportation and Development (DOTD) Standards and Specifications (LSSRB), latest edition.

1.3 ENVIRONMENTAL REQUIREMENTS

- A. Do not install mixed materials in wind in excess of 10 mph or when temperature is below 40 degrees Fahrenheit.
- B. Minimize dust emissions or provide equipment that suppresses dust.
- C. Dispose of construction waste in accordance with the federal, state and local requirements.

1.4 SUBMITTALS

- A. Submit 30-pound sample of each material to be used at the site in airtight containers to the Construction Testing Laboratory (CTL) or submit gradation and certification of material that is to be used to the CTL for review.
- B. Submit name of each materials supplier and specific type and source of each material. Obtain approval of Owner prior to change in source.
- C. Submit mix designs, materials mix ratio, and laboratory test data to the Civil Engineering Consultant of Record 2 weeks prior to beginning stabilization activities. Certify materials and mix ratios will achieve the specified requirements as indicated in the Construction Documents or as specified by state and local agencies for soil stabilization if not stated in the Construction Documents.

- D. Submit approved mix designs, materials mix ratio, and laboratory test data to the CTL prior to commencing stabilization activities.

PART 2 PRODUCTS

1.5 MANUFACTURERS

- A. Provide products from one of the following manufacturers as specified in the Materials paragraph below:
1. TenCate Geosynthetics North America (Mirafi), Pendergrass, GA., (706) 693-2226, www.tencate.com
 2. Hanes Geo Components (WEBTEC), Winston Salem, NC. (336) 747-1600, www.hanesgeo.com
 3. Tensar International Corp., Atlanta, GA. (888) 828-5126, www.tensarcorp.com
 4. Thrace-LINQ Inc., Summerville, SC (843) 873-5800, www.thracelinq.com
 5. DuPont (Tygar). Summerville, SC (843) 832-6860, www.tygargeo.com
 6. Synteen Technical Fabrics, Lancaster, SC (800) 796-8336, www.synteen.com

1.6 MATERIALS

- A. Soil Treatment Materials:
1. Hydrated Lime: ASTM C977 or AASHTO M216.
 2. Portland Cement: ASTM C150, Type I.
 3. Fly Ash: ASTM C618.
- B. Aggregate:
1. Coarse Aggregate: Crushed carbonate, crushed gravel, crushed air-cooled slag, granulated slag, a mixture of crushed and granulated slag, or other types of suitable material meeting the following gradation requirements:

Sieve Size	Percent Passing
2 inches	100
1 inch	70-100
3/4 inch	50-90
No. 4	30-60
No. 30	7-30
No. 200	0-5

2. Fine Aggregate: Sand – Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter meeting the following gradation requirements:

Sieve Size	Percent Passing
No. 4	90-100
No. 50	7-40
No. 200	0-5

- C. Subsoil: Existing to be reused.
- D. Bridge Lift Material: Surge stone, granular fill, or shot rock fill.

1.7 ACCESSORIES

- A. Curing Seal: Asphalt Emulsion Primer.
- B. Geotextile Fabric for Stabilization: Provide one of the following (or approved equal):
1. Mirafi HP 370 or HP 570, by TenCate.
 2. SF40 or SF65, by DuPont.
 3. GTF-200 or 300, by Thrace-LINQ.
 4. TerraTex HD, by Hanes.
- C. Geogrid for Stabilization: Provide one of the following (or approved equal):

1. Biaxial Geogrid Type 1 (formerly BX 1100), by Tensar.
2. Biaxial Geogrid Type 2 (formerly BX 1200), by Tensar.
3. Mirafi BXG 11, by TenCate.
4. Mirafi BXG 12, by TenCate.
5. SF 11, by Syntee.
6. SF 12, by Syntee.

PART 3 EXECUTION

1.8 PREPARATION

- A. Obtain approval of mix design before proceeding with placement.
- B. Start stabilization only when weather and soil conditions are favorable for successful application of proposed material.
- C. Proofroll subgrade to identify areas in need of stabilization.

1.9 EQUIPMENT

- A. Perform operations using suitable, well maintained equipment capable of excavating subsoil, mixing and placing materials, wetting, consolidating, and compacting of material.

1.10 EXCAVATION

- A. Excavate subsoil to depth sufficient to accommodate soil stabilization.
- B. Remove lumped subsoil, boulders, and rock that interfere with achieving uniform subsoil conditions.
- C. Do not excavate within normal 45 degree bearing splay of any foundation.
- D. Notify Construction Manager of unexpected subsurface conditions. Discontinue affected work in area until notified to resume work.
- E. Correct areas over-excavated in accordance with Section 02300.
- F. Remove excess excavated material from site.

1.11 GEOTEXTILE FABRIC AND/OR GEOGRID

- A. Place geotextile fabric and/or geogrid over subsoil surface, lap edges and ends in accordance with manufacturer's recommendations in those areas that are shown on Construction Drawings or in those areas that need additional stabilization prior to placement of base course. Bridge lift sections may require the use of geotextile fabric and/or geogrid for stabilization prior to placement of fill.
- B. Place geotextile fabric and/or geogrid in accordance with manufacturer's recommendations.

1.12 SOIL TREATMENT AND BACKFILLING

- A. Lime Stabilized Subgrade: Where indicated on Construction Drawings or as required after continual failure, treat prepared subgrade with hydrated lime in accordance with state highway department specifications.
- B. Cement Stabilized Subgrade: Where indicated on Construction Drawings or as required after continual failure, treat prepared subgrade with Portland cement in accordance with state highway department specifications.
- C. Fly Ash Stabilized Subgrade: Where indicated on Construction Drawings or as required after continual failure, treat prepared subgrade with fly ash in accordance with state highway department specifications.

- D. Bridge Lifts: Where indicated on Construction Drawings or as required after continual failure, treat prepared subgrade by application of a bridge lift. Bridging over existing soils shall be acceptable only when approved in writing by the Owner. Place geotextile fabric or geogrid over existing soils to be bridged. The geotextile fabric or geogrid selected shall be appropriate for the bridge lift material being placed. Place bridge lift over geotextile fabric or geogrid. Surge stone and shot rock will be approved by the Owner's representative on a submittal basis. The Owner and the Owner's representative shall have sole discretion as to the acceptability of all submittals.
- E. Backfill and compaction of treated subsoil shall be in accordance with Sections 02300.
- F. Maintain optimum moisture of mixed materials to attain required stabilization and compaction.
- G. Finish subgrade surface in accordance with Section 02300.
- H. Remove surplus mix materials from site.

1.13 CURING

- A. Immediately following compaction of mix, seal top surface with curing seal.
- B. Do not permit traffic for 72 hours after sealing top surface.

1.14 FIELD QUALITY CONTROL

- A. Field quality control shall be the responsibility of the Contractor. Field quality control testing and inspection shall be at the discretion of the Contractor as necessary to assure compliance with Contract requirements
- B. Unconfined compression tests on lime, fly ash, or Portland cement treated mixture shall be conducted by the CTL in accordance with ASTM D1633. Mold three specimens for each mix design submitted by the Contractor to verify mix design meets the specified requirements. Cure each specimen at a constant moisture content and temperature for 28 days. Test for unconfined compressive strength and compare to the specified design strength. Perform test minimum of three weeks prior to proposed stabilization activities.
- C. Field Density: In-Place Field Density shall be determined as specified in Section 02300.

END OF SECTION

SECTION 313500 – EROSION CONTROL

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes

1. Installation of temporary and permanent erosion and sedimentation control systems.
2. Installation of temporary and permanent slope protection systems.
3. Stormwater Pollution Prevention Plan (SWPPP).

B. Related Sections and Documents

1. Louisiana Department of Transportation and Development (DOTD) Standards and Specifications (LSSRB), latest edition.
2. Section 02230 – Site Clearing
3. Section 02300 – Earthwork
4. Section 02375 – Rip-Rap (Stone Protection)
5. Section 02630 – Storm Drainage
6. Stormwater Pollution Prevention Plan (SWPPP)
7. Construction Drawings (“Site Maps”)
8. Construction Stormwater Details and Notes

1.2 ENVIRONMENTAL REQUIREMENTS

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

1.3 ENVIRONMENTAL REQUIREMENTS

- A. Protect adjacent properties, any identified endangered or threatened species and/or critical habitat, any identified cultural or historic resources, and receiving water resources from erosion and sediment damage until final stabilization is achieved. All stormwater controls and systems must be installed and functioning as designed and free of accumulated sediment and debris before final project approval.
- B. Minimize dust emissions or provide equipment that suppresses dust.
- C. Dispose of dry construction waste in accordance with the federal, state and local requirements.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Topsoil, seed, sod, and ground covers for the establishment of vegetation in accordance with the Landscaping Plan.
- B. All erosion control products, sediment control devices and materials for non-stormwater BMPs as specified herein and on the Construction Drawings.
- C. All Rolled Erosion Control Products shall have current QDOR™ status issued by the Erosion Control Technology Council (ECTC) (in addition to any state- or agency-specific requirements). Evidence of QDOR™ approval shall accompany the product shipped to the job site for ready identification by the General Contractor (GC) or an agency inspector.

- D. Temporary mulches such as loose straw, or wood cellulose
- E. Rip-Rap (stone protection) as specified in Section 02375.
- F. Temporary and permanent outfall structures as specified on the drawings.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Review the drawings and Stormwater Pollution Prevention Plan (SWPPP).
- D. Communicate SWPPP requirements, emphasizing construction sequence requirements, to Site Contractor, Erosion and Sediment Control Best Management Practice (BMP) installers, and all subcontractors working on-site.
- E. Install initial BMP's according to SWPPP while disturbing only those areas required to construct said BMP's.
- J. Proceed with site construction.

3.2 EROSION AND SEDIMENTATION CONTROL AND SLOPE PROTECTION IMPLEMENTATION

- A. Place erosion and sediment control systems in accordance with the drawings and SWPPP or as may be dictated by site conditions in order to maintain the intent of the specifications and permits.
- B. The SWPPP and Construction Drawings shall be corrected, modified or updated as site conditions change. Contractor must obtain approval from Owner's Engineer of Record prior to any modification or substitution of specified Best Management Practices. All BMP changes (and references to approvals) shall be noted in the SWPPP and posted on the drawings (Site Maps). Construction Drawings should be updated daily to track progress when any of the following activities occur: BMP installation or modification, major construction (paving, storm sewer installation, footing installation, etc...), clearing, grubbing or grading, or temporary or permanent stabilization.
- D. Unless required within a shorter timeframe by the applicable General Permit for Stormwater Discharges Associated with Construction Activity, the GC shall, at a minimum, initiate soil stabilization measures immediately whenever any clearing, grading, excavating or other earth disturbing activities have temporarily or permanently ceased on any portion of the site, and will not likely resume for a period exceeding 14 calendar days.

SECTION 321100 - BASE COURSE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Aggregate base for asphaltic concrete including sand/shell base and hot-mix sand asphalt base.
- B. Related Requirements:
 - 1. Louisiana Department of Transportation and Development (DOTD) Standards and Specifications (LSSRB), latest edition. LSSRB shall be the governing specification.
 - 2. Section 02300 – Earthwork: Excavation, Backfill, and Compaction for Pavement subgrade.
 - 3. Appendix B – Testing and inspection by Owner.

1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. ASTM International (ASTM):
 - 1. ASTM D698 – Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbs/ft³ (600 kN-m/m³)).
 - 2. ASTM D1557 – Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbs/ft³ (2,700 kN-m/m³)).
- C. Asphalt Institute.
- D. State Highway Department Standard Specifications.

1.3 SUBMITTALS

- A. Submit materials certificate to the Owner's Engineer of Record and the appropriate Construction Testing Laboratory, signed by materials producer and Contractor, certifying that materials comply with, or exceed, requirements specified herein or on the Construction Drawings.
- B. Submit certification of base course materials and placement as specified in Parts 2 and 3 hereinafter.

1.4 WEATHER LIMITATIONS

- A. Do not place aggregate when base surface temperature is less than 40 degrees F, nor when air temperature is below 45 degrees F. Do not place aggregate when surface is wet or frozen. Do not place aggregate when weather conditions are unfavorable otherwise.

PART 2 - PRODUCTS

2.1 BASE COURSE MATERIAL

- A. Aggregate Base Course: Aggregate base course shall consist of a well graded, durable aggregate uniformly moistened and mechanically stabilized by compaction. Base course may consist of a granular base (crushed slag, stone, or gravel, etc), sand/shell base material, or a hot-mix sand asphalt base.
- B. Base course shall be as shown on the drawings, or when not shown, shall be as specified herein.
- C. Aggregate base material requirements from State or other local highway agency specifications may be used for aggregate base course for roads, streets, or similar use pavements if the following conditions are met:
 - 1. Percentage of material by weight passing the No. 200 sieve will not exceed 10.

2. Portion of the material passing the No. 40 sieve must have a liquid limit not greater than 25 and a plasticity index not greater than 5.
- D. Aggregate shall consist of clean, sound, durable particles of crushed stone, crushed slag, crushed gravel, angular sand, or other approved material. Aggregate shall be free of lumps of clay, organic matter, and other objectionable materials or coatings. The portion retained on the No. 4 sieve shall be known as coarse aggregate; that portion passing the No. 4 sieve shall be known as fine aggregate.
1. Coarse aggregates shall be angular particles of uniform density.
 2. Fine aggregates shall be angular particles of uniform density. Fine aggregate shall consist of screenings, angular sand, crushed recycled concrete fines, or other finely divided mineral matter processed or naturally combined with the coarse aggregate.
- E. Gradation: The specified gradation requirements shall apply to the completed base course. The aggregates shall have a maximum size of 2 inches and shall be continuously well graded within the following limits:

GRADATION OF AGGREGATES
Percentage by Weight Passing Square-Mesh Sieve

Sieve Designation	No. 1	No. 2	No. 3
2 inch	100	----	----
1-1/2 inch	70-100	100	----
1 inch	45-80	60-100	100
1/2 inch	30-60	30-65	40-70
No. 4	20-50	20-50	20-50
No. 10	15-40	15-40	15-40
No. 40	5-25	5-25	5-25
No. 200	0-10	0-10	0-10

NOTE: Particles having diameters less than 0.0008 inch shall not be in excess of 3 percent by weight of the total sample tested.

