TECHNICAL SPECIFICATIONS

FOR

New County Work Building
J. Lee Vause Park
Leon County, Florida

LEON COUNTY PUBLIC WORKS DEPARTMENT
ENGINEERING SERVICES DIVISION

Provided by:

Civil Engineering:	**McCarthy and Associates, a Division of Pennoni**
Architectural:	**Workshop 131, Inc.**
Structural Engineering:	**McCarthy and Associates, a Division of Pennoni**
Mechanical Engineering:	**McGinniss & Fleming Engineering, Inc.**
Plumbing Engineering:	**McGinniss & Fleming Engineering, Inc.**
Electrical Engineering:	**McGinniss & Fleming Engineering, Inc.**

W. BRICK ROSENBAUM LICENSE No 31301 STATE OF FLORIDA PROFESSIONAL ENGINEER

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NEW COUNTY WORK BUILDING

J. LEE VAUSE PARK

LEON COUNTY, FLORIDA

SPECIFICATIONS

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June 10, 2019

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SECTION 031000

CONCRETE FORMWORK

PART 1 - GENERAL

1.01 DESIGN FORMWORK

A. Assume all responsibility for the design and engineering of the formwork, as well as its construction and removal.

B. Design formwork for the loads, lateral pressure, and allowable stresses outlined in Chapter 2, Guide to Formwork for Concrete", ACI 347, latest edition.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Facing Materials shall be such as to provide the specified surface finish.

B. Form Coating shall be a field applied chemical concrete release agent capable of preventing bond between poured concrete and the form and shall contain no oil, or shall be factory applied non-absorptive liner. Coat form before reinforcement is placed.

C. Form Ties shall be broken back at 1-inch from surface of concrete. Tie Cones, 1-inch diameter by 1-inch long, shall be used on all exposed concrete.

D. Pre-molded Expansion Joint material (E.J.) shall conform to ASTM D1751, "Preformed Expansion Joint Fillers for Concrete Paving and Structural Concrete (non-extruding and resilient bituminous types)".

2.02 FABRICATION

A. Construct formwork so that concrete surfaces will conform to the tolerance limits specified in Table 4.3.1, "Tolerances for Formed Surfaces", ACI 301, latest edition.

B. Provide positive means of adjustment (wedges or jacks) of shores and struts to compensate for anticipated deflections and settlement in the Formwork during concrete placing operations.

PART 3 - EXECUTION

3.01 ERECTION OF FORMS

A. Build forms tight to prevent loss of mortar from the concrete.

B. Provide clean-out openings at base of pier and wall forms to facilitate cleaning and observation immediately before concrete is placed.

C. Unless shown otherwise on drawings, corners of concrete members exposed to view after all other finish materials are in place shall be beveled using chamfer strips (maximum ½-inch across the beveled face) placed in the forms. Submit sample for approval before proceeding.

D. Overlap and hold forms against hardened concrete of a previous placement to prevent offsets or loss of mortar at the construction joint and to maintain a true surface.

3.02 INSTALLATION OF EMBEDDED ITEMS

A. Install inserts and materials to be cast into concrete.

B. Set 1-inch deep 24-gage galvanized iron wall slots in all concrete surfaces adjacent to brick or block masonry. Slots shall be set vertical in concrete surfaces and spaced 16-inches on center horizontally. Provide masonry anchors spaced 16-inches on center vertically in each wall slot.

C. Separate parallel runs of conduit by not less than 1-inch. Do not displace reinforcing bars from positions. No conduit shall be greater than ½ slab thickness. Bury conduit in slabs.

D. Install Adjustable Wedge Inserts at 32-inches on center in concrete for shelf angles.

3.03 REMOVAL OF FORMS

A. Horizontal member forms used to support the weight of concrete of structural members shall remain in place until the concrete has gained not less than 2/3 of the specified 28-day strength, or a minimum of 7 days.

B. Vertical member forms and forms not supporting the weight of concrete shall not be removed in less than 24 hours.

END.

SECTION 032000

CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 SUBMITTALS

A. Submit six copies of shop drawings for the fabrication and placing of reinforcing steel for approval, after being checked and approved by the contractor and before proceeding. Any changes by contractor or Fabricator of contract document details, materials, member sizes, or reinforcement shall be "flagged" on shop drawings accompanied by a written request for authorization and reason for requested change.

B. Placing plans shall show all dimensions, details, notes, locations, sizes, lengths and each bar mark together with accessories and material belonging to the reinforcing for the concrete.

C. Schedules shall show all information and be of the same form as those on the contract drawings.

D. Concrete wall reinforcing shall be shown in elevation.

E. Detail all reinforcing steel in accordance with the “ACI Detailing Manual”, ACI Publication SP-66, latest edition, unless otherwise indicated on the drawings.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Reinforcement shall be fabricated from ASTM A615 "Deformed Billet-Steel Bars for Concrete Reinforcement", Grade 60.

B. Reinforcement to be welded shall be fabricated from ASTM A706 "Low Alloy Steel Deformed Bars for Concrete, Grade 60.

C. Welded smooth wire fabric (WWF) shall conform to "Specifications for Welded Steel Wire Fabric for Concrete Reinforcement", ASTM A185, and shall be fabricated from plain wire conforming to "Specifications for Cold-Drawn Steel Wire for Concrete Reinforcement", ASTM A82.

D. Wire bar supports shall conform to the National Bureau of Standards PS7, "Wire Bar Supports for Reinforced Concrete Construction".

2.02 FABRICATION

A. All hooks shall be bent using the pin diameters and dimensions as "ACI Standard Hooks" in the "Manual of Standard Practice for Reinforced Concrete Construction", CRSI latest edition, unless otherwise shown on the plans.

B. Reinforcing bars shall not be bent or straightened in a manner that will injure the materials.

C. Reinforcing bars shall conform to the dimensions shown on the plans and within the fabricating tolerances as shown in the "Manual of Standard Practices for Reinforced Concrete Construction", CRSI latest edition.

PART 3 - EXECUTION

3.01 PLACEMENT/BAR REINFORCEMENT

A. Bar reinforcement shall be placed in specified positions in the forms and held in place, before and during the placing of concrete by means of bar supports, to carry the reinforcing bars they support within the following tolerances from the positions shown on the drawings or specified herein:

1. For clear concrete protection and for depth "d" in Flexural members, walls, and compression members where "d" is:
   a. 8 inches or less - plus or minus 1/4"
   b. More than 8 inches but less than 24 inches - plus or minus ½ ", but the cover shall not be reduced by more than one-half of the specified cover.

2. For longitudinal location of bends and ends of bars:
   a. +2 inches except at discontinuous ends of members where tolerance shall be +1/2 inch.
3. For spacing:
   a. +2 inches except that total number of bars shall not be reduced.

B. Except as shown otherwise on structural drawings, concrete cover for Reinforcing Bars shall be as follows:
   1. Cast against and permanently exposed to earth. - 3 inches
   2. Exposed to earth or weather – 2 inches
   3. Interior formed surfaces:
      a. Piers and Columns - 1½ inches
      b. Beams - 1½ inches
      c. Walls - ¾ inch
      d. Slabs & Joists - ¾ inch

C. "Continuous" bars, unless otherwise indicated on drawings, shall be lapped 36 diameters at splices (48 diameters when bars are used in reinforced masonry). Provide corner bars to match primary reinforcing at all corner conditions, including continuous wall footings and grade beams.

D. Splices not shown in contract documents shall be subject to approval.

E. Support all reinforcing bars.

F. Space bar supports a maximum of 4-feet on center with the first support not greater than 2-feet from the ends of the bars. Tie to prevent displacement during the concreting operations. Provide #4 support bars at 48-inches spacing where not supported by perpendicular reinforcement.

G. Reinforcement shall not be "field" bent after being embedded in hardened concrete except where specifically shown on the drawings.

H. Set and hold all vertical dowels in footings by template.

3.02 WELDING REINFORCEMENT

A. The welding of reinforcing bars will be permitted only on approval on the shop drawings by the Architect.

B. The welding of reinforcing bars at intersections for support purposes, in lieu of tie wire, is prohibited.

C. The welding of reinforcing bars shall be performed in accordance with "Recommended Practices for Welding Reinforcing Steel, Metal Inserts and Connections for Reinforced Concrete Construction", AWS D 12.1-latest edition, as published by the American Welding Society.

D. Welders shall be qualified by tests as prescribed in the "Standard Qualification Procedures, "AWS B 3.0, latest edition, as published by the American Welding Society.

END.

SECTION 033000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 RESPONSIBILITY AND QUALIFICATIONS

A. Assume all responsibility for the work, design and engineering of the formwork and the safe support of property adjacent to the work.

B. Work shall be done by one qualified to install the concrete work in accordance with the drawings and specifications. Minimum requirement for qualification shall be five years' experience with satisfactory completion of at least five similar projects.

C. Contractor shall obtain and pay for the services of a Qualified Testing Laboratory to sample and test concrete as specified in this SECTION and on the drawings.

1.02 SUBMITTALS

A. Submit shop drawings for the fabrication and placing of reinforcing steel after being checked and approved by the Contractor and before proceeding. Submit no "Approved as Corrected" drawings for approval.

B. Design and submit mix design series along with test data from laboratory or field experience corresponding to the same mix design.

1. Concrete shall have 28 day compressive strength as indicated on the Structural drawings.

C. Test reports shall show the requirements of ASTM Specifications.

D. Shop drawings shall be submitted in complete sets of a major area of work, with sheets consecutively numbered.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Formwork: See Section 031000.

B. Reinforcement: See Section 032000.

C. Welded Fabric: See Section 032000.

D. Bar Supports: Section 032000.

E. Portland Cement: A domestic brand approved by the Architect for color and conforming to the requirements of ASTM C150, low alkali, Type I or Type III.

F. Fine Aggregate: Conform to ASTM C33 except that the fineness modules shall be not less than 2.1 nor more than 3.1 and the gradation shall be as specified herein below:

Sieve No.	3/8	#4	#8	#16	#30	#50	#100
Total % Passing (By Weight)	100	95-100	80-100	50-85	25-60	10-30	2-10

G. Coarse Aggregate: Crushed stone or gravel and shall conform to ASTM C33. Size of coarse aggregate shall be as specified herein below:

1. Size #67: (3/4 inch to #4) - for Sections 4" thick and greater.
2. Size #7: (½ inch to #4) - for Sections less than 4" thick

H. Water used in mixing concrete shall be clean and fit to drink.

I. Admixtures:

1. Air Entraining Admixtures: Conform to the requirements of ASTM C260 and shall contain no chloride. Air Entraining shall not be used for interior slabs receiving troweled finishes. Submit certification for approval.
2. Retarding Admixtures: Contain no chloride, shall be free of organic acids or salts of organic acids, shall be compatible with the air entraining admixture to be used and shall conform to the requirements of ASTM C494, Type B. Submit certification for approval.
3. Water-Reducing Admixtures: Contain no chloride, shall be free of organic

acids, or salts of organic acids, shall be compatible with the air entraining admixture to be used and shall conform to the requirements of ASTM C494, Type A, water-reducing normal-setting admixture and, ASTM C494, Type D, water-reducing and retarding admixture. Submit certification for approval.

4. Water-Reducing, High Range (WRHR) Admixtures: Shall contain no chloride, shall be free of organic acids or salts of organic acids, shall be compatible with the air entraining admixture to be used, and shall conform to the requirements of ASTM C494, Type F or G. Submit certification for approval.
5. High, early strength accelerating, water-reducing admixture: contains no chloride, shall be free of organic acids, shall be compatible with air-entraining admixtures to be used and shall conform to the requirements of ASTM C494, Type C or F. Submit certification for approval.
6. Provide technical field service during initial pours at no cost to the Owner by one experienced in the adjustment of concrete mixes for the particular admixtures being used.

J. Water proof Curing Paper: Conform to ASTM C171.

K. Curing Compound: Contain no wax or varnish. Conform to ASTM C309, Type I, and Filor by West Chemical Products, Inc., Kure-N-Seal by Sonneborn-Contech, Inc., Clear Bond by Guardian Chemical Corp., Mr. Klear Seal by Castle Chemical Company, or Sealtight CS-309.

L. Expansion Joint Material in the Building: Nonextruding and resilient non-bituminous type conforming to ASTM D1752, Type II.

M. Dovetail Anchor Slots for Brick and Block Against Concrete: 1" x 1" 24 gage galvanized steel with drip type corrugated 16 gage galvanized steel anchors, Hohmann and Barnard, Inc., No. 305 with No. 303 anchor, Richmond Screw Anchor Co., Inc., No. 051F with 020 anchor, or Hackman Building Products No. 100 with No. 108 anchors.

2.02 PROPORTIONING

A. Proportion ingredients for each class of concrete by weight when the slump is the maximum permitted to produce an average compressive strength at 28 days which exceeds the specified compressive strength in accordance with Chapter 5, Section 5.3 of the Building Code Requirements for Reinforced Concrete (ACI-318-95).

B. Air content of freshly mixed, air entrained concrete as determined by the method of ASTM C 173 shall be 5%. A field tolerance of 1%+ is acceptable. All exterior concrete, exposed to the weather, shall be air entrained. Interior concrete shall not be air entrained.

C. Water-reducing admixture shall be used in all concrete to reduce the total water requirement per cubic yard of concrete without loss of workability, and produce an increased strength proportional to the water/cement ratio. During ambient temperatures of 75 F or below use normal setting, water-reducing admixture meeting ASTM C484, Type A. During ambient temperatures of 75 F and above use set-retarding, water-reducing admixture meeting ASTM C494, Type B and Type D. During ambient temperatures of 60 F and below use a high, early strength accelerating water-reducing admixture meeting ASTM C494, Type C and Type E.

D. The mixes shall be designed to secure concrete having the following consistency range in slump:

Type of Construction	Slump Range (Inches)
Reinforced Foundations	2-3
Elevated, Structural Slabs	2-4
Sidewalks, Driveways & Slabs-on-Grade	2-4

2.03 BATCHING AND MIXING

A. Measure cement by weight on a scale separate from those used for other materials. Cement may be measured in bags of standard weight of 94 pounds; however, no fraction of a bag shall be used in any batch.

B. Measure aggregates by weight. Batch weights shall be based on saturated surface dry materials corrected for the actual moisture condition of the aggregate.

C. Measure water by volume or by weight by devices not subject to variation due to variable pressure in the water supply line. Measuring tanks shall be provided with means for checking their calibration.

D. Devices for measuring quantities of cement, aggregates, water and admixtures shall be accurate within 1% under operating condition.

E. Furnish delivery ticket for each batch of concrete before unloading at the site. Weights of fine and coarse aggregate, amount of cement, and total water as batches shall be printed on ticket by an automatic printing device or shall be recorded and initialed by an employee of the Contractor stationed at the batch plant. Delivery ticket shall, in addition, include the following:

1. Name of batch plant.
2. Serial number of ticket.
3. Date and truck number.
4. Name of contractor.
5. Job name and location.
6. Class of concrete and slump.
7. Cubic yards of concrete.
8. Time loaded.
9. Amount water added at job.
10. Initials of job superintendent.

F. Ready-mixed concrete shall be produced and delivered in accordance with the requirements of ASTM C94.

PART 3 - EXECUTION

3.01 RESHORING

A. Concrete elements shall not be permitted to deflect or accept load during form stripping.

B. After forms are removed, slabs, beams and girders over ten feet in span and cantilevers over four feet shall be reshored for the remainder of the 28-day period. Concrete elements shall not be permitted to deflect or accept load during reshoring operations.

C. Reshoring operations shall be performed so that existing concrete members are not subject to overloads, eccentric loading, or reverse bending.

D. Reshoring elements shall have the same capabilities as original shoring and shall be wedged to provide solid bearing and support. Bracing shall be provided.

3.02 PLACING CONCRETE

A. Give the Architect 48 hours advance notice before placing concrete in any portion of the structure to permit inspection of the forms and reinforcement. Embedded items of whatever nature shall be in place prior to inspection. An authorization of the Architect shall be secured before concrete is placed.

B. Remove water and debris from forms before depositing concrete.

C. Clean reinforcement and forms coated with foreign material or with concrete from previous placing operations before depositing concrete.

D. Place concrete not later than 1-1/2 hours after mixing. Mix temperature shall not exceed 90 F at time of placing.

E. Construction joints shall be keyed and bulkheaded vertically and located at the center of span.

F. Internal type mechanical vibrators and hand spading shall be used to consolidate the concrete.

G. Concrete shall not be placed within twenty-five feet of workmen placing or securing reinforcement.
H. Place no concrete when the atmospheric temperature is below 35 F. After the concrete has been placed, if the temperature drops below 35 F, conform to paragraph 3.06, Curing and Protection.