- F. Hot-mix Sand Asphalt Bases: Asphalt Institute Type VI, VII, or VIII Mixes for Hot-mix Sand Asphalt Bases. Hot-Mix base shall be used only under asphaltic concrete surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Contractor shall verify to the Owner in writing that the subgrade has been inspected, tested, and gradients and elevations are correct, dry, and properly prepared in accordance with Section 02300.

3.2 CONSTRUCTION

- A. Perform base course construction in accordance with the applicable State standard specifications or as shown or specified.
- B. Perform base course construction in a manner that will drain the surface properly and prevent runoff from adjacent areas from draining onto base course construction.
- C. Compact base material to not less than 98 percent of optimum density as determined by ASTM D698 or 95 percent of optimum density, as determined by ASTM D1557 unless otherwise indicated on the Drawings.
- D. Construct to thickness indicated on Construction Drawings. The minimum base thickness as shown on drawings shall be achieved throughout all pavement areas.
1. Granular Base: Apply in lifts or layers not exceeding 8-inches, measured loose.
 2. Sand/Shell Base: Apply in lifts or layers not exceeding 4-inches, measured loose.
 3. Hot-mix Sand Asphalt Bases: Apply in lifts or layers not exceeding 3-inches, measured loose.

3.3 FIELD QUALITY CONTROL

- A. Field quality control shall be the responsibility of the Contractor in accordance with Contract Documents. Field quality control testing and inspection shall be at the discretion of the Contractor (except for specified mandatory testing listed below) as necessary to assure compliance with Contract requirements.
- B. Mandatory Testing and Inspection:
 - 1. Measure base course tolerances no more than 25 ft. on center with a rod and level or stringline.
 - 2. Certify in writing to the Owner that base course placement is in accordance with Contract Document requirements prior to subsequent work thereon.

END OF SECTION

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Preparation and placement of Portland cement concrete parking areas.
 - 2. Preparation and placement of Portland cement concrete roads and entrances.
 - 3. Aggregate base below slab.
 - 4. Exterior light pole bases.
- B. Related Requirements:
 - 1. Louisiana Department of Transportation and Development (DOTD) Standards and Specifications (LSSRB), latest edition.
 - 2. Section 02300 - Earthwork: Excavation, backfill, compaction for subgrades.
 - 3. Section 02765 - Pavement Markings.

1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. American Concrete Institute (ACI):
 - 1. ACI 117 - Tolerances for Concrete Construction and Materials and Commentary.
 - 2. ACI 301 - Structural Concrete.
 - 3. ACI 305.1- Hot Weather Concreting.
 - 4. ACI 306.1- Cold Weather Concreting.
 - 5. ACI 308.1 - Curing Concrete.
 - 6. ACI 318 - Building Code Requirements for Reinforced Concrete and Commentary.
- C. American Society for Testing and Materials (ASTM):
 - 1. ASTM A 36 - Structural Steel.
 - 2. ASTM A185 - Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
 - 3. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.
 - 4. ASTM C31 - Making and Curing Concrete Test Specimens in the Field.
 - 5. ASTM C33 - Concrete Aggregates.
 - 6. ASTM C 39 - Comprehensive Strength of Cylindrical Concrete Specimens.
 - 7. ASTM C42 - Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
 - 8. ASTM C94 - Ready-Mixed Concrete.
 - 9. ASTM C138 - Unit Weight, Yield, and Air Content (Gravimetric) of Concrete.
 - 10. ASTM C143 - Slump of Hydraulic Cement Concrete.
 - 11. ASTM C150 - Portland Cement.
 - 12. ASTM C172 - Sampling Freshly Mixed Concrete.
 - 13. ASTM C231 - Air-Content of Freshly Mixed Concrete by the Pressure Method.
 - 14. ASTM C260 - Air-Entraining Admixtures for Concrete.
 - 15. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
 - 16. ASTM C403 - Time of Setting of Concrete Mixtures by Penetration Resistance
 - 17. ASTM C618 - Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete.
 - 18. ASTM C920 - Elastomeric Joint Sealants.
 - 19. ASTM C989 - Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
 - 20. ASTM C1064 - Temperature of Freshly Mixed Portland Concrete Cement.
 - 21. ASTM C1218 - Water-Soluble Chloride in Mortar and Concrete.
 - 22. ASTM C1602 - Mixing Water used in the Production of Hydraulic Cement Concrete.
 - 23. ASTM D98 - Calcium Chloride
 - 24. ASTM D 698 - Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5 lb. (2.49 Kg) Hammer and 12-in (305 mm) Drop.

25. ASTM D994 - Preformed Expansion Joint Filler for Concrete (Bituminous).
26. ASTM D1241 - Materials for Soil-Aggregate Subbase, Base and Surface Courses
27. ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
28. ASTM D1752: Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
29. ASTM D2628 - Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements.
30. ASTM D3575: Standard Test Methods for Flexible Cellular Materials Made From Olefin Polymers.

D. Federal Specifications (FS):

1. FS HH-F-341 - Fillers, Expansion Joint: Bituminous (Asphalt & Tar)

E. International Code Council, Inc.:

1. International Building Code (IBC).

F. State Highway Department Standard Specifications.

G. National Ready-Mixed Concrete Association:

1. NRMCA Inspection Standards

1.3 SUBMITTALS

A. Submittal Procedures: Unless otherwise specified herein, submit in accordance with procedures specified in LSSRB.

B. Obtain Engineer of Record approval for Mix Design and Pavement Joint and Placement Plan prior to commencement of work.

C. Submit submittal items required within this section in a single submittal

D. Sieve Analysis for Aggregate Base: Submit current sieve analysis report, sampled and tested within the last 60 days of submittal date, for aggregate base and choker material.

E. Concrete Batch Plant Certifications: Submit name and address of the concrete supplier's batch plant and plant certification(s) by National Ready-Mix Concrete Association and/or State Department of Transportation.

F. Mix Design:

1. Fill out and submit attached Concrete Mix Design Submittal Form.
2. Submit three copies of each proposed mix.
3. Submit separate mix design for concrete to be placed by pumping in addition to the mix design for concrete to be placed directly from the truck chute.
4. Submit mix design to the Engineer of Record and the Construction Testing Laboratory.
5. Include applicable information shown on the Mix Design Submittal Form and the following:
 - a. Proportions of cementitious materials, fine and coarse aggregate, and water.
 - b. Water-cementitious material ratio, 28-day compressive design strength, slump, and air content.
 - c. Type of cement, fly ash, slag and aggregate.
 - d. Aggregate gradation.
 - e. Type and dosage of admixtures.
 - f. Special requirements for pumping.
 - g. Range of ambient temperature and humidity for which design is valid.
 - h. Special characteristics of mix which require precautions in mixing, placing, or finishing techniques to achieve finished product specified.
6. Materials and methods for curing concrete.

G. Attachments to Concrete Mix Design: Submit the following as attachments to be included with the Concrete Mix Design:

1. Cementitious materials mill test reports for the following:
 - a. Portland cement
 - b. Fly ash
 - c. Slag

2. Designation, type, quality, and source (natural or manufactured) of coarse and fine aggregate materials.
3. Sieve Analysis Reports: Provide separate sieve analysis of percentages passing for coarse and fine aggregate. Show values for each sieve size shown on the mix design form. Do not leave any line blank. Sieve analysis sampling and testing for each aggregate source shall be conducted within 60 days of concrete submittal date.
4. Aggregate Supplier Statement:
 - a. Stating if aggregate is possibly alkali-reactive based on tests or past service.
 - b. Stating if aggregate can possibly cause pop-outs, "D" cracking, or other disruptions due to moisture gain, freezing, or other mechanisms, based on tests or past service.
5. Product data for the following concrete materials admixtures:
 - a. Water reducing
 - b. Set retarding
 - c. Set accelerating
 - d. Data indicating chloride ion content information for each admixture
6. Concrete compressive strength data as required by ACI 318.
7. Concrete supplier approval of mix design.
8. Chloride-Ion Content: Measured water-soluble chloride-ion content (percent by weight of cementitious materials) in accordance with ASTM C1218.
9. Time of Initial Setting: Initial setting time in accordance with ASTM C403.

H. Product Data: Submit certified laboratory test data or manufacturer's certificates and data for the items listed below certifying that materials are in conformance requirements specified herein. Engineer of Record and the Construction Testing Laboratory for review and approval and within 7 calendar days after receipt of Notice-to-Proceed.

1. Portland cement concrete mix design(s)
2. Type and source of Portland cement, fly ash, and slag
3. Aggregate gradations
4. Joint back-up material
5. Soft preformed joint filler
6. Pavement joint sealant
7. Dowel bars
8. Tie bars
9. Reinforcing steel bars
10. Welded wire fabric
11. Air entraining admixtures
12. Water-reducing, set-retarding, and set-accelerating admixtures (if used)

I. Pavement Joint and Placement Plan: For projects with all-concrete parking lots, provide a placement plan identifying the items listed below.

1. Concrete truck access location.
2. Extent of placements including width, length, slab placement area and volume.
3. Locations of construction joints.
4. Location of sawn contraction joints if different from those shown on the civil drawings.

J. Delivery Tickets:

1. Copies of delivery tickets for each load of concrete delivered to site.
2. Indicate information required by ASTM C 94 on each ticket including additional information required for slabs.
3. Information on ticket shall include quantities of material batched including the amount of free water in the aggregate and the quantity of water that can be added at the site without exceeding the maximum water cementitious ratio of the approved mix design. Aggregate moisture corrections shall be based on ASTM definitions of aggregate moisture content and absorption.
4. Mix identification number on ticket shall match number on submitted and approved mix design.

K. Statement of Approval of Concrete Supplier: Submit statement with information specified in Quality Assurance paragraph below.

1.4 QUALITY ASSURANCE

A. Concrete Truck Inspection:

1. Conform to ASTM C94, NRMCA, and Department of Transportation standards in state where project is located.
2. Perform inspections immediately before starting concreting operations.
3. Record acceptable truck numbers.
4. Record the identification numbers of those trucks found to be acceptable on the basis of inspections.
5. Do not bring on site for concreting operations, any truck whose identification numbers are not recorded as acceptable.

B. Tolerances:

1. Conform to most stringent requirements of ACI 117 and ACI 301 except as specified herein.
2. Conform to ACI 117 thickness tolerances for slabs-on-ground.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Concreting in Hot, Dry, or Windy Weather:

1. Employ precautions to avoid cracking when the concrete rate of evaporation exceeds 0.1 pounds per square foot per hour or when any combination of concrete materials and weather conditions are favorable for the formation of plastic shrinkage cracks.
2. Maintain an accurate reading thermometer at the job site to check temperature of concrete.
3. Reject concrete if more than one slump adjustment, as defined in ASTM C 94, is required.
4. Do not place concrete when forms, subgrade, aggregate base, or reinforcing bars are more than 120 F or the temperature differential between the forms, aggregate base, or reinforcing bars and concrete will create conditions favorable for settlement cracks or thermal cracking.

B. Concreting in Cold Weather:

1. Conform to ACI 306.1 when temperature and other environmental conditions are as noted therein.
2. Subgrade shall be thawed to depth of 12 inches immediately before placing concrete.
3. Measure and record concrete temperature during protection period in each placement at regular time intervals, but not less than 3 times per 24 hour period.
4. Do not place slabs on subgrade or base that is more than 20°F cooler than concrete. Warm subgrade or base to decrease temperature differential to 20 F or less

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends as required. Coat forms with nonstaining type of coating that will not discolor or deface surface of concrete.

B. Aggregate Base and Choker Materials:

1. Aggregate Base Material:
 - a. Gradation: Conform to gradation shown on the Civil Drawings.
 - b. Equivalent Gradation: Equivalent gradations may be used upon approval of the Civil Engineer of Record. Submit proposed equivalent gradation to the Architect for approval within 30 days after the award of contract. Equivalent gradation shall be one of the following.
 - 1) Any state DOT approved road base material meeting the following gradation:

<u>Std. Sieve Size</u>	<u>% Passing</u>
No. 1-1/2	100
No. 4	15-55
No. 200	5-12

- 2) Material conforming to the General Requirements and of the Gradation "A", "C", or "D" requirements (with the modified allowance of 5% to 12% passing the No. 200 sieve) as defined by ASTM D1241
2. Aggregate Choker Material: Clean granular fill with less than 3% clay and/or friable particles. Use one of the following gradations:

- a. ASTM 448 No. 10 with 6% to 12% passing No. 200 sieve.
- b. Material meeting the following gradation:

<u>Std. Sieve Size</u>	<u>% Passing</u>
No. 4	85-100
No. 8	75-95
No. 16	55-75
No. 50	22-45
No. 100	10-30
No. 200	6-12

C. Reinforcement:

1. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A185. Furnish in flat sheets.
2. Reinforcing Bars: Deformed steel bars, ASTM A615, Grade 60.
3. Joint Dowel Bars: ASTM A615, grade 40 minimum, smooth round plain steel bars, or ASTM A36, smooth round or square plain steel bars, cut bars true to length with ends square and free of burrs. Epoxy coat per State Highway Department Standard Specifications.

D. Cementitious Materials:

1. Portland Cement: ASTM C150, Type I, Use only one brand throughout project.
2. Fly Ash: ASTM C 618, Class C or F. Use only one type and source throughout project.
3. Slag: ASTM C989, Grade 100 or 120. Use only one type and source throughout project.

E. Pavement Joint Materials:

1. Joint Back-up Material: Polyethylene foam, 100% closed cell
2. Soft Preformed Joint Filler: Flexible closed-cell non-extruding synthetic foam expansion joint strips.
 - a. Ceramar Flexibe Foam Expansion Joint, by W.R. Meadows.
 - b. Deck-O-Foam Expansion Joint Filler, by W.R. Meadows
3. Sealant:
 - a. Dow 888, by Dow Corning.
 - b. 301 NS by Pecora.
 - c. Spectrum 800 by Tremco.

F. Concrete Aggregate:

1. Conform to ASTM C33.
2. Aggregate shall contain no coal or lignite in concrete that will not be covered by soil.
3. Fine Aggregate:
 - a. Conform to fine aggregate grading requirements as defined in section 6.1 of ASTM C 33 unless approved by the Civil Engineer.
 - b. If manufactured sand is used, blend with minimum 25% natural sand unless otherwise approved by Civil Engineer.
4. Coarse Aggregate:
 - a. Nominal maximum coarse aggregate size shall be 1 inch for slabs $\leq$ 5-1/2 inch thick.
 - b. The nominal maximum size of an aggregate is the smallest sieve size through which the major portion of the aggregate must pass, with a minimal amount retained on the maximum sieve size. Maximum 4% shall be retained on the nominal maximum size sieve.
5. Adjust proportions of combined coarse, intermediate, and fine aggregates to provide the following particle size distribution characteristics, unless otherwise approved:
 - a. Coarseness Factor of 60 to 75%.
 - 1) The Coarseness Factor (CF) is the percent of combined aggregate retained on the #8 sieve that is also retained on the 3/8" sieve.
 - 2) The Coarseness Factor is calculated as follows:
 - a) $CF = \text{Aggregate retained on } 3/8'' \text{ sieve} / \text{Aggregate retained on } \#8 \text{ sieve.}$
 - b. Adjusted Workability Factor
 - 1) The Workability Factor (WF) is the percent of combined aggregate that passes the #8 sieve.
 - 2) The Adjusted Workability Factor (Adj-WF) is calculated as follows:
 - a) $\text{Adj-WF} = WF + [(\text{Cementitious Material} - 564 \text{ lbs.}) / 37.6]$
 - 3) The range of accepted Adj-WF for a given CF is as follows:
 - a) $\text{Adj-WF} = [(11.25 - .15 CF) + 33] \pm 2.5$

- 4) Combined percent retained on any given sieve size shall not exceed 24%.
- c. Gradation requirement of ASTM C33 may be waived in order to meet ranges specified.

G. Water: ASTM C 1602.

H. Air Entrainment: ASTM C260.

1. Air-Mix or AEA-92, by Euclid.
2. MasterAir VR 10, MasterAir AE 90, or MasterAir E 200 by BASF Admixtures.
3. Daravair or Darex Series, by W.R. Grace.
4. Equivalent approved products.

I. Evaporation Retardant: Water-based polymer, sprayable.

1. Euco-Bar, by Euclid
2. MasterKure ER 50 by BASF Admixtures
3. Aquafilm, by Dayton Superior.

J. Liquid Membrane Curing and Sealing Compound: ASTM C 1315, Type I, Class A or B, 25% minimum solids content, clear non-yellowing with no styrene-butadiene.

1. Water Based, VOC less than 350 g/l:
 - a. Super Aqua Cure, by Euclid Chemical Corp.
 - b. MasterKure CC 1315WB by BASF Admixtures.
2. Solvent Based (For use below 40F)
 - a. Super Rez-Seal, by Euclid Chemical Corp.
 - b. MasterKure CC 300 SB by BASF Admixtures.

K. Dissipating Curing Compound (For use below 40F): ASTM C 309 Type 1, Class A or B.

1. Solvent base, VOC less than 350 g/l: Cetri Vex EnvioCure 100 by Vexcon.

2.2 CONCRETE MIX

A. Design mix shall produce normal weight concrete consisting of Portland cement, supplementary cementitious materials, aggregates, admixtures, and water to produce specified requirements.

B. Concrete Site Pavement and Light Pole Bases

1. ACI Exposure Category and classification:
 - a. Negligible exposure: F0
 - b. Moderate exposure: F2
 - c. Severe exposure: F3
2. Compressive Strength: Strength at 28 days, unless otherwise indicated on the Drawings:
 - a. Negligible exposure classification: 3,500 psi.
 - b. Moderate exposure classification: 4,500 psi.
3. Maximum Water-Cementitious Material Ratio (Cement Quantity Includes Fly Ash or slag):
 - a. Negligible exposure: 0.55 by wt.
 - b. Moderate and severe exposure classification: 0.45 by wt.
4. Slump Range: Slump at the point of placement shall be 2 to 4 inches for hand placed concrete, 1-1/4 to 3 inches for machine placed (slip form) concrete. Maximum slump variance shall be 2 inches.
5. Air Content: As shown in the table below.

C. Air Entrainment as shown below:

Nominal Maximum Size Aggregate (Inch)	Average Air Content (%) +/- 1.5% By Exposure Category	
	Negligible - F0	Moderate or Severe – F2 & F3
3/8	4.5	7.5
1/2	4.0	7.0

3/4	3.5	6.0
1	3.0	6.0
1-1/2	2.5	5.5

D. Supplementary Cementitious Materials (SCM):

1. Concrete mix shall contain SCM at the amounts specified unless other amounts are approved by the Civil Engineer. Either fly ash or ground granulated blast furnace slag (GGBFS) may be used for the SCM but shall not be used together to form a ternary mix. Use of fly ash or GGBFS in the concrete mix is mandatory.
2. Fly Ash: Substitute fly ash for Portland cement at 20% of the total cementitious content.
 - a. If used to mitigate potential aggregate reactivity, up to 30% fly ash substitution of Portland cement is allowed. Only Type F fly ash may be used and shall have the following maximum properties: 1.5% available alkali and 8.0% CaO. When a maximum of 30% replacement is used, up to 10.0% CaO is permitted.
3. Ground Granulated Blast Furnace Slag (GGBFS): Substitute GGBFS for Portland cement at 25% of the total cementitious content.
 - a. If required to mitigate potential sulfate exposure or aggregate reactivity, up to 50% GGBFS substitution of Portland cement is allowed.
4. Maintain air-entrainment at specified levels.

E. Calcium Chloride:

1. Calcium chloride (Type L) may be used in solution form as part of the mixing water to accelerate concrete setting and early-strength development.
2. Amount of calcium chloride added shall not be more than necessary to produce the desired results and shall not exceed 2% by weight of cement.
3. The dosage range for the calcium chloride for the entire project shall not vary by more than 1%. Range is defined as the difference between the maximum and minimum dosages of calcium chloride for the entire project.
4. Calcium chloride shall not be used in the following applications unless approved by the Civil Engineer:
 - a. concrete containing embedded dissimilar metals or aluminum
 - b. slabs supported on permanent galvanized steel forms
 - c. concrete exposed to deicing chemicals
 - d. prestressed or post-tension concrete
 - e. concrete containing aggregates with potentially deleterious reactivity and concrete exposed to soil
 - f. concrete exposed to soil or water containing sulfates.
5. Use calcium chloride in accordance with manufacturer's recommendation.
6. Chloride-ion Concentration: Maximum water-soluble chloride-ion concentrations in hardened concrete at ages from 28 to 42 days contributed from the ingredients including water, aggregates, cementitious materials, and admixtures shall not exceed the following limits unless approved by the Civil Engineer:

Type of Member	Maximum water-soluble chloride ion (Cl-) content in concrete (percent by weight of cement)
Prestressed concrete	0.06
Reinforced concrete exposed to chloride in service	0.15
Reinforced concrete that will be dry or protected from moisture in service	1.00
Other reinforced concrete construction	0.30
7. When using calcium chloride or other admixtures containing chlorides, measure water-soluble chloride-ion content (percent by weight of cement) per ASTM C 1218. Sample shall be from concrete representing the submitted mix design and maximum chloride dosage anticipated for the project.

2.3 MIXING

- A. Mix concrete and deliver in accordance with ASTM C 94.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Proofroll prepared base material surface to check for unstable areas in accordance with Section 02300 including documentation and re-proof rolling as required. Paving work shall begin only after unsuitable areas have been corrected and are ready to receive paving.
- B. Remove loose material from compacted base material surface to produce firm, smooth surface immediately before placing concrete.

3.2 AGGREGATE BASE PLACEMENT

- A. Unless otherwise specified on the Drawings, place aggregate base as specified herein.
- B. Aggregate Base:
 - 1. Install aggregate base where shown on Drawings.
 - 2. Compact to final thickness shown in layers not exceeding 6 inches with minimum of 2 passes per layer with vibratory compactor.
 - 3. Compact fill to 98% of aggregate's Standard Proctor as determined by Method D of ASTM D698.
 - 4. Leave base up to 2 inches low until just prior to concrete placement.
- C. Aggregate Base Fine Grading:
 - 1. Compact to final thickness shown with 2 passes minimum vibratory compactor to produce smooth, flat, dense surface.
 - 2. Do not allow excess moisture in or on base at time of placing concrete.
 - 3. Level off aggregate base top surface with a maximum 3/4" thick aggregate choker material to achieve the following:
 - a. To reduce surface friction and to meet specified fine grade tolerances specified below.
 - b. To level areas exposed to rain, traffic, or excavations for buried utilities.
 - c. At areas where aggregate base material does not have sufficient fine particles to produce a surface that is free of exposed aggregate or surface voids greater than 3/8" in size at time of slab installation.
 - 4. Provide dry, smooth, flat, dense surface
 - 5. Proof-roll 48 hrs. maximum prior to concrete placement. Depression under a fully loaded ready mix truck shall not exceed 1/2 inch.
- D. Pavement Aggregate Base Fine Grade Tolerance: +0 inch, -3/4 inch with transition no greater than 3/4 inch vertically to 8 inches horizontally.

3.3 INSTALLATION

- A. Form Construction
 - 1. Set forms to required grades and lines, rigidly braced and secured.
 - 2. Install sufficient quantity of forms to allow continuance of work and so that forms remain in place minimum of 24 hours after concrete placement.
 - 3. Check completed formwork for grade and alignment to following tolerances:
 - a. Top of forms not more than 1/8-inch in 10'-0".
 - b. Vertical face on longitudinal axis, not more than 1/4-inch in 10'-0".
 - 4. Clean forms after each use and coat with form release agent as often as required to ensure separation from concrete without damage.
- B. Reinforcement: Fasten reinforcing bars or welded wire fabric (if required) accurately and securely in place with suitable supports and ties. Remove from reinforcement all dirt, oil, loose mill scale, rust, and other substances that will prevent proper bonding of the concrete to the reinforcement.
- C. Concrete Placement
 - 1. Mix and place concrete when the air temperature in the shade and away from artificial heat is a minimum of 35 degrees F and rising. Hot and cold weather concreting shall be in accordance with ACI 305.1 (hot weather) and 306.1 (cold weather).
 - 2. Do not place concrete until base material and forms have been checked for alignment and grade. Concrete shall not be placed around manholes or other structures until they are at required finish elevation and alignment.

3. Place concrete using methods that prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.
4. Deposit and spread concrete in continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2 hour, place construction joint.

D. Contraction and Construction Joints: Construct contraction and construction joints straight with face perpendicular to concrete surface. Construct transverse joints perpendicular to centerline, unless otherwise detailed.

1. Contraction Joints: Provide joints at spacing of 12'-0" on centers, maximum each way. Construct control joints for depth equal to at least 1/4 of the concrete thickness, as follows:
 - a. Form tooled joints in fresh concrete by grooving top with recommended tool and finishing edge with jointer.
 - b. Sawed Contraction Joints:
 - 1) Use saws, blades, skid plates, and accessories by Soff-Cut International, Inc. or approved equal.
 - 2) Start cutting sawed joints as soon as concrete has hardened sufficiently to prevent raveling or dislodging of aggregates. This will typically be from 1 hour in hot weather to 4 hours in cold weather after completing finishing of slab in that joint location.
 - 3) Provide at least two "Soff-Cut" saws on site with blades capable of achieving the required depth of saw cut.
 - 4) Extend sawed joint to the slab boundaries and abutments, including columns, drains, and other penetrations in the path of a defined joint. Implement methods and timing of the saw cut beyond the limits of the Soff-Cut saw reach to provide a consistent depth of cut with minimal raveling of joint edges.
2. Construction Joints: Place construction joints at end of placements and at locations where placement operations are stopped for period of more than 1/2 hour. Construct joints in accordance with details shown.

E. Isolation and Fixed Object Joints: Construct joint at locations and in accordance with details shown.

F. Pavement Joint Materials: Place joint fillers, back-up material, and sealants at locations shown and in accordance with manufacturer's instructions.

1. Soft Preformed Joint Fillers: Extend preformed joint fillers full-width and depth of joint, and not less than 1/2-inch or more than 1-inch below finished surface. Furnish preformed joint fillers in 1-piece lengths for full width being placed, wherever possible. Where more than 1 length is required, lace or clip preformed joint filler sections together in a single plane.

3.4 CONCRETE FINISHING

- A. After initial striking off and consolidating of concrete paving, smooth surface using either magnesium straight edge, wood, or magnesium channel float.
- B. Round edges of slabs and formed joints to 1/2-inch radius with edging tool. Eliminate tool marks on concrete surface.
- C. After completion of straightedge / floating and when excess moisture or surface sheen has disappeared, uniformly finish surface to provide a coarse, nonslip finish by scoring surface with stiff-bristled broom perpendicular to flow of traffic so as to produce regular corrugations not over 1/16 of an inch deep. Initial nonslip finishing shall be approved by the Owner's Representative.
- D. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point up minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Owner.

3.5 CURING AND PROTECTION

- A. Protect and cure finished concrete paving using curing compound. Cure for a period not less than 7 days.
- B. Use solvent based curing compound when compound is applied below 40 F.

3.6 CLEANING AND ADJUSTING

- A. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just prior to final inspection.
- B. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials.

3.7 FIELD QUALITY CONTROL

- A. Field quality control shall be the responsibility of the Contractor in accordance with the appropriate Contract Documents. Field quality control testing and inspection shall be at the discretion of the Contractor as necessary to assure compliance with Contract requirements.
- B. Responsibilities and Duties Relative to Testing and Inspection:
 - 1. Notify CTL in advance of concrete placements to allow sufficient time to prepare for a site visit.
 - 2. Assist testing agency in securing field specimens.
 - 3. Provide and maintain for sole use of CTL, facilities for safe storage and proper curing of concrete test cylinders at project site as required by ASTM C31 and acceptable to Construction Testing Laboratory.
- C. Correction of Deficient Work:
 - 1. When directed by the Owner, remove and replace or repair concrete and related Work which does not conform to specified requirements including strength, tolerances, and finishes.
 - 2. Bare cost of corrections or delays to other work affected by, or resulting from, corrections to concrete Work.
 - 3. If results of compressive strength tests reveal deficiencies in concrete, meet requirements of ACI 318 and ACI 301.