3.03 FINISHING FORMED SURFACES
A. Rough form finish shall be confined to all concrete surfaces not exposed to public view. After removal of forms, tie holes and defects shall be patched. Fins exceeding 1/4" in height shall be chipped off or rubbed off. Otherwise, surfaces shall be left with the texture imported by the forms.
B. Smooth form finish shall be used for all concrete surfaces exposed to public view. Form facing material shall produce a smooth, hard, uniform texture on the concrete. Form material with raised grain, torn surfaces, worn edges, patches, or dents which will impair the textures of the concrete surface shall not be used. Tie holes and defects shall be patched. All fins shall be removed.

3.04 REPAIR OF DEFECTS
A. Inspection by the Architect shall determine whether work is acceptable; and, if repairable, the method of repair to be used. Defects in materials and workmanship shall be subject to the above inspection at all times during the progress of the work regardless of previous inspections.
B. Condemned work shall consist of any concrete work which cannot be repaired. Condemned work shall be removed and replaced, at the Contractor's expense, with work that will conform to the contract documents.
C. Repair surface defects which are ½ inch or less in depth including tie holes by patching the same working day the forms are removed. Cut back defect at 90 degrees to the surface to sound concrete and at least 1" without feather edges. After soaking with water, pack a stiff mortar in the defect. In exposed concrete the mortar mix shall be determined by trial method using a mixture of white and grey portland cement to produce the described color. After mortar has attained its initial set, the patch shall be scraped or rubbed flush with the concrete and match the color and texture of the adjoining surface.

3.05 SLABS
A. Edge forms and intermediate screed strips shall be set to produce the designated elevations and contours of the finished surface. As a minimum, maintain the concrete thicknesses shown on the drawings.
B. Insure that termite treatment shall have been completed before installing vapor barrier. Install vapor barrier with 6" laps sealed with the manufacturer's recommended sealing compound.
C. Place and consolidate concrete to produce a surface within tolerances. Test for grade (or level) and correct by removing excess or adding and compacting additional concrete. These operations must be performed before bleeding water has an opportunity to collect on the surface.
D. Where metal forms are used at joints, the edge of the form shall be flush with the surface of the concrete. Where saw-cut joints are specified herein, cutting shall be started as soon as the concrete has hardened to prevent aggregates being dislodged by the saw, and shall be completed before shrinkage stresses become sufficient to produce cracking.
E. Scratched finish shall be applied to surfaces intended to receive bonded applied cementitious applications. Depress slabs as specified for applied finish. All pitches to drains shall be made in the concrete slab and not the setting bed. Level to a Class C tolerance and roughen surface with stiff brushes or rakes before final set. Before the concrete has fully hardened remove laitance and loose aggregate from the surface.

F. Troweled finish shall be applied to floors intended as walking surfaces or to receive contact floor coverings. Surface shall first be float-finished as specified above. It shall next be power troweled, and finally hand troweled. Final troweling shall be complete when a ringing sound is produced as the trowel is moved over the surface. The finished surface shall be free of trowel marks, uniform in texture and appearance, and shall be planed to a Class A tolerance, except tolerance for concrete on metal deck shall be Class B. Any defects of sufficient magnitude to show through floor covering shall be removed by grinding or patching.

G. Tolerance for finish surfaces shall be determined by a straight edge placed anywhere on the surface in any direction and shall be true planes within the following limitations:
   1. Class A - 1/8 inch in 10 feet;
   2. Class B - 1/4 inch in 10 feet;
   3. Class C - 1/4 inch in 2 feet.

3.06 CURING AND PROTECTION

A. Immediately after placement, concrete shall be protected from premature drying, temperatures above or below the range recommended in ACI 305R, latest edition and 306R, latest edition and mechanical injury.

B. Cure all surfaces for a period of 7 days and until average compressive strength has reached 70% of specified strength. Curing shall be by ponding, moist curing with sand or absorptive mats kept continuously wet, continuous application of steam (not exceeding 105 F) or mist spray, waterproof curing paper or liquid membrane forming curing compound. Selection of curing method shall be compatible with the finish to be applied to the concrete surface.

C. Use curing compound directly from the container without dilution and apply not later than one hour after final finishing in one coat at a coverage not to exceed 200 S.F. per gallon for surfaces with a "floated" or "broom" finish, or 300 S.F. per gallon for surfaces with a "troweled" finish. Submit engineering testing laboratory certification for approval. Do not use curing compound on surfaces to receive mortar beds for tile work.

D. Cold weather protection shall be in accordance with recommended practices of ACI 306R, latest edition. Whenever the mean daily outdoor temperature is less than 40 F, the temperature of the concrete shall be maintained between 50 F and 70 F for the curing period.

E. Hot weather protection shall be in accordance with ACI 305R, latest edition. When the anticipated ambient air temperature exceeds 80 F during placing or finishing operations, a retarding admixture shall be used in the mix to retard the setting time of the concrete.

3.07 CONTRACTOR DUTIES IN TESTING

A. Contractor shall submit to the Engineer the concrete mix designs proposed for use with a written request for review. Submittal shall include the results of all testing performed to qualify the materials and to establish the mix designs. Place no concrete in the work until mix design has been reviewed.

B. Contractor shall sample, mould, initially cure, and transport to the laboratory the acceptance test specimens for testing. During the first 24 hours after moulding he shall provide means for maintaining the temperature immediately adjacent to the specimens within the range of 60 F to 80 F and prevent loss of moisture from the specimens. After the initial curing period the acceptance test specimens shall be transported in a damp condition to the laboratory in a manner to prevent damage to the specimens. Include information for reporting of test data.
   1. Slump and air content shall be determined at the beginning of each day's pour and for each batch of concrete sampled for compressive strength tests. Make corrections to the mix if slump, unit weight, or air content are not within the specified tolerances. Slump and air content shall be determined by ASTM C143 and ASTM C173 respectively.

2. Make sets of four acceptance cylinders for strength testing for each 50 yards of concrete or fraction thereof for each class and strength for each day's concreting which shall be moulded from concrete samples taken at random over the duration of the pour.
3. Samples of concrete for strength testing shall be representative of the concrete in-place in the structure and shall not be taken from the first one-third of the concrete of the ready-mix truck. **No water shall be added to the concrete after samples of concrete for strength testing have been secured.**
4. Acceptance test cylinders shall be molded and cured in accordance with ASTM C31 from concrete samples in accordance with ASTM C172.
5. Provide designated testing laboratory with all field data specified to be included on concrete test reports in paragraph 3.08.
6. Field sampling and testing shall be performed by ACI Certified Technicians.

3.08 LABORATORY DUTIES IN TESTING

A. Designated testing laboratory shall perform all operations of testing materials, concrete and verifying mix designs.
B. Concrete test reports shall include the following:
   1. Class and strength concrete.
   2. Slump.
   3. Air content.
   4. Temperature of concrete mix at time of placement.
   5. Date and time of moulding.
   6. Date and age of test specimens.
   7. Location of concrete in the structure.
   8. Delivery ticket serial numbers.
C. Furnish five (5) copies of all test reports to the Architect.
D. Designated testing laboratory shall be selected and paid by the Owner.

3.09 STRENGTH TESTING AND EVALUATION

A. For each set of acceptance test cylinders, one cylinder shall be broken at the age of 7 days for information and two cylinders shall be broken at the age of 28 days for acceptance. The remaining cylinder shall be held by the laboratory for 120 days for use as a verification cylinder if required. Test in accordance with ASTM C39, latest edition.
B. Concrete shall be considered "Questionable Concrete" where any of the following test evaluations occur:
   1. Individual test strength is more than 500 psi below specified strength; or
   2. Average of any three consecutive strength tests are less than specified strength; or
   3. Individual test strength is less than specified strength and the concrete represented by the test is for concrete for a "critical" area of the structure. Critical areas of the structure are those areas which, in the opinion of the Architect, are critical to the structural stability of the structure as a whole.

3.10 QUESTIONABLE CONCRETE

A. Core tests shall be made at no cost to the government, and as directed by the Architect. If core tests fail to demonstrate the test strength required by the contract documents, or if they are impractical to obtain, and structural analysis does not confirm the safety of the structure, the Architect may, at his discretion, condemn the work or require load tests or additional construction. Should structural analysis confirm the safety of the structure, the Architect may, at his discretion, accept the questionable concrete in accordance with the Article of the General Conditions for the Acceptance of Defective Non-Conforming Work.
B. The Contractor shall pay all costs incurred in providing the additional testing or analysis to resolve the acceptability of questionable concrete.
C. The term "Building Official" in ACI Building Code 318 shall be deemed to mean, and

does mean, the Architect.

3.11 CORE TESTS

A. Three representative cores shall be taken from each member or area of concrete for each test considered "questionable". Location of cores shall be as directed by the Architect to least impair the strength of the structure. Damaged cores shall be replaced.

B. Cores shall be obtained and tested in accordance with ASTM C42, latest edition except that if concrete in the structure will be dry under service conditions, the cores shall be air dried (temperature 60 F to 80 F, and relative humidity less than 60%) for 7 days before test and shall be tested dry. If the concrete in the structure will be more than superficially wet under service conditions, the cores shall be immersed in water for at least 48 hours and tested wet.

C. Concrete in the questionable area will be considered structurally acceptable if the average of the cores is equal to or greater than 90% of the specified strength and no single core is more than 500 psi below specified strength.

3.12 LOAD TESTS AND ADDITIONAL CONSTRUCTION

A. Load tests shall be applied and their results evaluated in accordance with Chapter 20 of ACI Building Code 318, latest edition.

B. Work judged inadequate by results of a load test shall be reinforced with additional construction if so directed by the Architect or shall be replaced.

C. Additional construction and replaced work shall be at the Contractor's expense.

3.13 CONDUIT WORK

A. Electrical conduits shall be buried in concrete slabs. Low conduit shall be wired to the upper side of bottom reinforcing and top conduit shall be wired to the lower side of top steel.

B. Take care in spacing concrete around gangs or parallel conduit. Where such conduits occur, they shall be separated by at least one inch.

END.

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Framing with dimension lumber.
2. Wood blocking, cants and nailers.
3. Wood furring and grounds.
4. Wood sleepers.
5. Plywood backing panels.

1.2 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

1. Include data for wood-preservative and fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee Board of Review.

C. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
3. Engineered wood products.
4. Power-driven fasteners.
5. Powder-actuated fasteners.
6. Expansion anchors.
7. Metal framing anchors.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
3. Provide dressed lumber, S4S, unless otherwise indicated.

4. Provide lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.

B. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with applicable requirements of AWPA C2 (lumber) and AWPA C9 (plywood), except that lumber is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX). Mark each treated item the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction.

a. Ammoniacal, or amine, copper quat (ACQ)
b. Copper Azole.

2. Preservative Chemicals: Acceptable for painting and staining:

a. KDAT (Kiln dried after treatment).

3. Fasteners: Provide stainless steel. Do **not** allow aluminum or steel to have contact with pressure preservative wood.

4. Wrapped Blocking: All pressure treated wood shall be wrapped with 30 to 40 mil self-adhering polyethylene membrane. All galvanized metals, aluminum & stainless steel shall be fastened by stainless steel fasteners.

5. Products shall be approved by ACQ Manufacturer.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.

C. Application: Treat indicated items and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches (460 mm) above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING

A. General: Of grades indicated according to the American Lumber Standards Committee National Grading Rule provisions of the grading agency indicated.

B. Maximum Moisture Content: 19 percent for 2-inch nominal (38-mm actual) thickness or less, no limit for more than 2-inch nominal (38-mm actual) thickness.

C. Non-Load-Bearing Interior Partitions: Construction or No. 2 or better grade of any of the following species:

1. Mixed southern pine; SPIB.
2. Eastern softwoods: NELMA.
3. Northern species; NLGA.
4. Western woods; WCLIB or WWPA

D. Framing Other Than Non-Load-Bearing Interior Partitions: Construction or No. 2 or better grade and any of the following species:

1. Hem-fir (north); NLGA and Hem-Fir; WCLIB or WWPA.
2. Southern pine; SPIB.
3. Douglas fir-larch; WCLIB or WWPA, Douglas fir-south; WWPA and Douglas fir-larch (north); NLGA.
4. Spruce-pine-fir; NLGA and Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Cants.
5. Furring.
6. Grounds.

B. For items of dimension lumber size, provide Construction or No. 2 or better grade lumber with 19 percent maximum moisture content of any species.

C. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine, No. 2 grade; SPIB.
2. Eastern softwoods, No. 2 Common grade; NELMA.
3. Northern species, No. 2 Common grade; NLGA.
4. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.

2.5 PLYWOOD:

A. Comply with PS 1.

B. Bear the mark of a recognized association or independent inspection agency that maintains continuing control over quality of plywood which identifies compliance by veneer grade, group number, span rating where applicable, and glue type.

C. Sheathing:
1. APA rated Exposure 1 or Exterior; panel grade CD or better.

D. Subflooring:
1. At raised mezzanine floor:
a. APA Rated sheathing, Exposure 1. panel grade CD.
b. Minimum (3/4 inch) thick with span rating 32/16 or greater for supports at 16 inches on center.

2.6 PLYWOOD BACKING PANELS

A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch-nominal thickness.

2.7 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide stainless steel fasteners.

B. Power-Driven Fasteners: NES NER-272.

C. Bolts: Stainless steel bolts, hex nuts and, where indicated, flat washers.

2.8 METAL FRAMING ANCHORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alpine Engineered Products, Inc.
2. Simpson Strong-Tie Co., Inc.
3. SFS Intec, Inc., Fastening Systems.
4. USP Structural Connectors.

B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

C. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation for interior use only, unless indicated otherwise. All fasteners and framing anchors, in the exterior wall assembly and exposed to weather shall be stainless steel.

2.9 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch (25-mm) nominal thickness, compressible to 1/32 inch (0.8 mm); selected from manufacturer's standard widths to suit width of sill members indicated.

B. Flexible Flashing: Self-adhesive, rubberized-asphalt compound, bonded to a high-density, polyethylene film to produce an overall thickness of not less than 0.025 inch (0.6 mm).

PART 3 - EXECUTION

3.1 INSTALLATION

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

D. Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.

E. Do not splice structural members between supports, unless otherwise indicated.

F. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

G. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Published requirements of metal framing anchor manufacturer.
3. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

H. Use finishing nails for exposed work, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.

I. Fastening Methods:

1. Plywood Backing Panels: Nail or screw to supports.

3.2 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 10 00

GENERAL SECTION 07 21 16

BATT INSULATION

PART 1 -

1.1 SUMMARY

A. Section Includes: Provide fiberglass batt thermal insulation for interior partition wall assemblies.

1.2 References

A. Materials shall meet the property requirements of one or more of the following specifications as applicable to the specific product or end use:

1. American Society for Testing of Materials (ASTM):
   a. ASTM C423 Test Method for Sound Absorption Coefficient by the Reverberation Room Method.
   b. ASTM C518 Test Method for Steady State Thermal Transmission Properties by Means of the Heat Flow Meter.
   c. ASTM C665 Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
   d. ASTM C1320 Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.
   e. ASTM E136 Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C.
   f. ASTM E84 Test Method for Surface Burning Characteristics of Building Materials.
   g. ASTM E119 Test Methods for Fire Tests of Building Construction and Materials.

1.3 SUBMITTALS

A. Product Data: Submit data on product characteristics, performance criteria, and limitations, including installation instructions.

B. Sustainable Design: Submit manufacturer's sustainable design certifications as specified.

1.4 QUALITY ASSURANCE

A. Sustainable Design: Provide products which have received the following certifications:
   1. UL Certified Environmental Product Declaration in accordance with ISO 14025. Applies to EcoTouch® Faced and Unfaced insulation.
   2. UL Environment EcoLogo CCD-106, applies to EcoTouch® Faced and Unfaced insulation.
   3. GREENGUARD Indoor Air Quality Certified® and GREENGUARD Children & Schools Certified℠, applies to EcoTouch® Unfaced Batts and EcoTouch® Faced Batts and Rolls.
   4. GREENGUARD Formaldehyde Free, applies to EcoTouch® Unfaced and EcoTouch® Faced Batts and Rolls.
   5. Scientific Certification Systems SCS-MC-01025, SCS Certified minimum 65% recycled glass content (with at least 41% post-consumer recycled and the balance of pre-consumer recycled glass content), applies to EcoTouch® Unfaced Batts and Rolls.

6. USDA Certified Biobased Products: EcoTouch® unfaced – 98 percent; EcoTouch® Kraft-faced – 57 percent; EcoTouch® FSK-faced – 78 percent.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original packaging.