END OF SECTION

SECTION 321600 - CURBS AND SIDEWALKS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Portland cement concrete curbs, gutters, and sidewalks except sidewalks adjacent to building.
- B. Related Requirements:
 - 1. Louisiana Department of Transportation and Development (DOTD) Standards and Specifications (LSSRB), latest edition.
 - 2. Section 02300 - Earthwork: Preparation of subgrades.
 - 3. Section 03310 - Structural Concrete and Exterior Concrete Slabs: Exterior sidewalks adjacent to building.

1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. American Concrete Institute (ACI):
 - 1. ACI 305R - Hot Weather Concreting
 - 2. ACI 306R - Cold Weather Concreting
 - 3. ACI 306.1 - Cold Weather Concreting.
 - 4. ACI 308 - Curing Concrete
- C. ASTM International (ASTM):
 - 1. ASTM A185 - Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
 - 2. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.
 - 3. ASTM C31 - Making and Curing Concrete Test Specimens in the Field.
 - 4. ASTM C39 - Comprehensive Strength of Cylindrical Concrete Specimens.
 - 5. ASTM C42 - Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
 - 6. ASTM C94 - Ready-Mixed Concrete.
 - 7. ASTM C138 - Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete.
 - 8. ASTM C143 - Slump of Hydraulic Cement Concrete.
 - 9. ASTM C231 - Air-Content of Freshly Mixed Concrete by the Pressure Method.
 - 10. ASTM C172 - Sampling Freshly Mixed Concrete.
 - 11. ASTM C173 - Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
 - 12. ASTM C260 - Air-Entraining Admixtures for Concrete.
 - 13. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
 - 14. ASTM C618 - Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete.
 - 15. ASTM C989 - Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
 - 16. ASTM C1064 - Temperature of Freshly Mixed Portland Concrete Cement.
 - 17. ASTM C1218 - Water-Soluble Chloride in Mortar and Concrete.
 - 18. ASTM D98 - Calcium Chloride.
 - 19. ASTM D994 - Preformed Expansion Joint Filler for Concrete (Bituminous).
 - 20. ASTM D1190 - Concrete Joint Sealer, Hot Poured, Elastic Type.
 - 21. ASTM D1751 - Performed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
 - 22. ASTM D2628 - Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements.
- D. Federal Specifications (FS):
 - 1. FS HH-F-341 - Fillers, Expansion Joint: Bituminous (Asphalt & Tar)
- E. State Highway Louisiana Department of Transportation and Development (DOTD) Standards and Specifications (LSSRB), latest edition.

1.3 SUBMITTALS

- A. Mix Design:
1. Fill out and submit attached Concrete Mix Design Submittal Form.
 2. Submit three copies of each proposed mix.
 3. Submit separate mix design for concrete to be placed by pumping in addition to the mix design for concrete to be placed directly from the truck chute.
 4. Submit mix design to the Engineer of Record and the Construction Testing Laboratory.
 5. Include applicable information shown on the Mix Design Submittal Form and the following:
 - a. Proportions of cementitious materials, fine and coarse aggregate, and water.
 - b. Water-cementitious material ratio, 28-day compressive design strength, slump, and air content.
 - c. Type of cement, fly ash, slag and aggregate.
 - d. Aggregate gradation.
 - e. Type and dosage of admixtures.
 - f. Special requirements for pumping.
 - g. Range of ambient temperature and humidity for which design is valid.
 - h. Special characteristics of mix which require precautions in mixing, placing, or finishing techniques to achieve finished product specified.
 - i. Materials and methods for curing concrete.
- B. Submit certified laboratory test data or manufacturer's certificates and data for the items listed below certifying that materials are in conformance requirements specified herein. Submit to the Engineer of Record and the Construction Testing Laboratory for review and approval and within 7 calendar days after receipt of Notice-to-Proceed.
1. Concrete mix design(s)
 2. Type and source of Portland cement, fly ash, and slag
 3. Aggregate gradations
 4. Preformed expansion joint filler
 5. Field molded/poured sealant
 6. Dowel bars
 7. Expansion sleeves
 8. Tie bars
 9. Reinforcing steel bars
 10. Welded wire fabric
 11. Air entraining admixtures
 12. Water-reducing, set-retarding and set-accelerating admixtures (if used)
- C. Test Reports: Submit field quality control test reports.

1.4 PROJECT CONDITIONS

- A. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize temporary striping, flagmen, barricades, warning signs, and warning lights as required.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends as required. Forms shall be of depth equal to depth of curbing or sidewalk, and so designed as to permit secure fastening together at tops. Coat forms with nonstaining type of coating that will not discolor or deface surface of concrete.
- B. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A185. Furnish in flat sheets.
- C. Reinforcing Steel: Deformed steel bars, ASTM A615, Grade 60.
- D. Portland Cement: Shall conform to ASTM C150, Type I.

- E. Fly Ash: ASTM C618, Class C or F. Use only one type and source throughout project.
- F. Slag: ASTM C989, Grade 100 or 120. Use only one type and source throughout project.
- G. Exterior Pavement Joint Materials
 - 1. Joint Back-up Material: Polyethylene foam, 100% closed cell.
 - 2. Sealant:
 - a. Dow 888, by Dow Corning.
 - b. 301 NS by Pecora.
 - c. Spectrum 800 or 900 by Tremco.
- H. Aggregate: ASTM C33.
- I. Water: Clean and potable
- J. Dowel Bars: ASTM A615, grade 60, and plain steel bars.
- K. Air Entrainment: ASTM C260. .
 - 1. Air-Mix or AEA-92, by Euclid Chemical Corp.
 - 2. MasterAir VR 10, MasterAir AE 90, or MasterAir E 200 by BASF Admixtures.
 - 3. Daravair or Darex Series, by W.R. Grace.
 - 4. Equivalent approved products.
- L. Liquid Membrane Curing and Sealing Compound: ASTM C1315, Type I, Class A or B, 25% minimum solids content, clear non-yellowing with no styrene-butadiene.
 - 1. Water Based, VOC less than 350 g/l:
 - a. Super Aqua Cure, by Euclid Chemical Corp.
 - b. MasterKure CC 1315WB by BASF Admixtures.
 - 2. Solvent Based
 - a. Super Rez-Seal, by Euclid Chemical Corp.
 - b. MasterKure CC 300 SB by BASF Admixtures.
- M. Dissipating Curing Compound: ASTM C309 Type 1, Class A or B.
 - 1. Solvent base, VOC less than 350 g/l: Cetri Vex EnvioCure 100 by Vexcon.

2.2 CONCRETE MIXING

- A. Mix concrete and deliver in accordance with ASTM C94. Design mix shall produce normal weight concrete consisting of Portland cement, supplementary cementitious materials, aggregates, admixtures and water to produce the following:
 - 1. Compressive Strength: 3,500 psi minimum at 28 days unless otherwise indicated on the Drawings.
 - 2. Slump Range: 2"-4" for hand placed concrete, 1-1/4" to 3" for machine placed (slipform) concrete.
 - 3. Air Entrainment: 5 to 8 percent.
- B. Supplementary Cementitious Materials (SCM):
 - 1. Concrete mix shall contain SCM at the amounts specified unless other amounts are approved by the Civil Engineer. Either fly ash or ground granulated blast furnace slag (GGBFS) may be used for the SCM but shall not be used together to form a ternary mix. Use of fly ash or GGBFS in the concrete mix is mandatory.
 - 2. Fly Ash: Substitute fly ash for Portland cement at 15% of the total cementitious content.
 - a. If used to mitigate potential aggregate reactivity, only Type F fly ash may be used and shall have the following maximum properties: 1.5% available alkali and 8.0% CaO. When a maximum of 25% replacement is used, up to 10.0% CaO is permitted.
 - 3. Ground Granulated Blast Furnace Slag (GGBFS): Substitute GGBFS for Portland cement at 20% of the total cementitious content.
 - a. If required to mitigate potential sulfate exposure or aggregate reactivity, up to 50% substitution of Portland cement is allowed.
 - 4. Maintain air-entrainment at specified levels.
- C. Calcium chloride:

1. Calcium chloride (Type L) may be used in solution form as part of the mixing water to accelerate concrete setting and early-strength development.
 - a. Amount of calcium chloride added shall not be more than necessary to produce the desired results and shall not exceed 2% by weight of cement.
 - b. The dosage range for the calcium chloride for the entire project shall not vary by more than 1%. Range is defined as the difference between the maximum and minimum dosages of calcium chloride for the entire project.
 - c. Calcium chloride shall not be used in the following applications unless approved by the Civil Engineer:
 - 1) concrete containing embedded dissimilar metals or aluminum
 - 2) slabs supported on permanent galvanized steel forms
 - 3) concrete exposed to deicing chemicals
 - 4) prestressed or post-tension concrete
 - 5) concrete containing aggregates with potentially deleterious reactivity and concrete exposed to soil
 - 6) concrete exposed to soil or water containing sulfates.
2. Use calcium chloride in accordance with manufacturer's recommendation.
3. Chloride-ion Concentration:
 - a. Maximum water-soluble chloride-ion concentrations in hardened concrete at ages from 28 to 42 days contributed from the ingredients including water, aggregates, cementitious material, and admixtures shall not exceed the following limits unless approved by the Civil Engineer:

Type of Member	Maximum water-soluble chloride ion (Cl-) content in concrete (percent by weight of cement)
Prestressed concrete	0.06
Reinforced concrete exposed to chloride in service	0.15
Reinforced concrete that will be dry or protected from moisture in service	1.00
Other reinforced concrete construction	0.30

4. When using calcium chloride or other admixtures containing chlorides, measure water-soluble chloride-ion content (percent by weight of cementitious materials) per ASTM C1218. Sample shall be from concrete representing the submitted mix design and maximum chloride dosage anticipated for the project.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Begin paving work only after unsuitable areas have been corrected and are ready to receive paving.
- B. Remove loose material from compacted base material surface to produce firm, smooth surface immediately before placing concrete.

3.2 INSTALLATION

- A. Form Construction
 1. Set forms to required grades and lines, rigidly braced and secured.
 2. Install sufficient quantity of forms to allow continuance of work and so that forms remain in place minimum of 24 hours after concrete placement.
 3. Check completed formwork for grade and alignment to following tolerances:
 - a. Top of forms not more than 1/8-inch in 10'-0".
 - b. Vertical face on longitudinal axis, not more than 1/4-inch in 10'-0".
 4. Clean forms after each use and coat with form release agent as often as required to ensure separation from concrete without damage.
- B. Reinforcement: Fasten reinforcing bars or welded wire fabric (if required) accurately and securely in place with suitable supports and ties. Remove from reinforcement all dirt, oil, loose mill scale, rust, and other substances that will prevent proper bonding of the concrete to the reinforcement.

C. Concrete Placement

1. Concrete shall be mixed and placed when the air temperature in the shade and away from artificial heat is a minimum of 35 degrees F and rising. Hot and cold weather concreting shall be in accordance with ACI 305R (hot weather) and 306.1 and 306R (cold weather). Do not place concrete until base material and forms have been checked for line and grade. Moisten base material if required to provide uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until set at required finish elevation and alignment.
2. Place concrete using methods that prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.
3. Deposit and spread concrete in continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2 hour, place construction joint. Automatic machine may be used for curb and gutter placement. Machine placement shall be at required cross section, line, grade, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified herein.

D. Joint Construction

1. Contraction Joints: Construct concrete curb or combination concrete curb and gutter, where specified on Construction Drawings, in uniform sections of length specified on Construction Drawings. Form joints between sections either by steel templates, 1/8-inch in thickness, of length equal to width of curb and gutter, and with depth which will penetrate at least 2-inches below surface of curb and gutter; or with 3/4-inch thick performed expansion joint filler cut to exact cross section of curb and gutter; or by sawing to depth of at least 2-inches while concrete is between 4 and 24 hours old. If steel templates are used, they shall be left in place until concrete has set enough to hold its shape, but shall be removed while forms are still in place.
2. Longitudinal Construction Joints: Tie concrete curb or combination concrete curb and gutter, where specified on Construction Drawings, to concrete pavement with 1/2-inch round deformed reinforcement bars of length and spacing shown on Construction Drawings.
3. Transverse Expansion Joints: Concrete curb, combination concrete curb and gutter, or concrete sidewalk shall have filler cut to exact cross section of curb, gutter, or sidewalk. Joints shall be similar to type of expansion joint used in adjacent pavement.

E. Joint Fillers: Extend joint fillers full-width and depth of joint, and not less than 1/2-inch or more than 1-inch below finished surface where joint sealer is indicated. Furnish joint fillers in 1-piece lengths for full width being placed, wherever possible. Where more than 1 length is required, lace or clip joint filler sections together.

F. Joint Sealants: Install in accordance with manufacturer's recommendations.

3.3 CONCRETE FINISHING

- A. After striking off and consolidating concrete, smooth surface by screeding and floating. Adjust floating to compact surface and produce uniform texture. After floating, test surface for trueness with 10'-0" straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide continuous smooth finish.
- B. Work edges of sidewalks, gutters, back top edge of curb, and formed joints with edging tool, rounding edge to 1/2-inch radius. Eliminate tool marks on concrete surface. After completion of floating and trowelling, when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:
 1. Curbs, gutters, and sidewalks: Broom finish by drawing fine-hair broom across surface perpendicular to flow of traffic. Repeat operation as necessary to produce fine line texture.
- C. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point up minor honeycombed areas. Remove and replace areas or sections with major defects as directed Owner.
- D. Check surface areas at intervals necessary to eliminate ponding areas. Remove and replace unacceptable work as directed by Owner.

3.4 CURING AND PROTECTION

- A. Protect and cure finished concrete paving using with curing compound or with acceptable moist-curing methods in accordance with "water-curing" section of ACI 308. Cure for a period not less than 7 days.

- B. Use solvent based curing compound when compound is applied below 40 F.

3.5 BACKFILL

- A. After concrete has set sufficiently, spaces on either side of concrete curb, combination concrete curb and gutter, or concrete sidewalk shall be refilled to required elevation with suitable material compacted in accordance with Section 02300.

3.6 CLEANING AND PROTECTION

- A. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just prior to final inspection.
- B. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials.

3.7 FIELD QUALITY CONTROL

- A. Field quality control shall be the responsibility of the Contractor in accordance with Section 01452. Field quality control testing and inspection shall be at the discretion of the Contractor as necessary to assure compliance with Contract requirements.

END OF SECTION

SECTION 32 16 25 - ARCHITECTURAL SIDEWALKS

PART 1 - GENERAL

- 1.1 The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete of concrete walks as shown on drawings and specified in accordance with provisions of the contract documents and completely coordinated with that of all other trades.
- 1.2 Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.
- 1.3 Refer to Sections:
 - 03 11 00 - Concrete Formwork,
 - 03 30 00 - Cast-in-Place Concrete
 - 32 13 13 - Concrete Paving
- 1.4 Shop Drawings shall be required and shall include a floor plan indicating the following:
 - A. Location of all control joints
 - B. Location of all expansion joints
 - C. Spacing of all control joints
 - D. Spacing of all expansion joints
 - E. Indication of control joint and expansion joint material to be used along with sealant
- 1.5 The Louisiana Standard Specifications for Roads and Bridges Current Edition, published by the State of Louisiana, Department of Transportation and Development is hereby made a part of these specifications by reference. Any reference to the "Project Engineer" or "Department" made in these specifications should be revised to "Project Architect". All work on concrete walks will be in accordance with Section 706 of the Standard Specifications or any section referenced with Section 706.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Construct all concrete walks and paving as detailed on the plans. If not specifically shown control joints at concrete walks shall be 6'-0" o.c. If not specifically shown, control joints at areas other than concrete walks shall be no more than 10'-0" o.c. each way for large areas. Control joints shall be 3-1/8" galvanized steel screed key joint with Greenstreak Inc. Model #627 screed cap or as indicated on Contract Documents. (Manufacturer: Greenstreak, P.O. Box 7139, St. Louis, Missouri 63177, (314) 225-9400 and (800) 325-9504, or approved equal.)
- B. Expansion joints shall be 3/4" wide with a 3/4" wide polypropylene expansion board, with G-Seal #605 paving cap seal. Also use this material and system where concrete walks butt up against building, grade beams, etc. Expansion joints shall be spaced no more than 24' o.c. and as indicated on drawings. Verify exact location with Architect before installation.
 1. **Optional Expansion Joint Assembly:** shall be 3/4" wide asphalt impregnated expansion filler (Conform to ASTM D – 1751) with top 3/4" filled with Sonneborn Sonolastic SL-1 Self-Leveling Sealant. Also use this material and system where concrete walks butt up against building, grade beams, etc. Expansion joints shall be spaced no more than 24' o.c. and as indicated on drawings. Verify exact location with Architect before installation.

- C. Unless otherwise indicated on the drawings, all concrete used for Architectural Concrete Walks shall be minimum 3000 psi and shall be fiber reinforced. (Re: 03 30 00 - Cast-In-Place Concrete, for additional information)
 - 1. Concrete mix design shall include 2-1/4" long Forta Macro/Structural Synthetic Twisted Bundle Reinforcement fibers at a rate of 3.0 lbs. per cubic yard of concrete (min.).

PART 3 - EXECUTION

- 3.1 All walks shall be level, straight and true (slope if any shall be as shown on plans, as follows the adjacent ground level, but in no case more than 1:20).
- 3.2 Slope of sidewalks directly adjoining an exit shall not exceed 1:50 for a min. of 4'-0" measured perpendicularly to the width of the entire opening.
- 3.3 All walks shall have a moderately non-slip finish (light broom finish).
- 3.4 All curved or radius walks shall have special care taken to build true to form and shape with all walks greater than 1" out of true or not tangent to straight runs shall be rejected by the Architect, demolished and replaced at the contractor's expense.

END OF SECTION 32 16 25

SECTION 321723 - PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Painting and marking of pavements, curbs, guard posts, and light pole bases.
- B. Related Requirements:
 - 1. Louisiana Department of Transportation and Development (DOTD) Standards and Specifications (LSSRB), latest edition.

1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. American Association of State Highway and Transportation (AASHTO):
 - 1. AASHTO M247 - Glass Beads Used in Traffic Paints
 - 2. AASHTO M248 - Ready-Mixed White and Yellow Traffic Paints
- C. Master Painter's Institute (MPI):
 - 1. MPI 32 – Traffic Marking Paint, Solvent Based.
 - 2. MPI 97 – Traffic Marking Paint, Latex.
- D. ASTM International (ASTM):
 - 1. ASTM D4259 – Standard Practice for Abrading Concrete.
 - 2. ASTM D4414 - Standard Practice for Measurement of Wet Film Thickness by Notched Gauges.
- E. Federal Specifications (FS):
 - 1. FS A-A-2886 - Paint, Traffic, Solvent Based (supersedes FS TT-P-85 and FS TT-P-115, Type I)
 - 2. FS TT-B-1325 - Beads (Glass Spheres) Retro-Reflective
 - 3. FS TT-P-1952 - Paint, Traffic And Airfield Marking, Waterborne
- F. The Society for Protective Coatings (SSPC):
 - 1. SSPC-SP13 – Surface Preparation of Concrete.

1.3 ENVIRONMENTAL REQUIREMENTS

- A. Minimize dust emissions and provide equipment that suppresses dust.

1.4 PROJECT CONDITIONS

- A. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize flagmen, barricades, warning signs, and warning lights as required.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Paint shall be waterborne or solvent borne, colors as shown or specified herein. Pavement marking paints shall comply with applicable state and local laws enacted to ensure compliance with Federal Clean Air Standards. Paint materials shall conform to the restrictions of the local Air Pollution Control District.
- B. Waterborne Paint: Paints shall conform to FS TT-P-1952 and have MPI 97 approval.

- C. Solvent Borne Paint: Paint shall conform to FS A-A-2886 or AASHTO M248 and have MPI 32 approval. Paint shall be non-bleeding, quick-drying, and alkyd petroleum base paint suitable for traffic-bearing surface and be mixed in accordance with manufacturer's instructions before application for colors White, Yellow, Blue, and Red.
- D. Glass Beads: AASHTO M 247, Type 1 or FS TT-B-1325, Type 1, Gradation A.
- E. Pickup Area Pavement Marking Paint: Paint shall conform to the requirements specified herein for solvent borne or waterborne paints, with exception of the relevant difference due to the material being supplied in a color other than white or yellow.
 - 1. Color: Orange, according to the following mix rate:

Gallon	Color
5	Yellow
1	Red
6	Orange

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the work area and correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

- A. Sweep and clean surface to eliminate loose material and dust.
- B. Where existing pavement markings are indicated on Construction Drawings to be removed or would interfere with adhesion of new paint, sodium bicarbonate (soda) blasting shall be used to remove the markings. Equipment employed shall not damage existing paving or create surfaces hazardous to vehicle or pedestrian traffic and shall be equipped with a manufacturer's recommended mist system for dust suppression. Within public rights-of-way, appropriate governing authority shall approve method of marking removal.
- C. New pavement surfaces shall be allowed to cure for not less than 30 days before application of marking materials.

3.3 CLEANING EXISTING PAVEMENT MARKINGS

- A. Remove existing pavement markings which are in good condition but interfere or conflict with the newly applied marking patterns. Deteriorated or obscured markings that are not misleading or confusing or do not interfere with the adhesion of the new marking material do not require removal. Conduct sodium bicarbonate (soda) blasting in such a manner that the finished pavement surface is not damaged or left in a pattern that is misleading or confusing. Use a water mist spray system recommended by the manufacturer for dust suppression when pavement preparation includes soda blasting of existing pavement markings.

3.4 APPLICATION

- A. Apply two coats of same color of paint as specified below, at manufacturer's recommended rate, without addition of thinner, with maximum of 100 square feet per gallon or as required to provide a minimum wet film thickness of 15 mils and dry film thickness of 7 ½ mils per coat. Paint shall be applied for a total dry film thickness of 15 mils. Apply with mechanical equipment to produce uniform straight edges. At sidewalk curbs and crosswalks, use straightedge to ensure uniform, clean, and straight stripe.
- B. Install pavement markings according to manufacturer's recommended procedures for the specified material.
- C. Following items shall be painted with colors noted below:
 - 1. Pedestrian Crosswalks: White
 - 2. Exterior Sidewalk Curbs and Guard posts: Yellow
 - 3. Exterior Light Pole Bases: Yellow (unless otherwise noted on Construction Detail).

4. Fire Lanes: Red or per local code.
5. Lane Striping where separating traffic moving in opposite directions: Yellow.
6. Lane Striping where separating traffic moving in the same direction: White.
7. ADA Symbols: Blue or per local code.
8. ADA parking space markings as shown on the drawings.
9. Parking Stall Striping: Yellow, unless otherwise noted on Construction Drawings.

- D. Apply glass beads at pedestrian crosswalk striping and at lane striping and arrows at driveways connecting to public streets. Broadcast glass beads uniformly into wet markings at a rate of 6 lb/gal.

3.5 FIELD QUALITY CONTROL

- A. Field quality control shall be the responsibility of the Contractor in accordance with Contract Documents. Field quality control testing and inspection shall be at the discretion of the Contractor as necessary to assure compliance with Contract requirements.

3.6 CLEANING

- A. Waste materials shall be removed at the end of each workday. Upon completion of the work, all containers and debris shall be removed from the site. Paint spots upon adjacent surfaces shall be carefully removed by approved procedures that will not damage the surfaces and the entire job left clean and acceptable.

END OF SECTION

SECTION 321725 – Traffic Signs and Signals

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Traffic control signs.
- B. Related Requirements:
 - 1. Louisiana Department of Transportation and Development (DOTD) Standards and Specifications (LSSRB), latest edition, and standard details.
 - 2. Section 09900 - Painting. Painting for painted posts where shown on the Drawings.

1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. ASTM International (ASTM):
 - 1. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - 2. ASTM C94 - Ready Mix Concrete
 - 3. ASTM D4956 - Retroreflective Sheeting for Traffic Control.
- C. US Department of Transportation, Federal Highway Administration:
 - 1. Manual on Uniform Traffic Control Devices (MUTCD).

PART 2 - PRODUCTS

2.1 SIGNS

- A. Conform to US Department of Transportation [MUTCD](#). Sign classification, type, size, and color shall be as shown on the drawings
- B. Retroreflectivity: Microprismatic type, diamond grade reflective sheeting conforming to ASTM D 4956

2.2 POSTS

- A. Square Post: Square tubular steel sign post, galvanized, 12 ga, perforated full-length with 7/16 inch holes on four sides, unless noted otherwise on the Construction Drawings. Post size shall be as shown on the Drawings.
- B. Steel Pipe: ASTM A 53, Type E (electric-resistance welded) or Type S (seamless), Grade B, Schedule 40, size as shown on the Drawings.

2.3 CONCRETE

- A. Mix concrete and deliver in accordance with ASTM C 94.
- B. Design mix to produce normal weight concrete consisting of Portland cement, aggregate, water-reducing admixture, air-entraining admixture, and water to produce following:
 - 1. Compressive Strength: 3,500 psi, minimum at 28 days, unless otherwise indicated on the Drawings.
 - 2. Slump Range: 1 to 3-inches at time of placement
 - 3. Air Entrainment: 5 to 8 percent

PART 3 - EXECUTION

3.1 PREPARATION

- A. Field verify underground utilities prior to sign installation. Primary utilities of concern of shallow depths are lawn sprinkler systems, electric, telephone, fiber optic, cable and gas.

3.2 INSTALLATION

- A. Install signs as shown on the Drawings and in accordance with MUTCD and manufacturer's instructions.
- B. Install signs of the type and at locations shown on the Drawings.
- C. Install posts of the type as shown on the drawing.

END OF SECTION

**SECTION 32 31 13 - COLOR CHAIN LINK FRAMEWORK FENCING
(COMMERCIAL WEIGHT)**

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete of color chain link framework fencing (commercial weight) as shown on drawings and specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.
- C. Refer to Section 31 00 00 - Excavation, Filling, and Grading, Section 03 11 00 - Concrete Formwork, and Section 03 30 00 - Cast-in-Place Concrete for additional information.
- D. Shop Drawings shall be required and shall include a floor plan indicating the following:
 - 1. Color chain link framework fencing system fabric.
 - 2. Color chain link framework fencing posts supports.
 - 3. Foundation excavations at new fencing
 - 4. Concrete and concrete reinforcing for fence supports
 - 5. Color chain link framework fencing gates and associated braces and rails
 - 6. Steel ornamental cantilever gates and associated braces, pickets, and rails
- E. The Contractor shall provide an earth surface that is level beneath the color chain link framework fencing.
- F. Provide color chain link framework fence and gates as a complete unit produced by a single manufacturer, including necessary erection accessories, fittings and fastenings.
- G. The installer must examine the conditions under which the fence and gates are to be installed. Notify the Architect in writing of conditions which would interfere with proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.
- H. The installer shall follow the standards of the City, Parish and State along with the International Building Code.
- I. Height of the color chain link framework fence shall be as indicated specifically in the Drawings.

1.2 QUALITY ASSURANCE

- A. The Contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and materials and techniques specified.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM) Standards: A90/A90M - Test Method for Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
- B. A653/A653M - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

- C. A924/A924M - Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
- D. B6 - Specification for Zinc. B117 - Practice for Operating Salt Spray (Fog) Apparatus.
- E. D1499 - Practice for Operating Light- and Water-Exposure Apparatus (Carbon-Arc Type) for Exposure of Plastics.
- F. D3359 - Test Methods for Measuring Adhesion by Tape Test. E8/E8M - Test Methods for Tension Testing of Metallic Materials.
- G. F567 - Practice for Installation of Chain-Link Fence. F626 - Specification for Fence Fittings.
- H. F668 - Specification for Poly (Vinyl Chloride) (PVC)-Coated Steel Chain-Link Fence Fabric.
- I. F900 - Specification for Industrial and Commercial Swing Gates.
- J. F934 - Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials.
- K. F969 - Practice for Construction of Chain-Link Tennis Court Fence.
- L. F1043 - Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.
- M. F1184 - Specification for Industrial and Commercial Horizontal Slide Gates.
- N. American Association of State Highway and Transportation Officials (AASHTO) Standards: M181 - Standard Specification for Chain-Link Fence.
- O. United States Federal Supply Service General Services Administration Specifications: RR-F-191/3 - Federal Specification Sheet for Fencing, Wire and Post, Metal (Chain-Link Fence Posts, Top Rails and Braces) - Detail Specification.