B. Store and protect products in accordance with manufacturer's instructions. Store in a dry indoors location. Protect insulation materials from moisture and soiling.

C. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

D. Do not install insulation that has been damaged or wet. Remove it from jobsite.

1. An exception may be allowed in cases where the contractor is able to demonstrate that wet insulation when fully dried out (either before installation or afterward following exposure to system operating temperatures) will provide installed performance that is equivalent in respects to new, completely dry insulation. In such cases, consult the insulation manufacturer for technical assistance.

PART 2 - PRODUCTS – BASIS OF DESIGN

2.1 MANUFACTURER

A. Thermal Insulation: EcoTouch® PINK® FIBERGLAS™ Insulation with PureFiber® Technology by Owens-Corning, Toledo, OH 43659; www.owenscorning.com.

2.2 MATERIALS

A. EcoTouch® Unfaced Batt Insulation: ASTM C 665, Type I, preformed formaldehyde free glass fiber batt type, unfaced. Includes Unfaced SonoBatts and Sound Attenuation Batts.
1. Noncombustible per ASTM E 136.
2. Flamespread less than 25, smoke developed less than 50 per ASTM E84.
3. ICC Building Code Construction Classification: All types.
4. Water vapor sorption, Maximum by weight: not more than 5 percent.

B. Accessories: Provide accessories per insulating system manufacturer's recommendations, including the following:
1. Tape: Polyethylene self-adhering type for Kraft faced insulation and bright aluminum self-adhering type for foil faced insulation.
2. Insulation Fasteners: Impale clip of galvanized steel; type recommended by insulation manufacturer for particular use intended.
3. Mechanical Insulation Fasteners: FM approved, corrosion resistant, size required to suit application.
4. Wire Mesh: Galvanized steel, hexagonal wire mesh.
5. Spindle Fasteners: Corrosion-resistant wire spindles.
6. Ventilation Baffles: Formed plastic, metal, or cardboard sized to fit full width of rafter spaces.

2.3 PERFORMANCE CRITERIA

A. Wood Frame Construction - Walls, R-Value: Per ASTM C518.
   1. R-11, 3-1/2 inch (89mm) thickness, 15 inch (381mm) or 23 inch (584mm) width, 48 inch (1219mm) or 93 inch (2362mm) length.

B. Wood Frame Construction - Roof/Floor/Ceiling, R-Value: Per ASTM C518.
   1. R-38, 12-1/4 inch (305mm) thickness, 16 inch (406mm) or 24 inch (584mm) width, 48 inch (1219mm) length.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which work of this section will be installed. Verify that adjacent materials are dry and ready to receive insulation. Verify mechanical and electrical services within walls have been tested and inspected.

B. Provide written report listing conditions detrimental to performance of work in this section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's installation instructions and ASTM C1320.

B. Friction-fit blanket insulation in place, until the interior finish is applied. Install batts to fill entire stud cavity, with no gaps, voids, or areas of compression. If stud cavity is less than 8 feet in height, cut lengths to friction fit against floor and ceiling tracks. Walls with penetrations require that insulation be carefully cut to fit around outlets, junction boxes, and other irregularities.
   1. Do not install insulation on top of or within 3 inches of recessed light fixtures unless the fixtures are approved for such use.

C. In crawl spaces and where the underside of floors are exposed to unconditioned space, insulation shall fill the cavity or be installed in contact with the underside of the decking. If vapor retarder is required by local code, a Kraft vapor retarder must be in contact with a 15 minute thermal barrier.

D. Within exterior wall framing, install insulation between pipes and backside of sheathing. Cut or split insulation material as required to fit around wiring and plumbing.

E. Where showers and bathtubs are located on exterior walls, install insulation and vapor retarder air barrier between units and exterior.

F. If eave ventilation baffles are required, install ventilation baffles at eaves to hold insulation down from roof sheathing and provide positive ventilation from eave to attic space.

G. Fluff insulation to full thickness for specified R-value before installation. Do not compress insulation in the cavity during installation, creating gaps or voids that could diminish thermal value.

H. Trim insulation neatly to fit spaces. Fill miscellaneous gaps and voids with insulation.

I. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within the plane of insulation.

J. For unfaced batt insulation, install with friction fit or retain in place with manufacturer's recommended fasteners or mesh.

K. For batt insulation with factory-applied facing, install with vapor retarder membrane facing warm in the winter side of building spaces or as specified by local building code. Lap ends and side flanges of membrane over or between framing members. Tape to seal tears, cuts or misalignments in membrane.

L. Secure insulation in place using one of the following methods: Friction fit; staple or nail facing flanges in place as needed, tape in place, retain in place with spindle fasteners, retain in place with wire mesh secured to framing members.

3.3 PROTECTION

A. Protect installed insulation from damage due to weather and physical abuse until protected by permanent construction.

END OF SECTION 07 21 16

SECTION 07 92 00

JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes joint sealants for the following applications, including those specified by reference to this Section:
   1. Provide sealant/caulk at all dissimilar materials on the exterior and interior surfaces. When joints or the connection of dissimilar materials are large enough provide backer rod and sealant.
   2. Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
      a. Construction joints in cast-in-place concrete.
      b. Joints in siding and trim.
      c. Joints between different materials listed above.
      d. Perimeter joints between materials listed above and frames of doors, windows and louvers.
   3. Exterior joints in horizontal traffic surfaces.
      a. Isolation and contraction joints in cast-in-place concrete slabs.
   4. Interior joints in vertical surfaces and horizontal nontraffic surfaces.
      a. Control and expansion joints on exposed interior surfaces of exterior walls.
      b. Perimeter joints of exterior openings where indicated.
      c. Perimeter joints between interior wall surfaces and frames of interior doors, and windows.
   5. Interior joints in horizontal traffic surfaces.
      a. Isolation joints in cast-in-place concrete slabs.
      b. Control and expansion joints in tile flooring.

B. See Division 08 Section "Glazing" for glazing sealants.

1.2 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples: For each type and color of joint sealant required, provide manufacturers sample sheet for selection.
   1. Provide a minimum of 6 different colors as selected by Architect from manufacturers full color range if requested after initial submittal of manufacturer's sample sheet.
   2. All sealant colors shall match adjacent material.

C. Preconstruction field test reports.

D. Compatibility and adhesion test reports.

E. Product certificates or test reports.

1.4 QUALITY ASSURANCE

A. Preconstruction Compatibility and Adhesion Testing: Submit samples of materials that will contact or affect joint sealants to joint-sealant manufacturers for testing according to ASTM C 1087 manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
B. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates according to the method in ASTM C 1193 that is appropriate for the types of Project joints.

1.5 WARRANTY

A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.
B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
C. Suitability for Immersion in Liquids. Where elastomeric sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247 and qualify for the length of exposure indicated by reference to ASTM C 920 for Class 1 or 2. Liquid used for testing sealants is deionized water, unless otherwise indicated.
D. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
E. Multi-component Sealant is permitted but must be compatible and equivalent to specified sealants.

F. Low-Modulus Neutral-Curing Polyurethane Sealant (JS-1): Where joint sealants of this type are indicated, provide products complying with the following:
   1. Available Products:

a. Pecora Corporation; Dynatrol I-XL.
b. Tremco; Dymonic.
c. Tremco; Vulkem 921.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Uses Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
   a. Coated glass, aluminum coated with a high-performance coating, color anodic aluminum, galvanized steel, brick, limestone, marble, granite, plastic, tile, wood.

G. Medium-Modulus Neutral-Curing Silicone Sealant (JS-2): Where joint sealants of this type are indicated, provide products complying with the following:
1. Available Products:
   a. GE Silicones; Silglaze II SCS2800.
   b. Tremco; Tremsil 600.
   c. Dow Corning Corporation; 795.
   d. Pecora Corporation; Pecora 895.
2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
   a. Coated glass, aluminum coated with a high-performance coating, color anodic aluminum, galvanized steel, brick, limestone, marble, granite, plastic, tile, wood.
6. Stain-Test-Response Characteristics: Nonstaining to porous substrates per ASTM C 1248.

H. Single-Component Mildew-Resistant Acid-Curing Silicone Sealant (JS-3): Where joint sealant of this type are indicated, provide products formulated with fungicide that are intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and temperature extremes, and that comply with the following:
1. Available Products:
   a. Dow Corning Corporation; 786 Mildew Resistant.
   b. GE Silicones; Sanitary SCS1700.
   c. Tremco; Tremsil 200 White.
2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.
   a. Coated glass, aluminum coated with a high-performance coating, color anodic aluminum galvanized steel, marble, granite, plastic and tile.

I. Single-Component Pourable Urethane Sealant (JS-4): Where joint sealants of this type are indicated, provide products complying with the following:
1. Available Products:
   a. Pecora Corporation; Urexpan NR-201.
   b. Polymeric Systems Inc.; Flexiprene 952.
   c. Tremco; Tremflex S/L.
   d. Tremco; Vulkem 45.
   e. Sonneborn Building Products, Div., ChemRex Inc.; SL 1.
2. Type and Grade: S (single component) and P (pourable).
3. Class: 25.
4. Use Related to Exposure: T (traffic) and NT (nontraffic).

5. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.
    a. Color anodic aluminum, aluminum coated with high-performance coating, galvanized steel, brick, granite, marble, ceramic tile and wood.

2.3 SOLVENT-RELEASE JOINT SEALANTS

A. Acrylic-Based Solvent-Release Joint Sealant: Comply with ASTM C 1311 or FS TT-S-00230.
    1. Available Products:
        a. Tremco; Mono 555.
B. Butyl-Rubber-Based Solvent-Release Joint Sealant: Comply with ASTM C 1085.
    1. Available Products:
        a. Bostik Findley; Bostik 300.
        b. Fuller, H. B. Company; SC-0296.
        c. Fuller, H. B. Company; SC-0288.
        d. Pecora Corporation; BC-158.
        e. Polymeric Systems Inc.; PSI-301.
        f. Sonneborn, Division of ChemRex Inc.; Sonneborn Multi-Purpose Sealant.
        g. Tremco; Tremco Butyl Sealant.

2.4 LATEX JOINT SEALANTS

A. General: For Interior Use Only.
B. Latex Sealant (JS-5): Comply with ASTM C 834, Type OP, Grade NF.
C. Available Products:
    1. Bostik Findley; Chem-Calk 600.
    2. Pecora Corporation; AC-20+.
    3. Sonneborn, Division of ChemRex Inc.; Sonolac.
    4. Tremco; Tremflex 834.

2.5 ACOUSTICAL JOINT SEALANTS

A. General: For Interior Use Only.
B. Acoustical Sealant for Exposed and Concealed Joints (JS-6): Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

    1. Available Products:
        a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
        b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

2.6 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
B. Cylindrical Sealant Backings (Backer Rod): ASTM C 1330, Type C (closed-cell material with a surface skin) polyurethane foam rod, oversized 20 – 50 percent larger than joint width as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants.
   1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant.
      a. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.
   2. Remove laitance and form-release agents from concrete.
      a. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.2 INSTALLATION

A. General: All Dissimilar Materials are to be caulked.
B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
C. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
D. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

F. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

G. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

H. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.3 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: All exterior wall penetrations shall be finished with sealant for a water and weathertight installation.
1. Joint Sealant: JS-1, Low Modulus-neutral-curing sealant.
2. Joint Sealant Color: As selected by Architect from Manufacturers full color range.

B. Joint-Sealant Application: Exterior siding and trim.
1. Joint Sealant: JS-1, Low-Modulus neutral curing sealant.
2. Joint Sealant Color: As selected by Architect from Manufacturers full color range.

C. Joint-Sealant Application: Exterior vertical and horizontal nontraffic construction joints in cast-in-place concrete.
1. Joint Sealant: JS-1, Low-Modulus-neutral-curing sealant.
2. Joint-Sealant color: As selected by Architect from Manufacturers full color range.

D. Joint-Sealant Application: Exterior horizontal nontraffic and traffic isolation and contraction joints in cast-in-place concrete slabs.
1. Joint Sealant: JS-4, Single-component pourable urethane sealant.
2. Joint-Sealant Color: As selected by Architect from Manufacturers full color range.

E. Joint-Sealant Application: Exterior vertical joints between different materials listed above.
1. Joint Sealant: JS-1, Low-Modulus neutral-curing sealant.
2. Joint-Sealant Color: As selected by Architect from Manufacturers full color range.

F. Joint-Sealant Application: Exterior perimeter joints between substrate material and frames of doors, windows, and louvers.
1. Joint Sealant: JS-1, Low-Modulus neutral-curing sealant.
2. Joint-Sealant Color: As selected by Architect from Manufacturers full color range.

G. Joint-Sealant Application: Exterior control and expansion joints in ceilings and other overhead surfaces.
1. Joint Sealant: JS-1, Low-Modulus neutral-curing sealant.

2. Joint Sealant Color: As selected by Architect from manufactures full color range.

H. Joint-Sealant Application: Vertical control and expansion joints on exposed interior surfaces of exterior walls.
   1. Joint Sealant: JS-5 Latex sealant.
   2. Joint-Sealant Color: As selected by Architect from Manufacturers full color range.

I. Joint-Sealant Application: Interior perimeter joints of exterior openings.
   1. Joint Sealant: JS-5, Latex sealant.
   2. Joint-Sealant Color: As selected by Architect from Manufacturers full color range.

J. Joint-Sealant Application: Interior joints between plumbing fixtures and adjoining walls, floors, and counters.
   1. Joint Sealant: Single-component mildew-resistant acid-curing silicone sealant.
   2. Joint-Sealant Color: As selected by Architect from Manufacturers full color range.

K. Joint-Sealant Application: Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
   1. Joint Sealant: JS-5 Latex sealant.
   2. Joint-Sealant Color: As selected by Architects from Manufacturers full color range.

END OF SECTION 07 92 00

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SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Standard hollow metal doors and frames.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.
B. Shop Drawings: Include elevations, door edge details, frame profiles, metal thicknesses, preparations for hardware, and other details.
C. Schedule: Prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings.

1.3 QUALITY ASSURANCE

A. Steel Door and Frame Standard: Comply with ANSI A 250.8, unless more stringent requirements are indicated.
B. 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 as close to neutral pressure as possible according to NFPA 252 or UL 10B.

1.4 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Amweld Building Products, LLC.
   2. Ceco Door Products; an Assa Abloy Group company.
   3. Steelcraft; an Ingersoll-Rand company.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, CS, Type B; suitable for exposed applications.
B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, CS, Type B, Commercial Steel (CS).
C. Galvanized Steel Sheets: Shall be manufactured from hot-dipped galvanized steel, G60 zinc coating conforming to ASTM A 525. Galvanized doors shall have galvanized hardware reinforcement.

D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z (12G) coating designation; mill phosphatized.
   1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
F. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.
G. Core: Provide manufacturer's standard core for thermally improved doors with maximum U-value of 0.24 btu/hr/sq.ft./degree F (ASTM C236) for all exterior doors.
H. Glazing: Division 08 Section "Glazing."
I. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type non-corrosive compound free of asbestos fibers, sulfur components, and other
J. Finish: All doors, frames and frame components shall be cleaned, phosphatized and finished as standard with one coat of baked-on rust inhibiting prime painted in accordance with the ANSI A224.1 "Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames." Doors and Frames shall be in compliance with 200-hour salt spray and 500-hour humidity test in accordance with ASTM test method B117 "Standard Practice for Operating Salt Spray (Fog) Apparatus" and D1735 "Standard Practice for Testing Water Resistance."

2.3 STANDARD HOLLOW METAL DOORS

A. Interior Doors: Complying with ANSI/SDI A250.8 for level and model and ANSI A250.4 for physical endurance level indicated.
   1. (Heavy-Duty Doors) Level 2 and Physical Performance Level B, Model 1(Full Flush) 0.042-inch-thick (18 gage).

B. Exterior Doors: Complying with ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level indicated.
   1. 1. (Extra Heavy-Duty Doors) Level 3 and Physical Performance Level A, Model 1 (Full Flush) 0.053-inch-thick (16 gage).

2.4 STANDARD HOLLOW METAL FRAMES

A. General: ANSI A250.8; concealed fastenings, unless otherwise indicated.
B. Frame Steel Sheet Thickness:
   1. 0.042-inch-thick (18 gage) for wood doors.
   2. 0.053-inch-thick (16 gage) for level 2 steel doors.
   3. 0.067-inch-thick (14 gage) for level 3 steel doors.
C. Door Silencers: Three silencers on single-door frames and two silencers on double-door frames.
D. Plaster Guards: 0.016-inch- (0.4-mm-) thick, steel sheet plaster guards or mortar boxes to close off interior of openings at mortised cutouts.
E. Supports and Anchors: Not less than 0.042-inch-(1.0-mm-) thick zinc-coated steel sheet.
   1. Masonry Wall Anchors: 0.177-inch- (4.5-mm-) diameter, steel wire complying with ASTM A 510 (ASTM A510M) may be used in place of steel sheet.
F. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Zinc-coat items that are to be built into exterior walls according to ASTM A 153/A 153M, Class C or D as applicable.