1.4 SUBMITTALS

- A. Shop Drawings:
 - 1. Details of special fabrication and installation necessary for this project, including special conditions, which require special configurations.
 - 2. The shop drawings shall show a layout of the color chain link framework fence and gates along with locations of gates with the indication of width and height.
 - 3. **Any and all shop drawings not reviewed, stamped, dated and signed by the Contractor prior to submittal to the Architect will be returned as rejected.**
 - 4. The Contractor shall be responsible for all dimensions, quantities, assortments and accuracies of the shop drawings.
 - 5. Generally, notes and markings on the shop drawings by the Contractor placed after the review by the Architect shall be null and void unless again reviewed by the Architect.
 - 6. **Note! Any changes from the Contract Documents shall be highlighted in yellow on the shop drawings (dimension, size, color, etc.).**

7. Furnish the Architect with four (4) blue-line prints of every sheet required. (Prints are to be reviewed and stamped approved by the Contractor before submitting to the Architect.)
8. Manufacturer's literature:
 - a. Recommended installation methods and procedures.
 - b. Standard drawings for fence and gate installation.
9. Certificates:
 - a. Manufacturer's certification that materials meet specification requirements, for record purposes.

1.5 PRODUCT HANDLING AND STORAGE

- A. Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism and theft.

1.6 PRODUCT WARRANTY

- A. All fencing components (i.e. posts, rails, and braces) shall be warranted within specified limitations, by the manufacturer for a period of **15 years from date of Substantial Completion**. Warranty shall cover any defects in material finish, including cracking, peeling, chipping, blistering or corroding. A sample copy of the PermaCoat Colored Chain Link Framework 15 Year Limited Warranty is attached to the end of this section.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. The color chain link framework fence systems shall conform to Ameristar PermaCoat PC-20 (Commercial Weight) as manufactured by:
 1. Ameristar Fence Products, Inc., in Tulsa, Oklahoma, Contact Person: Chris Koehler (Phone 800-321-8724) or
 2. Merchant Metals (www.merchantmetals.com) Phone: (888)260-1600

prior approved equal.
- B. Material - Steel Framework:
 1. The steel material used to manufacture Ameristar PermaCoat PC-20 shall be zinc-coated steel strip, galvanized by the hot-dip process conforming to the criteria of ASTM A653/A653M and the general requirements of ASTM A924/A924M.
 2. The zinc used in the galvanizing process shall conform to ASTM B6. Weight of zinc shall be determined using the test method described in ASTM A90 and shall conform to the weight range allowance for ASTM A653, Designation G-90.
 3. The framework shall be manufactured in accordance with commercial standards to meet the strength (50,000 psi minimum yield strength) and coating requirements of ASTM F1043, Group IC, Electrical Resistance Welded Round Steel Pipe, light industrial weight.
 4. The exterior surface of the electrical resistance weld shall be recoated with the same type of material and thickness as the basic zinc coating.

5. The manufactured framework shall be subjected to the PermaCoat process, a complete thermal stratification coating process (multi-stage, high-temperature, multi-layer) including, as a minimum, a six-stage pretreatment/wash (with zinc phosphate), an electrostatic spray application of an epoxy base, and a separate electrostatic spray application of a polyester finish.
6. The material used for the base coat shall be a (gray color) thermosetting epoxy; the minimum thickness of the base coat shall be two (2) mils. The material used for the finish coat shall be a thermosetting "no-mar" TGIC polyester powder; the minimum thickness of the finish coat shall be two (2) mils. The stratification coated pipe shall demonstrate the ability to endure a salt-spray resistance test in accordance with ASTM B117 without loss of adhesion for a minimum exposure time of 3,500 hours. Additionally, the coated pipe shall demonstrate the ability to withstand exposure in a weather-ometer apparatus for 1,000 hours without failure in accordance with ASTM D1499 and to show satisfactory adhesion when subjected to the cross-hatch test, Method B, in ASTM D3359. The polyester finish coat shall not crack, blister or split under normal use.
7. The color of all framework shall be Black in accordance with ASTM F934.
8. The strength of Ameristar PermaCoat PC-20 shall conform to the requirements of ASTM F1043; the minimum weight shall not be less than 90% of the nominal weight (see Table 1). The strength of line, end, corner and pull posts shall be determined by the use of 4' or 6' cantilevered beam test. The top rail shall be determined by a 10' free-supported beam test (see Table 1). An alternative method of determining pipe strength is by the calculation of bending moment (see Table 1). Conformance with this specification can be demonstrated by measuring the yield strength of a randomly selected piece of pipe from each lot and calculating the section modulus. The yield strength shall be determined according to the methods described in ASTM E8. For materials under this specification, the 0.2 offset method shall be used in determining yield strength. Terminal posts, line posts and top/bottom rails shall be precut to specified lengths.

C. Material - Fence Fabric

1. The material for chain link fence fabric shall be manufactured from galvanized steel wire. The weight of zinc shall meet the requirements of ASTM F668, Table 4. Galvanized wire shall be PVC-coated to meet the requirements of ASTM F668. The class of the fence fabric shall be Class 2B - Fused and Bonded.
2. Selvage: Top edge knuckled and bottom edge knuckled.
3. Color: The coating color for the fence fabric shall be Black. Reference ASTM F668 and ASTM F934.
4. Wire Size: The size of the steel wire core shall be 9 gauge and shall have a 2 to 4 mils coating.
5. Height and Mesh Size: The fabric height shall be 6' (see Drawings) feet high with a mesh size of 2 inches. (See Table 2).

D. Material - Fence Fittings

1. The material for fence fittings shall be manufactured to meet the requirements of ASTM F626. The coating for all fittings shall be the same PermaCoat color coating system required for the framework (see G.2.); the color of all fittings and

fasteners shall be Black in accordance with ASTM F934. All fasteners shall be stainless steel.

E. Material - Gates

1. Swing gates shall be manufactured and coated to meet the requirements of ASTM F900. Slide gates shall be manufactured to meet the requirements of ASTM F1184. The color of all gates shall be Black in accordance with ASTM F934.
2. Provide locking drop bars and hold backs with all gates.
3. Match gate fabric to that of the fence system. Gatepost per ASTM F1083 schedule 40 galvanized steel pipe. Gate frames shall be fully welded prior to galvanizing and finish coat is applied. Gates shall be light mill coated prior to installation of final PVC or Polyester Coating (fused and adhered).
4. Polymer coated gate frames and gateposts; match the coating type and color to that specified for the fence framework.
5. Moveable parts such as hinges, latches and drop rods may be field coated using a liquid polymer touch up.

PART 3 - EXECUTION

3.1 PREPARATION

- A. All new installation shall be laid out by the contractor in accordance with the construction plan.

3.2 INSTALLATION

- A. Install chain link fence in accordance with ASTM F567. For chain link tennis court fences, install in accordance with ASTM F969. Fence posts shall be set at spacings of a maximum of 8' o.c. Gate posts shall be spaced according to the gate openings specified in the Contract Documents. The "Paving and Surfacing" and "Cast-In-Place Concrete" sections of this specification shall govern post base placement and material requirements. Install fabric using tension bands and carriage bolts on security side and attach with wire ties or clip to line posts at 15 inches o.c. and to rails, braces and tension wire at 24 inches o.c.
- B. Posts: Posts shall be set plumb in concrete footings in accordance with ASTM F567. Size Footings as per Contract Documents. Top of concrete footing to be at grade crowned to shed water away from the post.
- C. Terminal Posts: End, Corner Pull and Gate Posts shall be braced and trussed for fences 6 ft. and higher. The horizontal brace rail and diagonal truss rod shall be installed in accordance with ASTM F567.
- D. Tension Wire: Fences without bottom rail shall have a tension wire installed 3 in. up from the bottom of the fabric. Tension wire to be stretched taut, independently and prior to the fabric, between the terminal posts and secured to the terminal post using a brace band. Secure the tension wire to each line post with a tie wire.
- E. Gate Installation: Swing Gates and gateposts in compliance with ASTM F567. Direction of swing shall be outward. Gates shall be plumb in the closed position having a bottom clearance of 3 in. Gate drop bars and gate leaf hold backs shall be installed for all gates.

3.3 CLEANING

- A. The Contractor shall clean the jobsite of excess materials. Post hole excavations shall be scattered uniformly away from posts.

TABLE 1

Fence Industry	Decimal O.D. Equivalent		Pipe Wall Thickness		Weight		Section Modulus Inches	x	Min. Yield Strength psi	=	Max. Bending Moment lb. in.	Calculated Load (lbs.)		
	O.D.	Inches	(mm)	Inches	(mm)	lb./ft.	(kg/m)					10' Free Supported	Cantilever	
													4'	6'
1-3/8"	1.315	33.40	.080	2.03	1.06	1.57	.0900	x	50,000	=	4,500	150	N/A	N/A
1-5/8"	1.660	42.16	.085	2.16	1.43	2.13	.1574	x	50,000	=	7,870	262	164	109
2"	1.900	48.26	.090	2.29	1.74	2.59	.2208	x	50,000	=	11,040	N/A	230	154
2-1/2"	2.375	60.33	.095	2.41	2.32	3.45	.3734	x	50,000	=	18,670	N/A	389	259
3"	2.875	73.03	.111	2.82	3.26	4.85	.6365	x	50,000	=	31,825	N/A	663	442

TABLE 2

Finished Gauge	Finished OD (NOM)	Core Diameter (NOM)	PVC Coating Thickness	Mesh Sizes Available		Fabric Extrusion Type	Minimum Breaking Strength
8	.162 (4.11 mm)	.120 (3.05 mm)	.015 - .025 (0.38 - 0.64 mm)	2 (50 mm); 1-3/4 (44 mm); 1 (25 mm)		CLASS 1, 2A	850#
9	.148 (3.76 mm)	.097 (2.46 mm)	.015 - .025 (0.38 - 0.64 mm)	2 (50 mm); 1-3/4 (44 mm); 1-1/4 (32 mm); 1 (25 mm)		CLASS 1, 2A	650#

**PERMACOAT® COLOR CHAIN LINK FRAMEWORK
15 YEAR LIMITED WARRANTY**

PermaCoat® Color Chain Link Framework by AMERISTAR® is manufactured from the highest quality materials by skilled craftsmen to meet the highest standards of workmanship in the industry. Galvanized steel framework shall be subject to a six stage pretreatment/wash (with zinc phosphate) followed by an electrostatic spray application of PermaCoat® Color System, a two coat powder system. The base coat is a thermosetting epoxy powder coating (gray in color). The top coat is a "no-mar" TGIC polyester powder coat finish, which provides the protection necessary to withstand adverse environmental conditions.

The powder coated surface on all framework by AMERISTAR® is guaranteed under normal and proper usage, against cracking, peeling, chipping, blistering or corroding for a period of fifteen (15) years from the original purchase date. Normal and proper usage does not include physical damage, abrasion or exposure to salty environments to the protective coating.

PermaCoat® Color Chain Link Framework is also guaranteed for the same period of time against defects in workmanship or materials.

Should any ornamental fence framework manufactured by Ameristar® Fence Products fail in accordance with any of the above conditions, Ameristar® Fence Products warrants to the original purchaser their redemption through replacement, renewal or issuance of a pro-rated credit. The decision as to which method of redemption is allowed is solely at the discretion of Ameristar®. If pro-rated allowance is the chosen alternative, the amount will be based on the total number of years under warranty from date of purchase to date of claim, based on the original cost of framing materials found to be defective. Notice of failure under the conditions of this warranty shall be sent to Ameristar® Fence Products or its authorized representative, in writing, together with proof of purchase and shall specify the nature of the defect and when it was first observed. When cutting PermaCoat Color Chain Link Framework tubing or pipe immediately seal the exposed surfaces by 1) Removing all metal shavings from cut area 2) Apply zinc-rich primer to thoroughly cover cut edge and drilled hole; let dry 3) Apply 2 coats of custom finish spray paint matching fence color. Failure to seal exposed surfaces per steps 1-3 above will negate warranty. Should the fence be improperly installed, Ameristar® Fence Products shall not be responsible for guaranteed performance or appearance of the material. Neither does this guarantee apply when failure or damage is due to improper use or application, abuse or misuse, salty environments, vandalism or acts of God. Ameristar® Fence Products reserves the right to inspect the material to determine validity of the claim.

Upon validation of the claim by Ameristar® Fence Products or its authorized representative, redemption by replacement, renewal or issuance of a pro-rated credit shall be made by Ameristar® Fence Products. Reimbursement for the costs of removal and installation of materials are not included in the guarantee, nor will Ameristar® Fence Products provide those services.

The above constitutes the complete warranty by the manufacturer. No other agreement, written or implied, is valid. Ameristar® Fence Products does not authorize any other person or agent to make any other express warranties. Ameristar® Fence Products neither assumes nor authorizes any other person or agent to assume any other liability in connection with PermaCoat® Color Chain Link Framework. Some jurisdictions do not allow limitations on how long an implied warranty lasts, nor do they allow an exclusion or limitation of incidental or consequential damages; therefore, the limitations and exclusions noted herein may not apply.

PURCHASE DATE _____

DEALER SIGNATURE _____



P. O. BOX 581000 TULSA, OKLAHOMA 74158-1000

SECTION 32 31 19 - ALUMINUM ORNAMENTAL FENCE SYSTEM

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete of aluminum ornamental fence system as shown on drawings and specified in accordance with provisions of the Contract Documents and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.
- C. Refer to Section 31 00 00 - Earthwork, Section 03 11 00 - Concrete Forming, Section 03 30 00 - Cast-in-Place Concrete and Section 08 71 00 - Door Hardware for additional information.
- D. Shop Drawings shall be required and shall include a floor plan indicating the following:
 - 1. Aluminum ornamental fence system columns, rails and pickets
 - 2. Foundation excavations at new fencing
 - 3. Concrete and concrete reinforcing for fence supports
 - 4. Aluminum ornamental cantilever gates and associated braces, pickets, and rails
 - 5. Aluminum ornamental cantilever gates and associated braces, pickets, and rails
- E. The Contractor shall provide an earth surface that is level beneath the Aluminum ornamental fence system.
- F. Provide aluminum ornamental fence, gates and aluminum cantilever gate as a complete unit produced by a single manufacturer, including necessary erection accessories, fittings and fastenings.
- G. The installer must examine the conditions under which the fence and gates are to be installed. Notify the Architect in writing of conditions which would interfere with proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.
- H. The installer shall follow the standards of the City, Parish and State along with the International Building Code.
- I. Height of the ornamental fence shall be as indicated specifically in the Drawings.