2.5 FRAME ANCHORS

A. Jamb Anchors:
   1. Masonry Type: N/A
   2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
   3. Postinstalled Expansion Type for In-Place Concrete or Masonry: N/A

2.6 STOPS AND MOLDINGS

A. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Door lites shall be screw type only.

2.7 ACCESSORIES

A. Mullions and Transom Bars: N/A
B. Grout Guards: N/A

2.8 FABRICATION

A. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.
B. Hollow Metal Doors:
   1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors. Seal joints in top edges of doors against water penetration. Provide close top, bottom and side edges of doors flush as an integral part of the door construction.
   2. Glazed Lites: Factory cut openings in doors.
   3. Astragals: N/A
C. Hollow Metal Frames: Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
   1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
   2. Sidelight and Transom Bar Frames: N/A
   3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
   4. Grout Guards: N/A
   5. Jamb Anchors: Provide number and spacing of anchors as follows:
      a. Masonry Type: N/A
         1) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
      b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
         1) Four anchors per jamb from 60 to 90 inches high.
      c. Compression Type: N/A
      d. Postinstalled Expansion Type: N/A
   6. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers.
      a. Single-Door Frames: Three door silencers.
      b. Double-Door Frames: N/A.
D. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
   1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.

2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 electrical Sections.

E. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
1. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.

2.9 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
1. Shop Primer: Provide shop applied primer compatible with finish coat specified in Division 09 Painting Sections.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Hollow Metal Frames: Comply with ANSI/SDI A250.11.
1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
a. At fire-protection-rated openings, install frames according to NFPA 80.
b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
c. Install frames with removable glazing stops located on secure side of opening.
d. Install door silencers in frames before grouting.
e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.
2. Masonry Walls: N/A.
3. In-Place Concrete or Masonry Construction: N/A
4. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make 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 to the following tolerances:
1. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

4. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a perpendicular line from head to floor.

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: Maximum 1/16 inch (1.6 mm), 2 credit card thickness.
      b. Between Edges of Pairs of Doors: 1/8 inch (3 mm) maximum.
      c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch (9.5 mm).
      d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 1/2 inch.
   2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
   3. Smoke-Control Doors: Install doors according to NFPA 105.

D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.
   1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (50 mm) o.c. from each corner.

3.2 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. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

C. Galvanized Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 08 11 13

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SECTION 08 14 16

FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Solid-core Doors with wood-veneer primed for field finishing.
   2. Solid-core Doors with wood-veneer faces and factory finishing.

B. Related Sections:
   1. Division 08 Section "Glazing" for glass view panels in flush wood doors. Glazing shall be factory installed with metal beads.

1.2 SUBMITTALS

A. Product Data: For each type of door indicated.
B. Each door; elevation of each kind of door; construction details; location and extent of hardware blocking; mortises, holes, and cutouts; requirements for veneer matching; factory finishing; fire ratings; and other pertinent data.
C. Samples: For factory-finished doors.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
B. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Quality Standards Illustrated."
C. 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 according to NFPA 252 and UL10C, Category A.
D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.4 DELIVERY, STORAGE AND HANDLING

A. Protect door during transit, storage and handling to prevent damage, soiling, and deterioration. Comply with requirements of referenced standard and manufacturer's written instructions.
   1. Individually package doors in cardboard cartons and wrap bundles of doors in plastic sheeting.
B. Mark each door with individual opening numbers used on Shop Drawings. Use removable tags of concealed markings.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet-work is complete and HVAC system is operating and will maintain temperature and relative humidity at occupancy level during the remainder of the construction period.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup or twist) more than 1/4-inch in a 42-by-84-inch section, or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
   1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
   2. Warranty shall be in effect during the following period of time from date of Substantial Completion.
      a. Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Flush Wood Doors:
      a. Algoma Hardwoods Inc.
      b. Eggers Industries; Architectural Door Division.
      c. Marshfield-Algoma Door Systems.

2.2 DOOR CONSTRUCTION, GENERAL

A. Doors for Transparent Clear Finish:
   1. Grade: Premium, except Grade A faces are acceptable.
   2. Species and Cut: White birch, rotary cut.
   3. Match between Veneer Leaves: Book match.
   4. Assembly of Veneer Leaves on Door Faces: Running match.
   5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
B. Interior Veneer-Faced Solid-Core Doors:
   1. Core: Either glued block or structural composite lumber.
      a. Screw Withdrawal, Face: 700 lbf. (3100 N)
      b. Screw Withdrawal, Edge: 475 lbf. (1780 N)
   2. Construction: Five or seven plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.
      a. WDMA I.S. 1-A Performance Grade: Heavy Duty.
C. Fire-Rated Doors:
   1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as needed to provide fire rating indicated.
   2. Edge Construction: Intumescent seals concealed (Comply with local code, jurisdiction and UL10C, Category A testing) by outer stile matching face veneer, and laminated backing for improved screw-holding capability and split resistance.
   3. Pairs: Furnish formed-steel edges and astragals for pairs of fire-rated doors, unless otherwise indicated.

4. Pairs: Furnish formed-steel edges and astragals for pairs of fire-rated doors, unless otherwise indicated.

2.3 FABRICATION

A. Fabricate doors in sizes indicated for Project-site fitting.
B. Job fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in NFPA 80 for fire-rated doors.
C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
   1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
   2. Metal Astragals: Pre-machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
D. Openings: Cut and trim openings through doors in factory.
   1. Light Openings: Trim openings with moldings of material and profile indicated.
   2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section "Glazing."
   3. Louvers: Factory install louvers in prepared openings.

2.4 LIGHT FRAMES

A. Provide Wood Beads for light openings in wood doors. Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
   1. Wood: Same species as door faces.
   2. Profile: Manufacturer’s standard shape.
   3. Finish: Provide to match doors and clear fast-drying alkyd based sanding sealer to match sheen of door.
   4. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch- (1.2-mm-) thick, cold-rolled steel sheet; factory primed for paint finish; and approved for use in doors of fire-protection rating indicated.

2.5 FACTORY FINISHING

A. 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.
   1. 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, but must be sealed.
B. Finish doors at factory that are indicated to receive transparent finish.
   1. Samples: Provide Samples for verification and finish systems used.
   2. Grade: Custom.
   3. Finish: Manufacturer's standard finish with performance comparable to AWI System TR-6 catalyzed polyurethane.
   4. Staining: None required, clear finish is specified.
   5. Sheen: Satin.

2.6 LOUVERS

A. Provide lightproof louvers for interior doors, where indicated, that comply with SDI 111C, with blades or baffles formed of 0.020-inch- (0.5-mm-) thick, cold-rolled steel sheet set into 0.032-inch- (0.8-mm-) thick steel frame.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Hardware: For installation, see Division 08 Section "Door Hardware."
B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
   1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
   1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold unless otherwise indicated.
      a. Comply with NFPA 80 for fire-rated doors.
D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

END OF SECTION 08 14 16

SECTION 08 33 23

OVERHEAD COILING DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Overhead coiling service doors.

1.2 RELATED SECTIONS

A. Section 07 90 00 – Joint Sealants

1.3 REFERENCES

A. ANSI/DASMA 108 - American National Standards Institute Standard Method For Testing Sectional Garage Doors And Rolling Doors: Determination Of Structural Performance Under Uniform Static Air Pressure Difference.

1.4 DESIGN / PERFORMANCE REQUIREMENTS

A. Overhead coiling service doors:
   A. Wind Loads: Wind Loads: Design and size components to withstand loads caused by pressure and suction of wind acting normal to plane of wall as calculated in accordance with applicable code.
B. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   a. Preparation instructions and recommendations.
   b. Storage and handling requirements and recommendations.
   c. Details of construction and fabrication.
   d. Installation instructions.
C. Shop Drawings: Include detailed plans, elevations, details of framing members, anchoring methods, required clearances, hardware, and accessories. Include relationship with adjacent construction.
D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) long, representing actual product, color, and patterns.
F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
G. Operation and Maintenance Data: Submit lubrication requirements and frequency, and periodic adjustments required.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing Work of this section with a minimum of five years experience in the fabrication and installation of security closures.
B. Installer Qualifications: Installer Qualifications: Company specializing in performing Work of this section with minimum three years and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.
B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.
C. Store materials in a dry, warm, ventilated weathertight location.

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 manufacturer's absolute limits.

1.9 COORDINATION

A. Coordinate Work with other operations and installation of adjacent materials to avoid damage to installed materials.

1.10 WARRANTY

A. Warranty: Manufacturer’s limited door and operator system, except the counterbalance spring and finish, to be free from defects in materials and workmanship for 3 years or 20,000 cycles, whichever occurs first.
B. PowderGuard Finish
    a. PowderGuard Premium Applied to curtain, guides, bottom bar, headplates: Manufacturer’s limited Premium Finish warranty for 2 years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Overhead Door Corp., 2501 S. State Hwy. 121, Suite 200, Lewisville, TX 75067. ASD. Tel. Toll Free: (800) 275-3290. Phone: (469) 549-7100. Fax: (972) 906-1499. Web Site: www.overheaddoor.com. E-mail: info@overheaddoor.com.
B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 OVERHEAD COILING SERVICE DOORS

A. Industrial Doors: Overhead Door Corporation, Model 610 Service Doors.
B. Curtain: Interlocking roll-formed slats as specified following. Endlocks shall be attached to each end of alternate slats to prevent lateral movement.
    a. Flat profile type F-265, fabricated of
        i. 18 gauge galvanized steel.

b. Galvanized Steel: Slats and hood galvanized in accordance with ASTM A 653 and receive rust-inhibitive, roll coating process, including 0.2 mils thick baked-on prime paint, and 0.6 mils thick baked-on polyester top coat.
c. Polyester Top Coat.
d. White polyester.

C. Weatherseals:
a. Vinyl bottom seal.
b. Guide weatherseal.

D. Bottom Bar:
a. Extruded aluminum for doors up to 15 feet 4 inches (4.67 m) wide.

E. Guides: Three structural steel angles.

F. Brackets:
a. Galvanized steel to support counterbalance, curtain and hood.
b. Finish; Bottom Bar, Guides, Headplate and Brackets:

G. Finish: Black powdercoat finish.

H. Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel, supporting the curtain with deflection limited to 0.03 inch per foot of span. Counterbalance is adjustable by means of an adjusting tension wheel.

I. Hood:

J. 24 gauge galvanized steel with intermediate supports as required.

K. Manual Operation:
a. Chain hoist.

L. Windload Design:
a. Provide to meet the Design/Performance requirements specified.

M. Locking:
a. Chain keeper locks for chain hoist operation.

N. Wall Mounting Condition:
a. Face-of-wall mounting.

O. Vision Lites: Provide with 10 inch by 1 inch fenestrations.
a. Provide with Plexiglas covers over openings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify opening sizes, tolerances and conditions are acceptable.
B. Examine conditions of substrates, supports, and other conditions under which this work is to be performed.
C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.
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 in accordance with manufacturer's instructions.
B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
E. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07900.
F. Install perimeter trim and closures.
G. Instruct Owner's personnel in proper operating procedures and maintenance schedule.

3.4 ADJUSTING

A. Test for proper operation and adjust as necessary to provide proper operation without binding or distortion.
B. Adjust hardware and operating assemblies for smooth and noiseless operation.

3.5 CLEANING

A. Clean curtain and components using non-abrasive materials and methods recommended by manufacturer.
B. Remove labels and visible markings.
C. Touch-up, repair or replace damaged products before Substantial Completion.

3.6 PROTECTION

A. Protect installed products until completion of project.

END OF SECTION 08 33 23

SECTION 08 41 13

ALUMINUM FRAMED STOREFRONTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Weatherstripping.

C. Perimeter sealant.

1.2 RELATED REQUIREMENTS

A. Section 07 9005 - Joint Sealers: Perimeter sealant and back-up materials.

B. Section 08 8000 - Glazing: Glass and glazing accessories.

1.3 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; American Architectural Manufacturers Association; 2012.
B. AAMA 501.2 - Field Check of Metal Storefronts, Curtain Walls, and Sloped Glazing Systems for Water Leakage; American Architectural Manufacturers Association; 2009 (part of AAMA 501).
C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association; 2012.
D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2013.
E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.
F. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).
G. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.
B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, internal drainage details.
C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.
D. Design Data: Provide framing member structural and physical characteristics, engineering calculations, dimensional limitations.
E. Samples: Submit two samples 12 x 12 inches in size illustrating finished

aluminum surface, glass, infill panels, glazing materials.

F. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.
G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed at the State in which the Project is located.
B. Manufacturer and Installer Qualifications: Company specializing in manufacturing aluminum glazing systems with minimum three years of documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.
B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.8 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C). Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
B. Correct defective Work within a five-year period after Date of Substantial Completion.
C. Provide five-year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
D. Provide five-year manufacturer warranty against excessive degradation of exterior finish.
E. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING

A. Center-Set Style:
    1. Basis of Design: YKK AP America Inc; YES 40 FS.
    2. Vertical Mullion Dimensions: 2 inches wide by 4 inches deep (50 mm wide by 102 mm deep).
B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
C. Substitutions: See Section 01 6000 - Product Requirements.
D. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.03 MANUFACTURERS

A. Aluminum-Framed Storefront and Doors:
    1. EFCO Corporation; www.efcocorp.com.
    2. Kawneer North America; www.kawneer.com.
    3. Oldcastle Building Envelope: www.oldcastlebe.com.

4. YKK AP America Inc; www.ykkap.com.
5. Substitutions: See Section 01 6000 - Product Requirements.

2.4 STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Finish: Pigmented organic coatings.
      a. Factory finish all surfaces that will be exposed in completed assemblies.
      b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
   2. Finish Color: As selected from manufacturer's standards.
   3. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   4. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   6. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F (95 degrees C) over a 12-hour period without causing detrimental effect to system components, anchorages, and other building elements.
   7. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
   8. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

2.5 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, drainage holes and internal weep
   1. drainage system.
   1. Glazing stops: Flush.
   2. Cross-Section: As indicated on drawings.
B. Glazing: As specified in Section 08 8000.

2.6 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).
B. Fasteners: Stainless steel.
C. Perimeter Sealant: As specified in Section 07 90 05.
D. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

2.7 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils (0.018 mm) thick.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.2 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.
B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
C. Provide alignment attachments and shims to permanently fasten system to building structure.
D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
E. Provide thermal isolation where components penetrate or disrupt building insulation.
F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.
H. Coordinate attachment and seal of perimeter air and vapor barrier materials.
I. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
J. Install perimeter sealant in accordance with Section 07 9005.
K. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.3 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inches every 3 ft (1.5 mm/m) non-cumulative or 1/16 inches per 10 ft (1.5 mm/3 m), whichever is less.
B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch (0.8 mm).

3.4 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for independent testing and inspection requirements. Inspection will monitor quality of installation and glazing.
B. Test installed storefront for water leakage in accordance with AAMA 501.2.

3.5 ADJUSTING

A. Adjust operating hardware and sash for smooth operation.

3.6 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.
B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
C. Remove excess sealant by method acceptable to sealant manufacturer.

3.07 PROTECTION

A. Protect installed products from damage during subsequent construction.

END OF SECTION 08 41 13

08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

1. Section Includes:
   - A. Hardware for wood, hollow steel, and aluminum doors.
   - B. Hardware for fire-rated doors.
   - C. Thresholds.
   - D. Weatherstripping, seals and door gaskets.

1.2 RELATED REQUIREMENTS

A. Section 08 11 13 - Hollow Metal Doors and Frames.

B. Section 08 14 16 - Flush Wood Doors.

1.3 REFERENCE STANDARDS

1. 36 CFR 1191 - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Rule; current edition; (ADA Standards for Accessible Design).
2. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.
3. BHMA A156.1 - American National Standard for Butts and Hinges; Builders Hardware Manufacturers Association, Inc.; 2006 (ANSI/BHMA A156.1).
4. BHMA A156.2 - American National Standard for Bored and Preassembled Locks & Latches; Builders Hardware Manufacturers Association; 2011 (ANSI/BHMA A156.2).
5. BHMA A156.3 - American National Standard for Exit Devices; Builders Hardware Manufacturers Association; 2008 (ANSI/BHMA A156.3).
6. BHMA A156.4 - American National Standard for Door Controls - Closers; Builders Hardware Manufacturers Association, Inc.; 2008 (ANSI/BHMA A156.4).
7. BHMA A156.5 - Cylinders and Input Devices for Locks; Builders Hardware Manufacturers Association; 2010 (ANSI/BHMA A156.5).
8. BHMA A156.6 - American National Standard for Architectural Door Trim; Builders Hardware Manufacturers Association; 2010 (ANSI/BHMA A156.6).
9. BHMA A156.7 - American National Standard for Template Hinge Dimensions; Builders Hardware Manufacturers Association; 2003 (ANSI/BHMA A156.7).
10. BHMA A156.8 - American National Standard for Door Controls - Overhead Stops and Holders; Builders Hardware Manufacturers Association, Inc.; 2010 (ANSI/BHMA A156.8).
11. BHMA A156.13 - American National Standard for Mortise Locks & Latches Series 1000; Builders Hardware Manufacturers Association; 2012 (ANSI/BHMA A156.13).
12. BHMA A156.18 - American National Standard for Materials and Finishes; Builders Hardware Manufacturers Association, Inc.; 2012 (ANSI/BHMA A156.18).
13. BHMA A156.22 - American National Standard for Door Gasketing and Edge Seal Systems, Builders Hardware Manufacturers Association; 2012 (ANSI/BHMA A156.22).
14. BHMA A156.31 - Electric Strikes and Frame Mounted Actuators; 2007 (ANSI/BHMA A156.31).
15. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2006.
16. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames; 2006.

17. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; Door and Hardware Institute; 2004.
18. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors; Door and Hardware Institute; 1993; also in WDHS-1/WDHS-5 Series, 1996.
19. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2013.
20. NFPA 101 - Life Safety Code; National Fire Protection Association; 2012.
21. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

1.4 ADMINISTRATIVE REQUIREMENTS

1. Coordinate the manufacture, fabrication, and installation of products onto which door hardware will be installed.
2. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.
3. Convey Owner's keying requirements to manufacturers.
4. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; require attendance by all affected installers.
5. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.5 SUBMITTALS

1. See Section 01 3000 - Administrative Requirements, for submittal procedures.
2. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project.
3. Hardware Schedule: Detailed listing of each item of hardware to be installed on each door. Use door numbering scheme as included in the Contract Documents. Identify electrically operated items and include power requirements.
4. Keying Schedule: Submit for approval of Owner.
5. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.
6. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
7. Keys: Deliver with identifying tags to Owner by security shipment direct from hardware supplier.
8. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

1. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
2. Hardware Supplier Qualifications: Company specializing in supplying commercial door hardware with 5 years of experience.
3. Hardware Supplier Personnel: Employ an Architectural Hardware Consultant (AHC) to assist in the work of this section.

1.7 DELIVERY, STORAGE AND HANDLING

Package hardware items individually, label and identify easch package with door opening code to match hardware schedule.

1.8 WARRANTY

A. Special Warranty: Provide 10 year warranty for door closers and 5 years for exit devices and cylindrical locks.

PART 2 - PRODUCTS

2.1 DOOR HARDWARE, GENERAL

1. Provide all hardware specified or required to make doors fully functional, compliant with applicable codes, and secure to the extent indicated.
2. Provide all items of a single type of the same model by the same manufacturer.
3. Provide products that comply with the following:
   a. Applicable provisions of federal, state, and local codes.
   b. ADA Standards for Accessible Design.
   c. ANSI/ICC A117.1, American National Standard for Accessible and Usable Buildings and Facilities.
   d. Applicable provisions of NFPA 101, Life Safety Code.
   e. Fire-Rated Doors: NFPA 80.
   f. All Hardware on Fire-Rated Doors : Listed and classified by UL as suitable for the purpose specified and indicated.
   g. Hardware for Smoke and Draft Control Doors : Provide hardware that enables door assembly to comply with air leakage requirements of the applicable code.
4. Finishes: All door hardware the same finish unless otherwise indicated.
   a. Primary Finish: Satin chrome plated over nickel on brass or bronze, 626 (approx US26D).
   b. Secondary Finish: Satin chrome plated over nickel on brass or bronze, 626 (approx. US26D).
      1) Use secondary finish in kitchens, bathrooms, and other spaces containing chrome or stainless steel finished appliances, fittings, and equipment; provide primary finish on one side of door and secondary finish on other side if necessary.
   c. Finish Definitions: BHMA A156.18.
   d. Exceptions:
      1) Where base metal is specified to be different, provide finish that is an appearance equivalent according to BHMA A156.18.
      2) Hinges for Fire-Rated Doors: Steel base metal with plated finish.
      3) Door Closer Covers and Arms: Color to be selected by Architect from manufacturer's standard colors.
      4) Hardware for Aluminum Storefront Doors: Finished to match door, except hand contact surfaces to be satin stainless steel.
   e. Fasteners:
      1) Mineral Core Wood Doors: Sex bolts.
      2) Concrete and Masonry Substrates: Stainless steel machine screws and lead expansion shields.

2.2 HINGES

A. Hinges: Provide hinges on every swinging door.
   1. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
   2. Provide ball-bearing hinges at all doors.
   3. Provide hinges in the quantities indicated.
   4. Provide non-removable pins on exterior outswinging doors.

5. Provide non-removable pins on outswinging interior doors at Serving line to dining room.
6. Where electrified hardware is mounted in door leaf, provide power transfer hinges.

B. Quantity of Hinges Per Door:
1. Doors From 60 inches (1.5 m) High up to 90 inches (2.3 m) High: Three hinges.
2. Doors 90 inches (2.3 m) High up to 120 inches (3 m) High: Four hinges.
3. Manufacturers - Hinges:
   a. Assa Abloy McKinney: www.assaabloydss.com.
   b. Hager Companies: www.hagerco.com.
   c. Stanley Black & Decker: www.stanleyblackanddecker.com.

2.3 PIVOTS

A. Manufacturers - Pivots:
1. Assa Abloy McKinney or Rixson: www.assaabloydss.com.
2. DORMA Group North America: www.dorma-usa.com/usa.

2.4 PUSH/PULLS

A. A. Push/Pulls: Comply with BHMA A156.6.
1. Provide push and pull on doors not specified to have lockset, latchset, exit device, or auxiliary lock.
2. On solid doors, provide matching push plate and pull plate on opposite faces.
3. On glazed storefront doors, provide matching push/pull bars on both faces.

2.5 LOCKS AND LATCHES

A. Locks: Provide a lock for every door, unless specifically indicated as not requiring locking.
1. Hardware Sets indicate locking functions required for each door.
2. If no hardware set is indicated for a swinging door provide an office lockset.
3. Trim: Provide lever handle or pull trim on outside of all locks unless specifically stated to have no outside trim.
4. Lock Cylinders: Provide key access on outside of all locks unless specifically stated to have no locking or no outside trim.

B. Lock Cylinders: Manufacturer's standard tumbler type, six-pin standard core.
1. Provide cams and/or tailpieces as required for locking devices required.

C. Keying: Grand master keyed.
1. Key to existing keying system.
2. Supply keys in the following quantities:
   a. 6 master keys.
   b. 6 grand master keys.
   c. 2 change keys for each lock.
3. When providing keying information, comply with DHI Handbook "Keying systems and nomenclature".

D. Latches: Provide a latch for every door that is not required to lock, unless specifically indicated "push/pull" or "not required to latch".

E. Mortise Locks: BHMA A156.13; **Operational Grade 1**; stamped steel case with steel or brass parts; Series 1000.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:
      a. Allegion plc.
      b. Best Access Systems; Stanley Security Solutions, Inc.
      c. Corbin Russwin, Inc.; an ASSA ABLOY Group company.
      d. SARGENT Manufacturing Company; ASSA ABLOY.
      e. Stanley Commercial Hardware; a division of Stanley Security Solutions.
      f. Yale Security Inc; an ASSA ABLOY Group company.

2.6 SELF-CONTAINED ELECTRONIC LOCKS

A. Self-Contained Electronic Locks: BHMA A156.25, **mortise**; with internal, battery-powered, self-contained electronic locks; consisting of complete lockset, motor-driven lock mechanism, and actuating device; enclosed in zinc-dichromate-plated, wrought-steel case, and strike that suits frame. Provide key override, low-battery detection and warning, LED status indicators, and ability to program at the lock.
   1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
      a. Allegion plc.
      b. Best Access Systems; Stanley Security Solutions, Inc.
      c. Kaba Ilco Corp.
      d. Marks USA.
      e. SARGENT Manufacturing Company; ASSA ABLOY.
      f. Yale Security Inc; an ASSA ABLOY Group company.

2.7 SURFACE CLOSERS

A. Closers: Complying with BHMA A156.4.
   1. Basis of Design: LCN 4040XP Series w/ Optional Metal Cover
   2. Provide surface-mounted, door-mounted closers unless otherwise indicated.
   3. Provide a door closer on every exterior door.
   4. Provide a door closer on every fire- and smoke-rated door. Spring hinges are not an acceptable self-closing device unless specifically so indicated.
   5. On pairs of swinging doors, if an overlapping astragal is present, provide coordinator to ensure the leaves close in proper order.
   6. At corridors, locate door-mounted closer on room side of door.
   7. At outswinging exterior doors, mount closer on inside of door.

B. Manufacturers - Closers:
   1. Assa Abloy Corbin Russwin, Norton, Rixson, Sargent, or Yale: www.assaabloydss.com.
   2. C. R. Laurence Co., Inc; www.crl-arch.com.
   3. LCN, an Allegion brand: www.allegion.com/us.

2.8 MECHANICAL STOPS AND HOLDERS

A. Stops: Complying with BHMA A156.8; provide a stop for every swinging door, unless otherwise indicated.
   1. Provide wall stops, unless otherwise indicated.

2. Stop is not required if positive stop feature is specified for door closer; positive stop feature of door closer is not an acceptable substitute for a stop unless specifically so stated.

B. Manufacturers - Overhead Holders/Stops:
1. Assa Abloy Rixson or Sargent: www.assaabloydss.com.
2. C. R. Laurence Co., Inc; www.crl-arch.com.
3. Glynn-Johnson, an Allegion brand: www.allegion.com/us.

C. Manufacturers - Wall and Floor Stops/Holders:
1. Assa Abloy McKinney: www.assaabloydss.com.
2. C. R. Laurence Co., Inc; www.crl-arch.com.
3. Hiawatha, Inc: www.hiawathainc.com.

2.9 GASKETING AND THRESHOLDS

A. Gaskets: Complying with BHMA A156.22.
1. On each door in smoke partition, provide smoke gaskets; top, sides, and meeting stile of pairs. If fire/smoke partitions are not indicated on drawings, provide smoke gaskets on each door identified as a "smoke door" and 20-minute rated fire doors.
2. On each exterior door, provide weatherstripping gaskets, unless otherwise indicated; top, sides, and meeting stiles of pairs.
a. Where exterior door is also required to have fire or smoke rating, provide gaskets functioning as both smoke and weather seals.
3. On each exterior door, provide door bottom sweep, unless otherwise indicated.

B. Thresholds:
1. At each exterior door, provide a threshold unless otherwise indicated.

C. Fasteners At Exterior Locations: Non-corroding.

D. Manufacturers - Gasketing and Thresholds:
1. Assa Abloy McKinney: www.assaabloydss.com.
2. National Guard Products, Inc: www.ngpinc.com.
3. Pemko Manufacturing Co: www.pemko.com.

2.10 PROTECTOPN PLATES AND ARCHITECTURAL TRIM

A. Protection Plates:
1. Kickplate: Provide on push side of every door with closer, except storefront and all-glass doors.

B. Drip Guard: Provide projecting drip guard over all exterior doors unless they are under a projecting roof or canopy.

C. Manufacturers - Protection Plates and Architectural Trim:
1. Assa Abloy McKinney: www.assaabloydss.com.
2. C. R. Laurence Co., Inc; www.crl-arch.com.
3. Hiawatha, Inc: www.hiawathainc.com.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that doors and frames are ready to receive work; labeled, fire-rated doors and frames are present and properly installed, and dimensions are as indicated on shop drawings.

3.2 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Use templates provided by hardware item manufacturer.

C. Do not install surface mounted items until finishes applied to substrate are complete.

D. Install hardware on fire-rated doors and frames in accordance with code and NFPA 80.

E. Mounting heights for hardware from finished floor to center line of hardware item: As listed in Schedule, unless otherwise noted:
   1. For steel doors and frames: Comply with DHI "Recommended Locations for Architectural Hardware for Steel Doors and Frames."
   2. For wood doors: Comply with DHI "Recommended Locations for Architectural Hardware for Wood Flush Doors."

3.3 ADJUSTING

A. Adjust work under provisions of Section 01 7000.

B. Adjust hardware for smooth operation.

C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.Install hardware in accordance with manufacturer's instructions and applicable codes.

3.4 CLEANING

A. Clean adjacent surfaces soiled by hardware installation. Clean finished hardware per manufacturer's instructions after final adjustments has been made. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.Use templates provided by hardware item manufacturer.

3.5 PROTECTION

A. Protect finished Work under provisions of Section 01 7000.

B. Do not permit adjacent work to damage hardware or finish.

END OF SECTION 08 71 00

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SECTION 08 71 02

DOOR HARDWARE SETS

PART 1 - GENERAL

1.1 SUMMARY
1. Section Includes:
A. Hardware Sets.

1.2 RELATED REQUIREMENTS
1. Section 08 11 13 - Hollow Metal Doors and Frames.
2. Section 08 14 16 - Flush Wood Doors.
3. Section 08 71 00 – Door Hardware

PART 2 – SCHEDULE

Set 1E – Exterior Entry w/ Keypad
1. Closer
2. Self Contained Electronic Lock w/ key override and deadbolt.
3. Weatherstripping
4. Bottom Sweep
5. Threshold

Set 1 - Exterior Exit
1. Closer
2. Lockset – F09
3. Weatherstripping
4. Bottom Sweep
5. Threshold

Set 2 – Privacy
1. Closer
2. Lockset – Privacy, F22
3. Weatherstripping
4. Bottom Sweep

Set 3 - Office
1. Closer
2. Lockset – Office, F05
3. Weatherstripping
4. Bottom Sweep

Set 4 – Storage
1. Closer
2. Lockset – Office, F09

END OF SECTION 08 71 02

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SECTION 08 80 00

GLAZING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Glass.
B. Glazing compounds and accessories.

1.2 RELATED REQUIREMENTS

A. Section 08 41 13 - Aluminum-Framed Storefronts: Glazing furnished by storefront manufacturer.

1.3 REFERENCE STANDARDS

A. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2011).
B. ASTM C1036 - Standard Specification for Flat Glass; 2011e1.
C. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.
D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.
E. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2012a.
F. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.
G. GANA (GM) - GANA Glazing Manual; Glass Association of North America; 2009.
H. GANA (SM) - GANA Sealant Manual; Glass Association of North America; 2008.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.
D. Samples: Submit two manufacturer's samples of glass and plastic units, showing coloration and design.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with GANA Glazing Manual and GANA Sealant Manual for glazing installation methods.
B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

1.7 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 50 degrees F (10 degrees C).
B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.8 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
B. Sealed Insulating Glass Units: Provide a ten (10) year warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.

PART 2 PRODUCTS

2.1 GLAZING TYPES

A. Type IG-1 - Sealed Insulating Glass Units: Vision glazing, low-E.
    1. Application(s): All exterior glazing unless otherwise indicated.
    2. Substitutions: Refer to Section 01 6000 - Product Requirements.
        a. Other products of the basis of design manufacturer and products of other manufacturers will be considered provided the overall performance is within the specified range(s) and the overall appearance is not significantly different from that of the specified product.
        b. Architect's decision on substitutions is final.
    3. Between-lite space filled with air.
    4. Thermal Resistance (U-Value):.29, maximum.
    5. Total Solar Heat Gain Coefficient:.38, maximum.
    6. Basis of Design: PPG Industries, Inc: www.ppgideascapes.com.
    7. Outboard Lite: Annealed float glass, 1/4 inch (6 mm) thick, minimum.
        a. Coating: PPG Solarban 72 on #2 surface, no coating on #3 surface.
        b. Tint: Starphire (ultra clear).
    8. Inboard Lite: Annealed float glass, 1/4 inch (6 mm) thick.
        a. Tint: None (clear).
    9. Total Thickness: 1 inch (25 mm).