1.2 QUALITY ASSURANCE

- A. The Contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and materials and techniques specified.

1.3 REFERENCES

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- B. ASTM B117 - Practice for Operating Salt-Spray (Fog) Apparatus.
- C. ASTM D523 - Test Method for Specular Gloss
- D. ASTM D714 - Test Method for Evaluating Degree of Blistering in Paint.

- E. ASTM D822 - Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.
- F. ASTM D1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
- G. ASTM D2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
- H. ASTM D2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
- I. ASTM D3359 - Test Method for Measuring Adhesion by Tape Test.
- J. ASTM F2408 – Ornamental Fences Employing Galvanized Steel Tubular Pickets.

1.4 SUBMITTALS

- A. Shop Drawings:
 - 1. Details of special fabrication and installation necessary for this project, including special conditions, which require special configurations.
 - 2. The shop drawings shall show a layout of the aluminum ornamental fence system, gates and the ornamental aluminum cantilever gates along with locations of gates with the indication of width and height.
 - 3. **Any and all shop drawings not reviewed, stamped, dated and signed by the Contractor prior to submittal to the Architect will be returned as rejected.**
 - 4. The Contractor shall be responsible for all dimensions, quantities, assortments and accuracies of the shop drawings.
 - 5. Generally, notes and markings on the shop drawings by the Contractor placed after the review by the Architect shall be null and void unless again reviewed by the Architect.
 - 6. **Note! Any changes from the Contract Documents shall be highlighted in yellow on the shop drawings (dimension, size, color, etc.).**
 - 7. Furnish the Architect with four (4) prints of every sheet required. (Prints are to be reviewed and stamped approved by the Contractor before submitting to the Architect.)
 - 8. Manufacturer's literature:
 - a. Recommended installation methods and procedures.
 - b. Standard drawings for fence and gate installation.
 - 9. Certificates:
 - a. Manufacturer's certification that materials meet specification requirements, for record purposes.

1.5 PRODUCT HANDLING AND STORAGE

- A. Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Materials shall be stored in such a manner to

ensure proper ventilation and drainage, and to protect against damage, weather, vandalism and theft.

1.6 PRODUCT WARRANTY

- A. All structural fence components (i.e. rails, pickets, and posts) shall be warranted within specified limitations, by the manufacturer for a period of 20 years from date of Substantial Completion. Warranty shall cover any defects in material finish, including cracking, peeling, chipping, blistering or corroding.
- B. Reimbursement for labor necessary to restore or replace components that have been found to be defective under the terms of manufactures warranty shall be guaranteed for five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. All 4' high aluminum ornamental fence systems shall conform to Echelon II standard picket spaced Majestic design, extended picket bottom rail treatment, 3-Rail style as manufactured by Ameristar Fence Products, Inc., in Tulsa, Oklahoma, Contact Person: Chris Koehler (Phone 800-321-8724) or prior approved equal.
- B. All 6' high aluminum ornamental fence system shall conform to Echelon II standard picket space Classic design, extended picket bottom rail treatment, 3-Rail style manufactured by Ameristar Fence Products, Inc., in Tulsa, Oklahoma, Contact Person: Chris Koehler (Phone 800-321-8724) or prior approved equal.
- C. Material:
 - 1. Aluminum material for fence panels and posts shall conform to the requirements of ASTM B221. The aluminum extrusions for posts and rails shall be Alloy and Temper Designation 6005-T52. The aluminum extrusions for pickets shall be Alloy and Temper Designation 6063 -T52.
 - 2. Material for pickets shall be 1" square x 0.062" thick extruded tubing. The rails shall be steel channel, 1.75 square. The top wall and internal web of the rail shall be 0.070" thick. Picket holes in the rail shall be spaced 4.175" o.c. Fence posts and gate posts shall meet the minimum size requirements of Table 1.
 - 3. Bracket to rail attachments shall be made using specially designed one-way tamper proof security nuts with carriage bolt. Bracket to post connections shall be made using self-drilling hex head screws.
 - 4. Aluminum castings shall be used for all post caps, finials and miscellaneous adornments.

2.2 FABRICATION

- A. Pickets, rails and posts shall be pre-cut to specified lengths. Rails shall be pre-punched to accept pickets.
- B. The rail inner slide shall be fully inserted into the rail outer channel to form the raceway of the internal retaining rod. Grommets shall be inserted into the pre-punched holes in the rails and pickets shall be inserted through the grommets so that pre-drilled picket holes align with the internal raceway of the two -part rails. (Note: this can best be accomplished by using an alignment template). Retaining rods shall be inserted into each rail so that they pass through the pre-drilled holes in each picket, thus completing the panel assembly.

- C. The manufactured framework and posts shall be subjected to the Ameristar thermal stratification coating process. (high-temperature, in-line multi stage and multi-layer) including, minimum 6 stage pretreatment/ wash and an electrostatic spray application of a polyester finish. The topcoat shall be a TGIC polyester powder coat finish with a minimum thickness of 2 mils. The color shall be Black. The coated panels and posts shall be capable of meeting the performance requirements for each quality characteristic shown in Table 2.
- D. Completed panels shall be capable of supporting a 300lb. load (applied at midspan) without permanent deformation. Panels shall be biasable to a 25% change in grade.
- E. Gates shall be fabricated using 1.75" sq. runner rail material, 2" sq. x .250" gate ends and 1" sq. x .125" pickets. All rail and upright intersections shall be joined by welding. All picket and rail intersections shall also be joined by welding. Gates and surrounding panels to have LWD 9 gauge 3/4" diamond pregalvanized mesh installed using pin headed pan head torx fasteners and 1" washers. Panic plates and bars installed where specified.

PART 3 - EXECUTION

3.1 PREPARATION

- A. All new installation shall be laid out by the contractor in accordance with the Contract Documents (Drawings and Specifications).

3.2 INSTALLATION

- A. Fence post shall be spaced according to Table 3, plus or minus 1/2". For installations that must be raked to follow sloping grades, the post spacing dimension must be measured along the grade. Fence panels shall be attached to posts with brackets supplied by the manufacturer. Posts shall be set in concrete footers having a minimum depth of 36" (Note: In some cases, local restrictions of freezing weather conditions may require a greater depth). The "Earthwork" and "Concrete" sections of this specification and drawings shall govern material requirements for the concrete footer. Posts setting by other methods such as plated posts or grouted core-drilled footers are permissible only if shown by engineering analysis to be sufficient in strength for the intended application, which is to withstand 129 mph winds.

3.3 FENCE INSTALLATION MAINTENANCE

- A. When cutting/drilling rails or posts adhere to the following steps to seal the exposed surfaces; 1) Remove all metal shavings from cut area. 2) Apply custom finish paint matching fence color. Failure to seal exposed surfaces per steps 1-2 above will negate warranty. Ameristar spray cans or paint pens shall be used to prime and finish exposed surfaces; it is recommended that paint pens be used to prevent overspray. Use of non-Ameristar parts or components will negate the manufactures' warranty. A manufacturer's warranty shall be provided to Owner.

3.4 GATE INSTALLATION

- A. Gate posts shall be spaced according to the manufacturers' gate drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected. Type and quantity of gate hinges shall be based on the application; weight, height, and number of gate cycles. All gate hinges shall have the capability of opening 180 degrees. The manufacturers' gate drawings shall identify the necessary gate hardware required for the application. Gate hardware shall be provided by the manufacture of the gate and shall be installed per manufacturer's recommendations and in locations shown on Contract Documents. **Gate shall be capable of being locked with a padlock. See Section 08 71 00 - Door Hardware.**

- B. Each swinging ornamental gate shall receive a lockable Cane Bolt. A 3/4" hole shall be drilled into the existing concrete at the 90 degree open position of all gates.

3.5 CLEANING

- A. The Contractor shall clean the jobsite of excess materials; post-hole excavations shall be scattered uniformly in areas as directed by Architect and Owner.

Table 1 - Minimum Sizes for Montage Plus Posts		
Fence Posts	Panel Height	
2-1/2" x 2-1/2" x 0.080" Alum. w/ reinforced web	Up to & Including 6' Height	
Gate Leaf	Gate Height	
	Up to & Including 4'	Over 4' Up to & Including 6'
Up to 4'	3" x 3" x 0.120" Alum.	4" x 4" x 0.250" Alum.
4'1" to 6'	4" x 4" x 0.250" Alum.	3" x 12 Ga.
6'1" to 8'	4" x 11 Ga.	4" x 11 Ga.

Table 2 - Coating Performance Requirements		
Quality Characteristics	ASTM Test Method	Performance Requirements
Adhesion	D3359 - Method B	Adhesion (Retention of Coating) over 90% of test area (Tape and knife test).
Corrosion Resistance	B117 & D1654	Corrosion Resistance over 1,000 hours (Scribed per D1654; failure mode is accumulation of 1/8" coating loss from scribe or medium #8 blisters).
Impact Resistance	D2794	Impact Resistance over 60" lb. (Forward impact using 0.625" ball).
Weathering Resistance	D822 D224, D523 (60° Method)	Weathering Resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of more than 3 delta-E color units).

Table 3 - Echelon II - Post Spacing By Bracket Type						
Span	For CLASSIC, GENESIS, MAJESTIC, & WARRIOR 8' Nominal (92.625" Rail)					
Post Size	2-1/2" to 3"	2-1/2"	2-1/2"	3"	2-1/2"	3"
Bracket Type	Industrial Flat Mount (BB301)	Industrial Universal (BB302)	Industrial Flat Mount (BB303)		Industrial Swivel (BB304)*	
Post Settings ± 1/2" O.C.	94.5" to 95"	96"	96"	96.5"	*97.5"	*98"
*Note: When using BB304 swivel brackets on either or both ends of a panel installation, care must be taken to ensure the spacing between post and adjoining pickets meets applicable codes. This will require trimming one or both ends of the panel.						

END OF SECTION 32 31 19

SECTION 32 92 23 - PLANTING, SEEDING AND SOD

PART 1 - GENERAL

1.1 SCOPE

- A. The contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of planting as shown on drawings and as specified in accordance with provisions of the contract documents and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.
- C. Submittals required in addition to product certificates are as follows:
 - 1. Certification of grass seed from seed vendor for each seed mixture.
 - 2. Planting schedule indicating anticipated dates and locations for sodding.
 - a. Provide sodding of quality and species complying with applicable requirements of ANSI Z60.1 (American Standard for Nursery Stock).
 - 3. Maintain and establish lawns by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations to produce a uniformly smooth lawn for not less than the following:
 - a. Seeded lawns: 60 days after date of Substantial Completion
 - b. Sodded lawns: 30 days after date of Substantial Completion

PART 2 - PRODUCTS

- 2.1 Sod Grass: Provide solid Bermuda grass sod of strain or variety (Celebration, Tiffway, etc.) adapted to the climate of this area and suitable for high incidence of foot traffic.
 - A. Provide strongly rooted sod, not less than 2 years old and free of weeds and undesirable native grasses and machine cut to pad thickness of 3/4" excluding top growth and thatch.
 - B. Provide only sod capable of vigorous growth and development when planted.
 - C. Provide sod of uniform sizes with maximum 5% deviation in either length or width.
 - D. Broken pads or pads with uneven ends will not be acceptable.
 - E. Sod pads incapable of supporting their own weight when suspended vertically with a firm grasp on the upper 10% of pad will be rejected.
- 2.2 New-Crop Seed Grass: Provide fresh, clean, new-crop seed complying with tolerance for purity and germination established by Official Seed Analyst of North America "Rules for Testing Seeds".
 - A. Provide seed of grass species and varieties, proportion by weight, and minimum percentages of purity, germination and maximum percent of weed seed as recommended for the time of year.
 - B. **On all other areas cleared in the immediate vicinity or having the ground broken during construction of this phase provide and place rye grass seed mixed with unhulled Common Bermuda, and broadcast at a rate of 5 lbs. per 1000 s.f.**
- 2.3 **Areas to receive seeding or sod shall be prepared by placing 2" thick fine graded top soil over the rough fill for growing grass.**

PART 3 - EXECUTION

3.1 Areas to Receive Sod: (Refer to "Site Plan/Contract Documents")

- A. Sodding shall be installed within the perimeter of the new drives and parking areas and within all of the open areas associated with the new drives and parking to fill areas as indicated on the Contract Documents.
- B. **New sod shall be installed within 10' of all paved sidewalks and at the entire perimeter of the new construction. In areas to receive sodding, solid Bermuda grass sod of strain or variety adapted to the climate of this area and suitable for high incidence of foot traffic shall be provided and installed.**

3.2 Before mixing, clean topsoil of roots, plants, sod, stones, slates, lumps, and other extraneous material harmful to plant growth. Any object larger than 5/8" shall be removed as debris.

3.3 Loosen subgrade with tiller to a minimum depth of 4". Remove concrete, bricks, sticks, roots, rubbish, and other extraneous materials then place 2" of topsoil graded at required slopes for drainage of water.

3.4 Lay sod to form a solid mass with tightly fitted joints within 24 hours of stripping. Butt ends and sides of sod and do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. During delivery and storage, sod must be protected from excessive drying especially the root systems. Sod shall be healthy, disease and insect free, and completely devoid of weeds. Work sifted soil or fine sand into minor cracks between pieces of sod, removing excess to avoid smothering sod and adjacent grass. Plant and sow as per recommendations of supply nursery. All sod and seed shall be placed on minimum 2" of fine grade, lime-enriched topsoil. Grass shall not be placed until the final phase of construction except in high erosion areas where rye grass seed mixed with Bermuda shall be broadcast. All lawns shall have all-purpose, ferti-lome 11-3-6 or equal at the rate of 40 lbs. per 3,000 sq. ft. Saturate sod with fine water spray within 2 hours of planting. During first week, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2" below the sod. Lime should be spread evenly and thoroughly mixed with soil approximately 2,000 lbs. per acre. The General Contractor shall mow established lawns until Substantial Completion of the project. Note: anchor sod on slopes exceeding 1:6 with wood pegs spaced as recommended by sod manufacturer.