2.2 EXTERIOR GLAZING ASSEMBLIES

A. Structural Design Criteria: Select type and thickness of glass to withstand dead and live loads
A. caused by positive and negative wind pressure acting normal to plane of glass.
    1. Design Pressure: In accordance with applicable codes.
    2. Use the procedure specified in ASTM E1300 to determine glass type and thickness.
    3. Limit glass deflection to 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.
    4. Glass thicknesses listed are minimum.

2.3 GLASS MATERIALS

A. Float Glass Manufacturers:
    1. Pilkington North America Inc: www.pilkington.com/na.
    2. PPG Industries, Inc: www.ppgideascapes.com.
    3. Substitutions: Refer to Section 01 6000 - Product Requirements.

B. Float Glass: All glazing is to be float glass unless otherwise indicated.
    1. Annealed Type: ASTM C1036, Type I, transparent flat, Class 1 clear, Quality Q3 (glazing
    1. select).
    2. Heat-Strengthened and Fully Tempered Types: ASTM C1048.
    3. Tinted Types: Color and performance characteristics as indicated.
    4. Thicknesses: As indicated; for exterior glazing comply with specified requirements for
    5. wind load design regardless of specified thickness.
C. Patterned Glass: Cast or molded glass.

2.4 SEALED INSULATING GLASS UNITS

A. Sealed Insulating Glass Units: Types as indicated.
    1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
    2. Edge Spacers: Aluminum, bent and soldered corners.
    3. Edge Seal: Glass to elastomer with supplementary silicone sealant.
    4. Purge interpane space with dry hermetic air.

2.5 GLAZING ACCESSORIES

A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness, ASTM C864 Option I.
    1. Length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) x width of glazing rabbet space minus 1/16 inch (1.5 mm) x height to suit glazing method and pane weight and area.
    2. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness, ASTM C 864 Option I.
B. Minimum 3 inch (75 mm) long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.
C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; hardness of 5 to 30 Durometer Shore "A"; coiled on release paper; black color.
D. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option I; BLACK color.
E. Glazing Clips: Manufacturer's standard type.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerance.
B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.2 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.
B. Prime surfaces scheduled to receive sealant.
C. Install sealants in accordance with ASTM C1193 and GANA Sealant Manual.

3.3 INSTALLATION - INTERIOR DRY METHOD (TAPE AND TAPE)

A. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch (1.6 mm) above sight line.
B. Place setting blocks at 1/4 points with edge block no more than 6 inches (150 mm) from corners.
C. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.

D. Place glazing tape on free perimeter of glazing in same manner described above.
E. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
F. Knife trim protruding tape.

3.04 CLEANING

A. Remove glazing materials from finish surfaces.
B. Remove labels after Work is complete.
C. Clean glass and adjacent surfaces.

END OF SECTION 08 80 00

SECTION 09 29 00

GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Interior gypsum board.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.
B. Samples: For the following products:
   1. Trim Accessories: Full-size Sample in 12-inch- (300-mm-) long length for each trim accessory indicated.
   2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

PART 2 - PRODUCTS

2.1 INTERIOR GYPSUM BOARD

A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. G-P Gypsum.
      b. American Gypsum Co.
      c. USG Corporation.
B. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
C. Type X:
   1. Thickness: 5/8 inch (15.9 mm).
   2. Long Edges: Tapered.
   3. Provide sag-resistant gypsum type applied to ceiling or overhead surfaces.
   4. Location: All exposed and concealed walls
D. Moisture-Resistant Type: Framing to be 16-inches o.c., follow manufacturers recommendation.
   1. Core: 5/8 inch (15.9 mm), Type X, at wall applications to match gypsum wall board thickness.
   2. Long Edges: Tapered.
   3. Products:
      a. United States Gypsum Co.; SHEETROCK Brand Gypsum Panels, Water-Resistant.
      b. Architect approved equal.
      c. Location: New sheathing in Restrooms or Ceilings in toilet rooms.

   4. Thickness: 5/8 inch (15.9 mm)
   5. Mold Resistance: ASTM D 3273, score of 10.

2.2 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.
   1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
   2. Shapes:
      a. Cornerbead: Use at Outside corner.
      b. LC-Bead: J-shaped; exposed long flange receives joint compound, use at exposed panel edges.
      c. L-Bead: L-shaped; exposed long flange receives joint compound.
      d. U-Bead: J-shaped; exposed short flange does not receive joint compound.
      e. Expansion (control) joint.

2.3 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.
B. Joint Tape:
   1. Interior Gypsum Wallboard: Paper.
   2. Exterior Gypsum Soffit Board: Paper.
C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
   1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
      a. Use setting-type compound for installing paper-faced metal trim accessories.
   3. Fill Coat: For second coat, use drying-type, all-purpose compound.
   4. Finish Coat: For third coat, use drying-type, all-purpose compound.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
   Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
   1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
   2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
D. Acoustical Sealant: As specified in Division 07 Section “Joint Sealants.”
E. Thermal Insulation: As specified in Division 07 Section “Thermal Insulation.”
   1. All other Panel Products: To comply as specified in Division 7 Section “Joint Sealants” and with manufacturer’s recommendations.

PART 3 - EXECUTION

3.1 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
D. Gypsum board at wall bases must be separated from carpet by 1-inch minimum or use waterproof film to prevent water transfer from floor.
E. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
F. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16-inch (1.5-mm) of open space between panels. Do not force into place.
G. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported edges of stud flanges first.
H. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.
I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.2 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:
   1. Type X: Where required for fire-resistance-rated assembly and at all gypsum board locations, unless noted otherwise on Drawings.
   2. Ceiling Type: Provide sag-resistant gypsum board for ceiling application.
   3. Moisture-Resistant Type: Provide moisture-resistant type at all ceilings in toilet rooms and also beside and behind all plumbing fixtures.
B. Single-Layer Application:
   1. On ceilings, apply gypsum panels before wall-partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
   2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
      a. Stagger abutting end joints not less than one framing member in alternate courses of panels.

   3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:
   1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16

inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers [and face layers separately to supports with screws] [with screws; fasten face layers with adhesive and supplementary fasteners].

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.3 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
C. Interior Trim: Install in the following locations:
   1. Cornerbead: Use at outside corners, unless otherwise indicated.
   2. LC-Bead: Use at exposed panel edges.
   3. L-Bead: L-shaped; exposed long flange receives joint compound.
   4. U-Bead: J-shaped; exposed short flange does not receive joint compound, use at exposed panel edges.
   5. Curved-Edge Cornerbead: Use at curved openings.

3.4 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints [at locations indicated on Drawings] [according to ASTM C 840 and in specific locations approved by Architect for visual effect].

C. Interior Trim: Install in the following locations:
   1. Cornerbead: Use at outside corners unless otherwise indicated.
   2. Bullnose Bead: Use [at outside corners] [where indicated] <Insert requirements>.
   3. LC-Bead: Use [at exposed panel edges] <Insert requirements>.
   4. L-Bead: Use [where indicated] <Insert requirements>.
   5. U-Bead: Use [at exposed panel edges] [where indicated] <Insert requirements>.

3.5 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
D. Gypsum Board Finish Levels: Finish panels to levels indicated below:
   1. Level 1: Ceiling plenum areas concealed areas, and where indicated.
   2. Level 2: N/A
   3. Level 3: N/A
   4. Level 4: Light-textured finishes, wall coverings, satin and flat paints.
      a. Primer and its application to surfaces are specified in other Division 09 Sections.
   5. Level 5: N/A

3.6 APPLYING TEXTURE FINISHES

A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.

B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture, **matching approved mockup, and** free of starved spots or other evidence of thin application or of application patterns.

C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer's written instructions.

3.7 FIELD QUALITY CONTROL

A. Above-Ceiling Observation: Architect will conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.
   1. Notify Architect seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
   2. Before notifying Architect, complete the following in areas to receive gypsum board ceilings.
      a. Installation of 80 percent of lighting fixtures, powered for operation.
      b. Installation, insulation, leak, and pressure testing of water piping system.
      c. Installation of air-duct systems.
      d. Installation of mechanical system control-air tubing.
      e. Installation of air devices.
      f. Installation of ceiling support framing.

3.8 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00

SECTION 09 51 13

ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes acoustical panels and exposed suspension systems for ceilings.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.
B. Coordination Drawings: Drawn to scale and coordinating acoustical panel ceiling installation with hanger attachment to building structure and ceiling mounted items:
   1. Ceiling suspension assembly members.
   2. Method of attaching hangers to building structure.
   3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels and special moldings.
   4. Minimum Drawing Scale: 1/8 inch = 1 foot (1:96).
C. Samples: For each acoustical panel, for each exposed suspension system member, for each exposed molding and trim and for each color and texture required.
   1. Acoustical Panel: Set of 6-inch square samples of each type, color, pattern and texture.
   2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch-long sample of each type, finish and color.
D. Product test reports.
E. Research/evaluation reports.
F. Maintenance data.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.
B. Fire-Test-Response Characteristics:
   1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
      a. Identify materials with appropriate markings of applicable testing and inspecting agency.
   2. Surface-Burning Characteristics: Acoustical panels complying with ASTM E 1264 for Class A materials, when tested per ASTM E 84.
      a. Smoke-Developed Index: 450 or less.
C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
D. Preinstallation Conference: Conduct conference at Project site.

1.4 PROJECT CONDITIONS

A. Environmental Limitation: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at levels indicated for Project when occupied for its intended use.
B. Before installing acoustical panels, permit them to reach room temperature and stabilized moisture content.

1.5 COORDINATION

A. Coordinate layout and installation of acoustical panels 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.

1.6 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.

1.7 WARRANTY

A. Manufacturer shall warrant all components of the acoustical ceiling system against failure associated with humidity including sagging, warping and rusting for a period of fifteen (15) years.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANEL CEILINGS, GENERAL

A. Acoustical Panel Standard: Comply with ASTM E 1264.
B. Metal Suspension System Standard: Comply with ASTM C 635.
C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
    1. Anchors in Concrete: Cast-in-place or Expansion anchors fabricated from corrosion-resistant materials, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
    2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.
D. Wire Hangers, Braces, and Ties: Zinc-coated carbon-steel wire; ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
    1. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch (2.69-mm-) diameter wire.

E. Antimicrobial Fungicide Treatment: Provide acoustical panels with face and back surfaces coated with antimicrobial treatment consisting of manufacturer's standard formulation with fungicide added to inhibit growth of mold and mildew and showing no mold or mildew growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

F. Provide Hanger Rods or Flat Hangers from mild steel, zinc coated or protected with rust-inhibitive paint as required

G. Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.
   1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension system indicated and that match width and configuration of exposed runners, unless otherwise indicated.
   2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
      a. Provide products along walls when reveal edge panels require being cut. Panel shall be cut straight to fit within the area.

2.2 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING, TYPE 1

A. Basis-of-Design Product:
   1. Manufacturer: Armstrong Ceiling Systems
   2. Product: Cirrus No. 578 or a comparable product approved by the architect.

B. Color: White.

C. LR: Not less than 0.86.

D. NRC: Not less than 0.70.

E. CAC: Not less than 35.

F. Edge/Joint Detail: Angled Tegular.

G. Thickness: 3/4 inch (19 mm).

H. Modular Size: 24 by 24 inches (610 by 610 mm).

I. Antimicrobial Treatment: Manufacturer's standard fungicide and bactericide product to retard the growth of mold/mildew.

J. Provide panel with HumiGuard Plus.

K. Provide Metal Suspension System, Type 1.

2.3 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING, TYPE 1

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong Ceiling Systems; or a comparable product approved by the Architect.
   1. Acoustical Ceiling Panels: 15/16-inch METALLIC ALUMINUM CAP.

B. Wide-Faced Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 (Z90) coating designation, with prefinished 15/16-inch- (24-mm-) wide metal caps on flanges.
   1. Structural Classification: Intermediate-duty system.
   2. End Condition of Cross Runners: Butt-edge type.
   3. Cap Material: Steel cold-rolled sheet.
   4. Cap Finish: Aluminum, Painted white.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with ASTM C 636 per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
B. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders and comply with layout shown on reflected ceiling plans.
C. Suspend ceiling hangers from building's structural members, plumb and free from contact with insulation or other objects within ceiling plenum. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers, use trapezes or equivalent devices. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
    1. Do not support ceilings directly from permanent metal forms or floor deck; anchor into concrete slabs.
    2. Do not attach hangers to steel deck tabs or to steel roof deck.
    3. Space hangers not more than 48-inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8-inches (200 mm) from ends of each member
    4. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
D. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building’s structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
E. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.6 m). Miter corners accurately and connect securely.
F. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
G. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
H. Install hold-down clips in areas indicated in Part 2, in areas required by authorities having jurisdiction; space as recommended by panel manufacturers written instructions, unless otherwise indicated.

END OF SECTION 09 51 13

09 65 13

RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Resilient base.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.
B. Samples: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches (300 mm) long, of each resilient product color, texture, and pattern required.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1.5 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive resilient products.
B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.
C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

A. Resilient Base:
   1. Manufacturers:
      a. VPI, LLC; Floor Products Division.
B. Resilient Base Standard: ASTM F 1861.
   1. Material Requirement: Type TP, Topset (rubber, thermoplastic).
   2. Style:
      a. Cove (base with toe) at Resilient Flooring
      b. Straight at Carpet applications.
C. Minimum Thickness: 0.125 inch (3.2 mm).

D. Height: 4 inches (102 mm).
E. Lengths: Coils in manufacturer's standard length.
F. Colors and Patterns: As selected by Architect from full range of industry colors. Refer to drawings for selection.
   1. TYPE RB-1: T.B.D.
   2. Location: As specified.

2.2 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
B. Concrete Substrates for Resilient Stair Treads and Accessories: Prepare according to ASTM F 710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
   3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.
   4. Moisture Testing: Perform tests recommended by manufacture and as follows: Proceed with installation only after substrates pass testing.
      a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
      b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level measurement.
C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
D. Do not install resilient products until they are same temperature as the space where they are to be installed.
   1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.2 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.
B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
E. Do not stretch resilient base during installation.

3.3 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
    1. Remove adhesive and other blemishes from exposed surfaces.
    2. Sweep and vacuum surface thoroughly.
    3. Damp-mop surfaces to remove marks and soil.
        a. Do not wash surfaces until after time period recommended by manufacturer.
        b. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
C. Cover resilient products until Substantial Completion.

END OF SECTION 09 65 13

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SECTION 09 91 13

EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following exterior substrates:

1. Steel
2. Galvanized metal.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For each finish and for each color and texture required.

C. Product List: Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

D. LEED SUBMITTALS:

1. MRc4 Recycled Content: Product data indicating *separate* percentages, by weight, of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating material costs for products.
2. EQc4.4 Composite Wood and Agrifiber: Product data indicating the type of resin binder used, and confirming that neither the product nor the laminating adhesives contain urea-formaldehyde resin binders.
3. VOC Content EQc4.2: Manufacturers' product data and material safety data sheets (MSDS) for paints and coatings used on the interior of the building including printed statement of VOC content in g/L.

1.3 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).

b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on benchmark samples.
   a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.4 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

PART 2 - PRODUCTS

2.1 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: As selected by Architect from manufacturer's full range.

2.2 METAL PRIMERS

A. Alkyd Anticorrosive Metal Primer: MPI #79.

B. Waterborne Galvanized-Metal Primer: MPI #134.

2.3 EXTERIOR LATEX PAINTS

A. Exterior Latex (flat): MPI #10 (Gloss Level 1).

B. Exterior Latex (semigloss): MPI #11 (Gloss Level 5).

2.4 EXTERIOR ALKYD PAINTS

A. Exterior Alkyd Enamel (Semigloss): MPI #94 (Gloss Level 5).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

C. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
   1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION AND APPLICATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

   1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

D. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

E. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.3 EXTERIOR PAINTING SCHEDULE

A. Steel Substrates:

   1. Alkyd System: MPI EXT 5.1D.

      a. Prime Coat: Alkyd anticorrosive metal primer.
      b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
      c. Topcoat: Exterior alkyd enamel (semigloss)

B. Galvanized-Metal Substrates:

   1. Latex Over Water-Based Primer System: MPI EXT 5.3H.

      a. Prime Coat: Waterborne galvanized-metal primer.
      b. Intermediate Coat: Exterior latex matching topcoat.
      c. Topcoat: Exterior latex semigloss.