3.5 All planting shall be watered and fertilized as recommended by the nursery supplier to guarantee the establishment and growth of a complete, dense and healthy lawn. All planting not surviving one year shall be replaced and replanted at the contractor's expense. (Exceptions: Planting destroyed by severe and unusual weather or destroyed through physical abuse beyond the control of the contractor.) After acceptance of the work, the Owner shall assume responsibility for watering and mowing as per schedule established in ITEM 1.1 C.3. (Above).

3.6 Timing of Planting: The contractor should not attempt planting under unfavorable weather conditions, although to do so is a full option of the general contractor who shall assume full responsibility.

END OF SECTION 32 92 23

SECTION 331000 - WATER DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Site water piping and fittings including domestic potable waterline and fire protection system supply waterline, valves, and fire hydrants.

B. Related Requirements:

1. Section 02300 – Earthwork: Trenching, backfill, and compaction for utilities.

C. NOTE: All water system items considered part of the proposed Public Water system, noted by call out on the plans or by virtue of being located in an existing or proposed public servitude, shall conform to the requirements and specifications found in Appendix A to this Section 331000.

1.2 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

B. American Society of Mechanical Engineers (ASME):

1. ASME B 16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

C. ASTM International (ASTM):

1. ASTM B88 - Seamless Copper Water Tube.
2. ASTM D1784 - Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
3. ASTM D2241 - Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR-Series).
4. ASTM D2564 - Poly (Vinyl Chloride) (PVC) Solvent Cement.
5. ASTM D2672 - Poly (Vinyl Chloride) (PVC) Integrally Molded Bell Ends For Solvent - Cemented Pipe Joints.
6. ASTM D3139 - Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals.
7. ASTM F477 - Elastomeric Gaskets And Lubricant.
8. ASTM F656 - Poly (Vinyl Chloride) (PVC) Cement Primer.

D. American Water Works Association (AWWA):

1. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
2. AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and other Liquids.
3. AWWA C116 - Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings for Watersupply Service.
4. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids.
5. AWWA C153 - Ductile-Iron Compact Fittings for Water Service.
6. AWWA C504 - Rubber-Seated Butterfly Valves.
7. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service.
8. AWWA C550 - Protective Interior Coatings for Valves And Hydrants.
9. AWWA C600 - Installation of Ductile-Iron Water Mains and Appurtenances.
10. AWWA C605 - Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.
11. AWWA C651 - Disinfecting Water Mains.
12. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inches Through 12 Inches, for Water Distribution.

E. National Fire Protection Association (NFPA):

1. NFPA 24 – Installation of Private Fire Service Mains and Their Appurtenances

1.3 SUBMITTALS

- A. **Submit manufacturer information on all pipe, fittings, seals, etc. that will be used for the installation of the system.**
- B. **Furnish 1 copy of results of meter test and hydrostatic pressure test to Owner, Civil Engineer of Record, and utility company upon completion of water distribution backfilling operations.**
- C. **Project Record Documents:**
 1. Disinfection report: Record the following:
 - a. Type and form of disinfectant used.
 - b. Date and time disinfectant injection start and time of completion.
 - c. Test locations.
 - d. Initial and 24 hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
 - e. Date and time of flushing start and completion.
 - f. Disinfectant residual after flushing in ppm for each outlet tested.
 2. Bacteriological report: Record the following:
 - a. Date issued, project name, testing laboratory name, address, and telephone number.
 - b. Time and date of water sample collection.
 - c. Name of person collecting samples.
 - d. Test locations.
 - e. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
 - f. Coliform bacteria test results for each outlet tested.
 - g. Certification that water conforms, or fails to conform, to bacterial standards.
 - h. Bacteriologist's signature and authority.
 3. Accurately record actual locations of piping mains, valves, connections, and top of pipe elevations.
 4. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.

PART 2 - PRODUCTS

2.1 PIPE

- A. **Pipe sizes 3-inches and smaller for installation below grade and outside building shall comply with one or combination of following:**
 1. Seamless Copper Tubing: Type "K" soft copper, ASTM B88.
 - a. Fittings: Wrought copper (95-5 Tin Antimony solder joint), ASME B 16.22.
 2. Polyvinyl Chloride (PVC) Water Pipe: Pipe, ASTM D 2241, with SDR 21 rating, continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM D1784 material classification.
 - a. Pipe joints: Integrally molded bell ends, ASTM D2672.
 - b. Cement primer: ASTM F656.
 - c. Solvent cement: ASTM D2564.
- B. **Pipe sizes 4 to 16 inches for installation below grade and outside building shall comply with one or combination of following:**
 1. Ductile Iron Water Pipe: AWWA C151, Pressure class 350 (4-12") Pressure Class 250 (14-16").
 - a. Fittings: Either mechanical joint or push-on joint, AWWA C153, and shall be coated with a 6-8 mil nominal thickness fusion bonded epoxy conforming to the requirements of AWWA C550 and C116, or cement mortar lined in accordance with AWWA C104.
 - b. Elastomeric gaskets and lubricant: ASTM F477.
 2. Polyvinyl Chloride (PVC) Water Pipe: Pipe, AWWA C900, rated DR 18 (Class 150), continually marked as required.
 - a. Elastomeric gaskets and lubricant: ASTM F477 for smaller pipes.

- b. Pipe joints: Integrally molded bell ends, ASTM D3139.

2.2 VALVES

A. Gate Valves, 2-Inches and Larger:

1. Manufacturer and Model: Mueller Resilient Wedge Gate Valves or approved equal.
2. AWWA C509, iron body, non-rising stem with square nut, single wedge, resilient seat, flanged or mechanical joint ends, control rod, post indicator where indicated on Construction Drawings, extension box and valve key.

B. Ball Valves, 2-Inches and Smaller:

1. Manufacturer and Model: Mueller Oriseal or approved equal.
2. Brass body, teflon coated brass ball, rubber seats and stem seals, Tee stem pre-drilled for control rod, AWWA compression inlet end, compression outlet with electrical ground connector, with control rod, extension box and valve key.

C. Butterfly Valves, From 2-Inch to 24-Inch: AWWA C504, Iron body, bronze disc, resilient replaceable seat, water or lug ends, infinite position lever handle.

D. Check Valves, Post Indicator Valves, And Backflow Preventers: Refer to Section 13900 - Fire Suppression.

E. Mark manufacturer's name and pressure rating on valve body.

2.3 FIRE HYDRANTS

A. Fire Hydrants: Type as required by utility company/Local Fire Department and as shown on Construction Drawings.

B. Hydrant Extensions: Fabricate in multiples of 6-inches with rod and coupling to increase barrel length.

C. Hose and Steamer Connections: Match sizes with utility company, with two hose nozzles, one pumper nozzle.

D. Finish: Apply primer and 2 coats of enamel or special coating to color as required by utility company.

2.4 ACCESSORIES

A. Thrust Blocking: Place 2500 psi concrete to provide sufficient bearing area to transmit unbalanced thrust from bends, tees, caps, or plugs to undisturbed soil without loading undisturbed soil in excess of 2,500 pounds per square foot when water main pressure is 100 psi.

MINIMUM THRUST BLOCKING BEARING AREAS

Pipe Diameter	Tees Sq. Ft	90° Bend Sq. Ft	45° Bend Sq. Ft	22½° Bend Sq. Ft.	11¼° Bend Sq. Ft.	5 5/8 Bend Sq. Ft.	Cap/Plug Sq. Ft.
3"	1.0	1.0	1.0	1.0	1.0	1.0	1.5
4"	1.0	1.0	1.0	1.0	1.0	1.0	2.0
6"	1.5	2.0	1.0	1.0	1.0	1.0	3.0
8"	2.5	3.5	1.8	1.0	1.0	1.0	4.0
10"	4.0	5.5	2.8	1.5	1.0	1.0	6.0
12"	6.0	8.0	4.0	2.0	1.5	1.0	8.5
14"	8.0	11.0	5.5	3.0	2.0	1.5	12.0
16"	10.0	14.2	7.0	4.0	3.0	2.5	15.0
18"	21.0	21.0	12.0	6.0	4.0	3.5	24.0

B. Locked mechanical joint fittings shall be installed where vertical changes in direction are required and, if approved by Owner and governing authority, can be installed in lieu of above thrust blocking requirements.

- C. **Polyethylene Encasement:** Single layer of two ply cross-laminated high density polyethylene encasement per AWWA C105, Section 4.1.2, Type III, Class C (Black), Grade 33, tensile strength 5,000 psi minimum, elongation 100 percent, thickness nominal 0.004 inch (4 mil).
- D. **Trace Wire:** Magnetic detectable conductor, (#12 Copper) brightly colored plastic covering imprinted with “Water Service” in large letters.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. **Verify that building service connection and municipal utility water main size, location, and depth are as indicated on Construction Drawings.**

3.2 PREPARATION

- A. **Ream pipe and tube ends and remove burrs.**
- B. **Remove scale and dirt, on inside and outside, before assembly.**
- C. **Prepare pipe for connections to equipment with flanges or unions.**
- D. **Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by licensed land surveyor and replaced, as necessary, by same.**

3.3 TRENCHING AND BEDDING

- A. **Excavate pipe trench and place bedding material in accordance with Section 02300.**

3.4 INSTALLATION – GENERAL

- A. **Perform installation in accordance with utility company or municipality requirements which shall take precedence over requirements stated herein when difference exists.**

3.5 INSTALLATION - PIPE AND FITTINGS

- A. **Maintain separation of water main from sanitary and storm sewer piping in accordance with state or local codes.**
- B. **Install ductile iron pipe and fittings in accordance with AWWA C600.**
- C. **Install PVC pipe and fittings in accordance with AWWA C605.**
- D. **Ductile iron pipe and fittings shall be installed with polyethylene encasement around the pipe for the entire length of the project except where water main is within steel casing or is concrete encased. Install polyethylene encasement in accordance with AWWA C105, Method A.**
- E. **Install pipe to allow for expansion and contraction without stressing pipe or joints or as specified by pipe manufacturer.**
- F. **Install access fittings in accordance with local codes to permit disinfection of water system performed under this Section.**

- G. **Connections with Existing Pipelines:** Where connections are made between new work and existing piping, make connection using suitable fittings for conditions encountered. Make each connection with existing pipe at time and under conditions with least interference with operation of existing pipeline and in compliance with local utility company.
- H. **Form and place concrete for thrust blocks or other specified methods of retainage at each change of direction or end of pipe main.**
- I. **Place pipe to depth in accordance with Section 02300.**
- J. **Backfill trench in accordance with Section 02300.**
- K. **Install trace wire continuous over top of non-metal pipe. Bury a minimum of 6 inches below finish grade, and above pipeline.**

3.6 INSTALLATION - VALVES AND HYDRANTS

- A. **Install gate valves as indicated on Construction Drawings. Support valve on concrete pads with valve stem vertical and plumb. Install valve boxes in manner that will not transmit loads, stress, or shock to valve body. Center valve box over operating nut of valve vertical and plumb. Securely fit valve box together leaving cover flush with finished surface.**
- B. **Install fire hydrant assemblies as indicated on Construction Drawings in vertical and plumb position with steamer/pumper nozzle pointed perpendicular to traffic where hydrant is adjacent to street, roadway, or parking lot drive or toward protected building unless otherwise directed by local authorities. Support hydrant assembly on concrete pad and firmly brace on side opposite inlet pipe against undisturbed soil and concrete blocking. Place minimum of 6-cubic feet of crushed stone or gravel around hydrant base and barrel after thrust blocking has cured at least 24 hours. Maintain vertical position of hydrant backfilling and compacting.**

3.7 FLUSHING OF PIPING

- A. **Thoroughly flush underground piping from the water supply to the system riser, and lead-in connections to the system riser, before the connection is made to downstream fire protection system piping. Continue flushing for sufficient time to ensure thorough cleaning.**
- B. **The minimum rate of flow shall be not less than one of the following:**
 - 1. 1,560 GPM for 8 in. piping; 2,440 GPM for 10 in. piping; and 3,520 GPM for 12 in. piping.
 - 2. Maximum flow rate available to the system under fire conditions.
 - 3. When supply cannot produce stipulated flow rates, obtain maximum available.

3.8 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. **Perform disinfection of potable lines in accordance with AWWA C651.**
- B. **Disinfect distribution system with chlorine before acceptance for domestic operation. Chlorine dosage shall be not less than 50 parts per million. Flush lines before introduction of chlorinating materials and after contact period of not less than 24 hours. Flush with clean water after contact period until residual chlorine content is not greater than 1.0 part per million. Flush water discharged from water supply lines or hydrants shall not be allowed to discharge directly onto exposed soil or turf which could result in erosion of soil. If potential for erosion exists at discharge point, measures shall be taken to prevent erosion. Open and close valves in lines being disinfected several times during contact period. After disinfection, take water sample and bacteriological test in accordance with AWWA C651. Do not place distribution system in service until approval is obtained from local governing authorities.**

- C. **Provide a means of neutralizing the super-chlorinated water before releasing into the environment. This may be accomplished by either a method of dechlorinization, direct release into a detention area approved by Wal-Mart, or any method acceptable to federal, state, and local codes. Direct release to open ground shall not be allowed, unless contained within an onsite detention facility with 6" permanent storage. In this case, the Contractor shall time the release to assure that no rainstorms are imminent. The intent of this condition is to allow the majority of the chlorine to evaporate into the atmosphere before a rainstorm has the opportunity to wash the residual downstream. Contractor shall not release super-chlorinated water directly into the sanitary sewer system, private or public, nor any storm drain system not directly discharging into the detention facility.**

3.9 SERVICE CONNECTIONS

- A. **Provide water service connection in compliance with utility company requirements including reduced pressure backflow preventer (if required) and water meter with by-pass valves and sand strainer.**

3.10 FIELD QUALITY CONTROL

- A. **Test water distribution system pipe installed below grade and outside building in accordance with the following procedures:**
 - 1. Perform testing of pipe materials, joints, and other materials incorporated into construction of water mains and force mains to determine leakage and water tightness. In the event state or local code requires more stringent test, more stringent test shall take precedence.
 - 2. Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water. Hydrostatically test at 200 psi, or 50 psi in excess of the system working pressure, whichever is greater, and shall maintain that pressure at +/- 5 psi for 2 hours. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage shall be 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.
- B. **Prepare reports of testing activities.**

END SECTION