END OF SECTION 09 91 13

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SECTION 09 91 23

INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following interior substrates:
   1. Steel.
   2. Galvanized metal.
   3. Gypsum board.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.
B. Samples: For each finish and for each color and texture required.
   1. Submit samples on rigid backing, 8-inches (200 mm) square.
   2. Step coats on samples to show each coat required for system.
   3. Label each coat of each sample.
   4. Label each sample for location and application area.
C. Product List: Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.3 QUALITY ASSURANCE

A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
B. Source Limitations: Obtain block filler and primers for each coating system from the same manufacturer as the finish coats.
C. MPI Standards:
   1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
   2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.
D. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
      a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
      b. Other Items: Architect will designate items or areas required.
   2. Apply benchmark samples after permanent lighting and other environmental services have been activated.
   3. Final approval of color selections will be based on benchmark samples.
      a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.4 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
   1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

PART 2 - PRODUCTS

2.1 PAINT, GENERAL

A. Material Compatibility:
   1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
B. Colors: As selected by Architect from manufacturer's full range.

2.2 PRIMERS/SEALERS

A. Interior Latex Primer/Sealer: MPI #50.

2.3 METAL PRIMERS

A. Quick-Drying Alkyd Metal Primer: MPI #76.
B. Waterborne Galvanized-Metal Primer: MPI #134.

2.4 LATEX PAINTS

A. Interior Latex (Flat): MPI #53 (Gloss Level 1).
B. Interior Latex (Satin): MPI #43 (Gloss Level 4).
C. Interior Latex (Semigloss): MPI #54 (Gloss Level 5).

2.5 SOLVENT-BASED PAINTS

A. Quick Dry (semigloss) MPI #81 (Gloss Level 5)

2.6 EPOXY PAINTS

A. Epoxy cold cured gloss: MPI #77 (gloss level 5).

2.7 FLOOR COATINGS

A. Interior/Exterior Clear Concrete Floor Sealer (Water Based): MPI #99.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
   1. Concrete: 12 percent.
   2. Masonry (Clay and CMU): 12 percent.
   3. Gypsum Board: 12 percent.
C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
   1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION AND APPLICATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
   2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
C. Concrete Substrates: Remove release agents, curing compounds, efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer’s written instructions.
   1. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry and vacuum before painting.
D. Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer’s written instructions.
E. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
   1. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
   2. Touch up bare areas and shop-applied prime coats that have been damaged. Wire brush, clean with solvents recommended by paint manufacturer, and tough up with same primer as the shop coat.
F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promise adhesion of subsequently applied paints.
G. Aluminum Substrates: Remove surface oxidation.
H. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.
I. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

J. Apply paints according to manufacturer's written instructions.
   1. Use applicators and techniques suited for paint and substrate indicated.
   2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
   3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
   4. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of durable paint film.
   5. Provide finish coats that are compatible with primers used.
   6. The term "exposed surfaces" includes areas visible when permanent or built-in-fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
   7. Plant interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
   8. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
   9. Sand lightly between each succeeding enamel or varnish coat.

K. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

L. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:
   1. Mechanical Work:
      a. Uninsulated metal piping.
      b. Uninsulated plastic piping.
      c. Pipe hangers and supports.
      d. Tanks that do not have factory-applied final finishes.
      e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
      f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
      g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
   2. Electrical Work:
      a. Switchgear.
      b. Panelboards.
      c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

M. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

N. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.

O. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.3 INTERIOR PAINTING SCHEDULE

A. Steel Substrates:
   1. Alkyd Gloss Finish: MPI INT 5.1E.
      a. Prime Coat: Quick-drying alkyd metal primer.
      b. Intermediate Coat: Alkyd matching topcoat.
      c. Topcoat: Alkyd (semigloss).
B. Galvanized-Metal Substrates:
   1. Alkyd System: MPI INT 5.3L.
      a. Prime Coat: Waterborne galvanized-metal primer.
      b. Intermediate Coat: Alkyd matching topcoat.
      c. Topcoat: Alkyd (semigloss).
C. Gypsum Board Substrates:
   1. Latex System: MPI INT 9.2A.
      a. Prime Coat: Interior latex primer/sealer.
      b. Intermediate Coat: Interior latex matching topcoat.
      c. Topcoat: Interior latex (flat) at ceiling applications and (Satin) at wall applications.
   2. Epoxy System: MPI INT 9.2F. 9 (Restrooms)
      a. Prime Coat: Interior latex primer/sealer.
      b. Intermediate Coat: Epoxy cold cured gloss matching topcoat.
      c. Topcoat: Epoxy cold cured gloss.

END OF SECTION 09 91 23

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SECTION 10 28 13

TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes

1. Public-use washroom accessories.
2. Public-use shower room accessories.

1.2 REFERENCES

A. American National Standards Institute (ANSI):

1. ANSI A 117.1 - Accessible and Usable Buildings and Facilities.

B. ASTM International (ASTM):

1. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
3. ASTM A 1008/A 1008M- Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
4. ASTM B 456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
5. ASTM C 1503 - Standard Specification for Silvered Flat Glass Mirror.
6. ASTM F 446 - Standard Consumer Safety Specification for Grab Bars and Accessories Installed in the Bathing Area.

1.3 ACTION SUBMITTALS

A. Product Data: For each product:

1. Manufacturer's product data sheets indicating operating characteristics, materials and finishes. Mark each sheet with product designation.
2. Mounting requirements and rough-in dimensions.

1.4 INFORMATION SUBMITTALS

A. Sample warranty.

B. Operation, care and cleaning instructions.

1.5 MAINTENANCE SUBMITTALS

A. Furnish indicated spare parts that are packaged with identifying labels listing associated products.

B. Operation and Maintenance data.

1.6 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

B. Manufacturer Qualifications: Approved manufacturer listed in this section, with minimum [5] years experience in the manufacture of product types. Manufacturers seeking approval must submit the following:

1. Product data, including test data from qualified independent testing agency indicating compliance with requirements.
2. Samples of each component of product specified.
3. List of successful installations of similar products available for evaluation by Architect.
4. Submit substitution request not less than 15 days prior to bid date.

C. Accessibility Requirements: Comply with requirements of ADA/ABA and with requirements of authorities having jurisdiction.

1.7 WARRANTY

A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage or frame corrosion defects within specified warranty period.

1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: Subject to compliance with requirements, provide commercial toilet accessories manufactured by Bradley Corporation, Menomonee Falls, WI 53051, (800) 272-3539, fax: (262) 251-5817; Email info@BradleyCorp.com; Website: www.bradleycorp.com.

1. Submit requests for substitution in accordance with Instructions to Bidders and Division 01 General Requirements.

2.2 MATERIALS

A. Stainless Steel: ASTM A 666 Type 304 (18-8); satin finish exposed surfaces unless otherwise indicated.

B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS, manufacturer’s standard thickness.

C. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating, manufacturer’s standard thickness.

D. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

E. Fasteners:

1. Exposed: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant.
2. Concealed: Galvanized steel.

F. Chrome Plating: ASTM B 456, Service Condition Number SC 2, moderate service.

G. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

H. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.3 PUBLIC-USE WASHROOM ACCESSORIES

A. Toilet Tissue Roll Dispenser, Surface Mount **TTDS**:

1.	Basis of Design:	**Bradley Corp., Model** 5402.
2.	Application:	Where indicated.
3.	Capacity:	Double roll dispenser.
4.	Finish and Base Material:	Satin-finish stainless steel with polymer spindles.
5.	Roll Access:	Under hinged cover.
6.	Delivery:	Non-controlled.
7.	Mounting:	Surface-mounted.
8.	Service Access:	Vandal resistant lock.

B. Paper Towel (Folded) Dispensers: **PTFD.**

1.	Basis of Design:	**Bradley Corp., Model** 250-15.
2.	Application:	Where indicated.
3.	Finish and Base Material:	Satin stainless steel, rolled at exposed edges.
4.	Mounting:	Surface.
5.	Towel Capacity by Types:	
	a. Multi-fold towels:	525.
	b. C-fold towels.	400.
6.	Towel Delivery Method:	Bottom pull.
7.	Service Access:	Vandal resistant hinged locking cover.

C. Liquid-Soap Dispenser: **SD-1**.

1.	Basis of Design:	**Bradley Corp., Model** 6562.
2.	Application:	Where indicated.
3.	Housing:	Satin stainless steel.
4.	Operation:	Stainless steel manual pump.
5.	Mounting:	Surface mounted.
6.	Soap Capacity:	40 ounces (1180 ml)

D. Waste Receptacle: **WR-1.**

1.	Basis of Design:	Bradley Corp., Model 357.
2.	Application:	Where indicated.
3.	Material and Finish:	Stainless steel, 22 ga., No. 4 finish (satin).
4.	Mounting:	Surface-mounted.

5.	Capacity:	6.5 gal. (78 L).
6.	Options:	Hinged satin stainless steel receptacle cover.
7.	Projection:	6.5 inches.

E. Fixed Grab Bars — GB36 & GB48:

1.	Basis of Design:	Bradley Corp., Model 812 series
2.	Description:	Fixed Grab Bar:
3.	Diameter:	1-1/2 inch (38 mm) diameter.
4.	Application:	Where indicated.
5.	Mounting:	Flanges with concealed fasteners.
6.	Material:	Stainless steel, 0.05 inch (1.27 mm) thick.
7.	Length:	36" Back Wall, & 48" Side Wall.
8.	Finish:	Safety grip.

F. Sanitary Product Disposal Unit — SDU:

1.	Basis of Design:	Bradley Corp., 4781-11
2.	Application:	Where indicated.
3.	Mounting:	Surface mounted.
4.	Receptacle:	Removable, w/ vandal-proof lock, capacity [1.25 gal (4.7 L).
5.	Finish:	Stainless steel satin.

G. Mirror Unit: — MG-1

1.	Basis of Design:	Bradley Corp., Model 780.
2.	Size and Application:	24 by 36 inches.
3.	Application:	Where Indicated.
4.	Frame:	Stainless-steel angle, mitered and welded.
5.	Installation:	tamper- and theft-resistant.
6.	Mirror:	1/4 inch (6 mm) thick, tempered glass.
7.	Exposed Finish:	Satin stainless steel
8.	Base Material:	Satin stainless steel.

H. Robe Hook: — RH:

1.	Basis of Design:	Bradley Corp., 9114.
2.	Description:	Single, surface mounted.
3.	Material and Finish:	Satin stainless steel.

2.4 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Assemble fixtures and associated fittings and trim in accordance with manufacturer's instructions.

B. Install supports attached to building structure for equipment requiring supports.

C. Grab Bars: Install grab bars to withstand downward force of not less than 250 lbf (1112 N) per ASTM F 446.

D. Install equipment level, plumb, and firmly in place in accordance with manufacturer's rough-in drawings.

3.2 CLEANING AND PROTECTION

A. Repair or replace defective work, including damaged equipment and components.

B. Clean unit surfaces, and leave in ready-to-use condition.

C. Turn over keys, tools, maintenance instructions, and maintenance stock to Owner.

3.3 TESTING AND ADJUSTING

A. Test each piece of equipment provided with moving parts to assure proper operation, freedom of movement, and alignment. Install new batteries in battery-powered items.

B. Repair or replace malfunctioning equipment, or equipment with parts that bind or are misaligned.

END OF SECTION 10 28 13

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SECTION 10 44 16

FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

B. Owner-Furnished Material: N/A.

C. Related Sections: N/A.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

B. Product Schedule: For fire extinguishers. Coordinate final fire extinguisher schedule with fire protection cabinet schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide fire extinguishers approved, listed, and labeled by FMG.

1.7 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function as required and as applicable.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of hydrostatic test according to NFPA 10.
b. Faulty operation of valves or release levers.

2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each mounting bracket indicated.

1. Basis-of-Design Product: Subject to compliance with requirements, provide [Ansul, a Tyco International Company] [Pyro-Chem; Tyco Safety Products] or comparable product by one of the following:

a. Amerex Corporation.
b. Badger Fire Protection; a Kidde company.
c. Buckeye Fire Equipment Company.
d. Fire End & Croker Corporation.
e. J. L. Industries, Inc.; a division of Activar Construction Products Group.
f. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
g. Larsen's Manufacturing Company.
h. Moon-American.
i. Pem All Fire Extinguisher Corp.; a division of PEM Systems, Inc.
j. Potter Roemer LLC.

2. Valves: Manufacturer's standard.
3. Handles and Levers: Manufacturer's standard.
4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.

B. Multipurpose Dry-Chemical Type in Steel Container <FE>: UL-rated 2-A:10-B:C, 5-lb (2.3-kg)] nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.2 MOUNTING BRACKETS <FE>

A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Ansul, a Tyco International Company or comparable product by one of the following:

a. Amerex Corporation.
b. Badger Fire Protection; a Kidde company.
c. Buckeye Fire Equipment Company.
d. Fire End & Croker Corporation.
e. J. L. Industries, Inc.; a division of Activar Construction Products Group.
f. Larsen's Manufacturing Company.
g. Potter Roemer LLC.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

1. Mounting Brackets: 54 inches (1372 mm) above finished floor to top of fire extinguisher.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 10 44 16

"LEFT BLANK"

SECTION 133419

PRE-ENGINEERED METAL BUILDING

PART 1 GENERAL

1.01 SUMMARY

A. Work includes:

1. Providing Pre-Engineered Metal Building complete including rigid frames and other framing members, roof and wall panels, liner panels, purlins, girts, and other subframing members, vapor barrier and insulation, flashings, trim, louvers, and miscellaneous accessories.
2. Providing metal roofing, wall panels, soffit panels and accessories for installation with traditional building systems.
3. Metal doors and frames, windows, and overhead rolling doors are specified in other sections.

1.02 REFERENCES

A. FBC – Florida Building Code, Sixth Edition (2017).

B. Specification for Structural Steel Buildings, Allowable Stress Design and Plastic Design, June 1, 1989, and the Commentary on the AISC Specification, June 1, 1989, and the Code of Standard Practice for Steel Buildings and Bridges, September 1, 1986, as specified in the AISC Manual of Steel Construction, 9th edition, unless shown otherwise on the drawings or specified otherwise herein; or, AISC - Load and Resistance Factor Design Specification for Structural Steel Buildings and commentary First Edition 1986; and, Code of Standard Practice and Commentary, 1986.

C. American Welding Society, AWS D1.1 - Structural Welding Code, 2000 edition.

D. AISI - Specification for the Design of Cold-Formed Steel Structural Members, latest edition.

E. MBMA - Low Rise Building Systems Manual, latest edition.

1.03 SYSTEM DESCRIPTION

A. Building components to withstand Building Dead Loads, Collateral Loads, Floor and Roof Live Loads, Roof Snow Loads, and Wind Loads due to pressure and suction of wind calculated in accordance with Florida Building Code.

1. Building Dead Load - Actual Loads.
2. Roof Live Load - 20 psf - Reducible
3. Wind Load - See plans.
4. Seismic Load - See plans.
5. Collateral Loads:
   a) Mechanical and Electrical systems - 4 psf min.
   b) Ceilings and Architectural features - 4 psf min.
   c) Special concentrated loads - Actual loads of equipment furnished, See plans.

B. Deflection: Deflection of members when subjected to the applicable Design Loads and Collateral Loads specified shall not exceed the limits specified below:

1. Girts - L/240 of span.
2. Purlins - L/180 of span.
3. Frames (vertical loads) - L/180 of span.
4. Frames (lateral loads) - L/360 of eave height.
5. Lateral Building Drift - Match Frame Drift

C. Assembly shall permit movement of components without buckling, failure of joint

seals, undue stress on fasteners or other detrimental effects, when subject to temperature range of -20° to +120° F. Provide sliding roof panel clips.

D. Pre-Engineered Metal Building Components shall be of type indicated on Drawings, and shall be provided by one manufacturer. Framing 3/16" thick and thicker shall conform to AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings. Framing less than 3/16" thick shall conform to AISI Specification for the Design of Cold-Formed Steel Structural Members.

E. Criteria and framing indicated in the specifications and on the drawings, shall be considered a minimum standard. The pre-engineered metal building manufacturer shall add additional members or requirements to produce a complete pre-engineered metal building roof and wall system that meets or exceeds the code requirements.

1.04 SUBMITTALS

A. Manufacturers Catalog Data or other descriptive data of miscellaneous accessories, fasteners, joint sealing material; including printed installation instructions and details; and factory color protective coatings.

B. Submit approval drawings of structural steel, roof and wall covering, flashing, trim, closures, and methods of thermal expansion control, to be checked and approved prior to proceeding with fabrication.

C. Indicate building dimensions, general construction details, anchorages and method of anchorage, and method of installation, including framing, anchor bolt settings, sizes, and locations from datum.

D. Submit shop drawings with structural calculations justifying design under seal of a professional structural engineer registered in the State of Florida. Submittal shall include frame, column and bracing reaction diagrams for all load cases and load combinations.

E. Welding of all steel in field shall be done by certified welders qualified in accordance with "Qualification of Welding Procedure - Welders and Welding Operators" of the AWS Code of Welding in Building Construction (AWS D1.0). Submit letter indicating current qualification (within past 12 months) for each welder.

F. Submit Test Reports of all tests required by referenced publications applicable to the item or material furnished for use.

G. Warranty:

1. Weathertightness.
2. Panel Finish.

1.05 QUALITY ASSURANCE

A. Components shall be the design of a manufacturer regularly engaged in the fabrication of pre-engineered structures. All materials shall be new, unused, and free from defect.

B. Erection and installation of work covered by this Section shall be performed by building manufacturer's personnel or by subcontractors Certified by the building manufacturer for erection and installation of manufacturer’s products. Subcontractor shall be thoroughly familiar with manufacturers product, having a minimum of five (5) years experience installing projects of this nature. Erection work shall be under direction and supervision of an experienced supervisor employed by manufacturer of the Certified subcontractor.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Upon arrival at job site, sheets and panels shall be inspected for moisture accumulation. If found wet, remove moisture, re-stack, and protect sheets and

panels until used.

B. Store metal sheets or panels to allow water which has accumulated during transit or storage to drain. Do not store sheets and panels in contact with materials which cause staining.

C. Deliver, store, and handle prefabricated components, sheets, panels, and other manufactured items in such a manner that they will not be damaged or deformed. Stack materials stored on site on platforms or pallets and cover with tarpaulins or other suitable vented weathertight covering.

1.07 WARRANTY

A. Roof and Wall Panels: Provide 20-year weather tightness warranty, by building manufacturer, covering durability of roof and wall panels due to rupture, structural failure, or perforation.

B. Roof and Wall Panel Finish (exterior color bake-on): Provide 25-year warranty, by building manufacturer, covering panel finish against blistering, peeling, cracking, flaking, checking, chipping, and excessive color change and chalking. Color change shall not exceed 9 N.B.S. units for roof panels and 5 N.B.S. units for wall panels, (per ASTM D2244.64T) and chalking for wall panels shall not be less than a rating of 8 per ASTM D659, latest edition.

PART 2 PRODUCTS

2.01 MATERIALS

A. Hot Rolled Structural Shapes: ASTM A36 or ASTM A529 with 36 ksi or 50 ksi minimum yield stress.

B. Tubing or Pipe: ASTM A500, Grade B; ASTM A501; or ASTM A53, Type E, Grade B.

C. Plate or Bar Stock: 42,000 PSI minimum yield strength: ASTM A529, ASTM A570, or ASTM A572.

D. Cold-Formed Steel: ASTM A607, Grade 50 minimum.

E. Galvanized Steel Sheet: ASTM A446, G90 coating, or ASTM A525, G90.

F. Bolts for Framing: ASTM A307 or ASTM A325.

G. Primer Paint: Manufacturer's standard gray and shall conform to Steel Structure Painting Council Specifications TT-P-636.

2.02 MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following

1. American Buildings
2. Butler
3. Gulf States
4. MBCI
5. Metal Sales

B. Roofing panels shall match MBCI, Ultra-Dek, 24 gauge.

C. Wall panels shall match MBCI, “PBU” panel, 24 gauge.

D. Soffit and liner panels shall match MBCI Artisan L12 with beads 26 gauge.

2.03 ROOF PANEL MATERIAL

A. Galvalume sheet conforming to the requirements of ASTM A792 with an AZ55 coating.

2.04 WALL AND SOFFIT PANEL AND GUTTERS AND DOWNSPOUTS MATERIAL

A. Structural Quality Galvanized Steel Sheet: Hot-dip zinc-coated steel sheet complying with ASTM A 446 with G90 coating complying with ASTM A525,

Grade C or to suit manufacturerer's standards. Provide sheet material matching formed panel finishes for building trim and closures.

B. METAL FINISHES

1. General: Apply coating either before or after forming and fabricating panels, as required by coating process and as required for maximum coating performance capability. Protect coating by application of strippable film to properly protect finish. Furnish air-drying spray finish in matching color for touch-up.
   a) Color shall be as indicated from manufacturer's color selections, both standard and custom. Provide minimum sixteen (16) colors.
2. Flouropolymer Coating: Manufacturer's standard two coat, themocured, full strength 70 percent "Kynar 500" coating consisting of a primer and a minimum 0.75mil dry mil thickness with a total minimum dry film thickness of 0.9 mil and 30 percent reflective gloss when tested in accordance with STM D 523.
   a) Durability: Provide coating that has been field tested under normal range of weathering conditions for minimum of 20 years without significant peel, blister, flake, chip, crack, or check in finish; without chalking more than NO. 8 in accordance with ASTM D 659; and without fading more than 5 NBS units.

2.05 INSULATION:

A. Roof: Two layers (6 inches total) R-19 with white foil scrim facing on bottom layer only.
1. Scrim facing on insulation that is exposed in the finished building shall be heavy, abuse resilient type. At other locations, scrim facing may be manufacturer's standard product.
2. Roof insulation shall be flexible, noncombustible fiberglass blankets with vapor resistant membrane. Vapor resistant membrane shall be laminated to insulation as composite unit. Insulation and vapor membrane shall carry Underwriters Laboratories Inc. (U.L. label) fire hazard classification indicating flame spread rating of 25 or less and a smoke developed rating of 450 or less, as a tested assembly.
3. Insulation system shall be applied under exposed metal roofing panels and over the roof support member. Vapor membrane shall always be placed to interior of building, whether it be exposed or nonexposed. Joints shall be lapped, taped, or folded, and stapled in accordance with building manufacturer's standard. Vapor membrane shall have a perm rating of not more than 0.02.
4. With R-19 blanket-type insulation only, thermal spacer (block) shall separate roof support member from roof panel, except at each concealed structural fastener. Spacer shall be of material having density of not less than 2 pcf and, if combustible material, shall be classified as having flame spread rating not greater than 25 when tested in accordance with ASTM E84-84.

B. Walls: One-layer (4 inches total) R-13 with white foil scrim facing on inside only, manufacturer's standard product.
1. Wall insulation shall be flexible, noncombustible fiberglass blankets with vapor resistant membrane. Vapor resistant membrane shall be laminated to insulation as composite unit. Insulation and vapor membrane shall carry Underwriters Laboratories Inc. (U.L. label) fire hazard classification indicating flame spread rating of 25 or less and a smoke developed rating of 450 or less, as a tested assembly.
2. Insulation system shall be applied under exposed metal wall panels and

over the wall support member. Vapor membrane shall always be placed to interior of building, whether it be exposed or nonexposed. Joints shall be lapped, taped, or folded, and stapled in accordance with building manufacturer's standard. Vapor membrane shall have a perm rating of not more than 0.02.

2.06 GUTTERS AND DOWNSPOUTS

A. Gutters: Gutters shall be provided complete with mitered corners, end pieces, and special pieces that may be required. Gutters shall be formed in sections not less than eight feet in length. Ends of each length shall be joined with riveted and sealed joints, except that expansion-type slip joints shall be provided at center of runs, unless specified otherwise. Gutters shall be supported on hangers of approved type, spaced at 36" o.c. maximum. Hangers and fastenings shall be constructed of metal compatible with gutters.

B. Downspouts: Provide manufacturer’s standard shapes and sizes, complete including elbows and offsets. Downspouts shall be provided in approximate 10' lengths; end joints shall telescope not less than 1-1/2", and longitudinal joints shall be locked. Gutter outlets shall be provided with zinc-coated steel, stainless steel, or nonferrous metal wire ball strainers of standard type. Downspouts shall be kept not less than 1" away from walls, and shall be fastened to walls at top, bottom, and at maximum 5' centers intermediately between, with leader straps, or concealed type fasteners; straps and fasteners shall be formed from metal compatible with the downspouts.

2.07 LIGHT TRANSMITTING PANELS

A. Manufacturer’s standard UV-resistant translucent panels, white, with measured haze value of 90% or greater when measured in accordance with ASTM D1003.

2.08 ACCESSORIES

A. Fasteners for Securing Panels:
   1. Fasteners for roof panels shall be 20-year fasteners.
   2. Provide fasteners for roof panels installed over purlins with 6-inch insulation.
   3. Fastening system shall be designed to withstand design loads specified herein.

B. Sheet Metal Accessories:
   1. Zinc-coated steel accessories shall be provided with zinc-coated siding or roofing, and aluminum accessories shall be provided with aluminum alloy siding or roofing. Zinc-coating for all sheet steel accessories, including continuous ridge vents, and louvers shall conform to 1.25 oz. PSF coating class.
   2. Caps, Strips, and Plates:
      a) Ridge caps, eave and edge strips, fascia strips, miscellaneous flashings, and miscellaneous sheet metal accessories, unless specified otherwise, shall be formed from the same materials and gauge as roof covering.
      b) Wall plates, base angles or base channels, and other miscellaneous framing members may be standard structural steel shapes, or may be formed from steel not lighter than 16 gauge.
   3. Roof Jacks and Curbs
      a) Openings 8" or smaller may be flashed and sealed to roof panel by jacks, providing complete structural support and weathertightness are maintained. Material shall be either metal with protective metallic coating or EPDM material with aluminum

sealing ring base.

b) Openings larger than 8", round or square, shall be framed with welded metal base fabricated from 0.07" thick (minimum) galvanized steel. Base and related appurtenance shall be supported by roof purlins and header framing. Base shall have minimum projection of 8" above weather surface of roof, and configuration of flanges shall match roof panel. Design of flanges shall provide for lapping of roof panels in shingle-fashion so that installation is water tight without depending on sealant. Flange-to-panel joint shall be sealed with nonhardening sealant and fastened in manner to provide complete support and weathertightness.

C. Miscellaneous Accessories:

1. Closure Strips: Formed of approved solid synthetic or natural rubber, or other material, standard with manufacturer of system furnished. Molded closure strips shall be free of opened voids and shall not absorb or retain water. Closure end strips shall be formed to match the corrugations or configurations of the roofing or siding being used and shall be provided where indicated and elsewhere to provide weathertight construction. Sealing material shall be used also for sealing joints in and around sealing strips at ridges, eaves, valleys, bottom course in siding on vertical surfaces, bolt holes before inserting fasteners, for flashings and corner closure sheets, and elsewhere to provide watertight construction. Bituminous type sealing materials shall not be used with factory color coated or painted sheets and panels.
2. Joint Sealing Material: Type as recommended by roofing and siding manufacturer to seal side and end laps in metal roofing of deep corrugation type where slope of roof is less than 3 in 12". Material shall be applied in accordance with manufacturer's printed instructions of material furnished. sealing material shall be used also for sealing joints in and around sealing strips at ridges, eaves, valleys, bottom course in siding on vertical surfaces, bolt holes before inserting fasteners, for flashing and corner closure sheets, and elsewhere to provide watertight construction. Bituminous type sealing materials shall not be used with factory color coated or painted sheet or panels.

2.09 FABRICATION

A. Structural steel members shall be sheared, formed punched, welded and painted in plant of manufacturer.
B. Welding shall be in accordance with standard practices of the American Welding Society, and shall be performed by qualified welders.
C. Clearly and legible mark each piece and part of assembly to correspond with previously prepared erection drawings, diagrams and instruction manuals.
D. Surface preparation shall conform to requirements of Steel Structures Painting Council Specification SSPC-SP3.
E. Paint shall conform to requirements of Steel Structures Painting Council Specification TT-P-636.
F. Dissimilar Materials:

1. Where aluminum surfaces come in contact with ferrous metal or other incompatible metals, the aluminum surfaces shall be kept from direct contact by one of the following methods:

a) Paint incompatible metal with coating of heavy-bodied bituminous paint.
b) Paint incompatible metal with prime coat of zinc-chromate primer

followed by one or two coats of aluminum metal-and-masonry paint, or other protective coating, excluding those containing lead pigmentation.

c) Nonabsorptive gasket.

d) Caulk between aluminum and incompatible metal.

2. If drainage from incompatible metal passes over aluminum, incompatible metal shall be painted by Method "a" or Method "b" above. Aluminum surfaces in contact with concrete or masonry materials shall be painted by Method "a". Green or wet wood, or wood treated with preservative, shall be painted by Method "a" or shall be given two coats of aluminum paint.

G. Finish:

1. Roof Panels: Galvalume or aluminized steel.
2. Wall and Other Panels: Kynar 500 fluoropolymer coating with minimum 70% resins; manufacturers standard color as shown on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Installer shall examine substrate and conditions under which work is to be installed. Notify Contractor in writing of any conditions detrimental in installation of work. do not proceed with work until unsatisfactory conditions have been corrected.

3.02 ERECTION

A. Framing Members: Plumb in both directions, guy and stay and space framing elements to assure proper fitting of prefabricated wall and roof coverings.

B. Wall and Roof Panels:

1. Wall Construction: Panels shall be applied with corrugations, ribs, or other configurations in vertical position. Panels shall be supplied in full wall height from base to eave with no horizontal joints except at junctions of door frames, window frames, louver panels, and similar locations. Side and end laps shall be sealed with joint sealing materials specified herein. Walls shall be flashed and sealed at base, at top, around windows, doors, framed louvers, and other similar openings. Placement of closure strips, flashing and sealing materials shall be accomplished in manner which will assure complete weathertightness. Flashing will not be required where approved "self-flashing" sheet or panels are used. Minimum end laps for panels shall be 2-1/2". Minimum side laps for panels shall be one corrugation or one configuration. side and end laps shall be sealed as specified herein for roofing, except that only one bead of plastic cement shall be required.
2. Roof Construction: Roof slope shall be as indicated. Roofing panels shall be applied with corrugations, ribs, or other configurations parallel to slope of the roof. Roofing panels shall be supplied in longest lengths obtainable with end laps occurring only at structural members. Roof curb units shall be installed in sequence with roof panels in shingle-fashion and location of units may be adjusted laterally up to 12 inches from locations shown to work with standing seams. Side laps shall be laid away from prevailing wind. Side and end laps shall be sealed with joint sealing material specified herein. Flash and seal roof at ridge, eaves, rakes, and projections through roof, and elsewhere to assure weathertight construction. Placement of closure strips, flashing, and sealing material shall be accomplished in an approved manner which will

assure weathertightness. Contact surfaces between roofing sheets at end and side laps shall be sealed with plastic cement, squeezed from pressure gun and forming two beads, each not less than 1/4" thick or building manufacturer's standard application.

3. Liner Panels: Where liner panels are installed in inmate areas (dayrooms and exercise) all edges shall be protected with an 18 ga angle connected to wall or abutted structure with tamper resistant screws. All connectors visible in finished job shall be tamper resistant.

C. Defects: Defects or errors in fabrication of building components shall be corrected by Contractor in a manner approved by the Architect. Defects or errors in fabrication of components, which cannot be corrected in an approved manner, shall be replaced by nondefective members at no additional cost to the Owner.

3.03 TOLERANCES

A. Framing Members: AISC Code of Standard Practice and Commentary and MBMA Code of Standard Practice and Commentary, latest editions.

END OF SECTION 133419

SECTION 15010

MECHANICAL GENERAL PROVISIONS

PART 1 - GENERAL

GENERAL CONDITIONS

The work described hereunder shall be installed subject to the Contractual Conditions for the entire Specifications.

CORRELATION

This Section of the Specifications and its accompanying Drawings are made separate for the convenience of the General Contractor in preparing his bid and in no way relieves the General Contractor of his responsibility to correlate the work under this Section with that of all other trades as regards the items to be furnished by various Subcontractors, the exact location of all equipment and materials and the necessity of planning the work of all trades to avoid interference.

PLANS AND SPECIFICATIONS

Drawings and Specifications are intended to clearly set forth all work, and the detailed description is added to assist in establishing the scope and the location of the several parts of the work. Collectively, they shall govern and control the scope, character, and design of the Work, and any item called for in any one of the documents shall be as though mentioned in all.

Failure to make reference in the Specifications to any items of the work shown on the Drawings, but necessary to the completion of the Work shall not relieve the Contractor of the full responsibility to furnish the materials and perform the work of such items, in a manner comparable to other items of similar nature for which detailed Specifications are included.

PROJECT FAMILIARIZATION

The bidder is expected to visit the site and familiarize himself with conditions at the site before submitting his bid. He shall familiarize himself with the work required throughout the entire project and shall make allowances for contingencies which may occur in the interconnection of the various systems.

EXPERIENCE

The Contractor performing this work shall be a Florida licensed, reputable firm, regularly performing commercial air heating and air conditioning and plant projects work as required by this project.

ALTERNATES AND ADDENDA

The Contractor shall investigate all Alternates, Addenda and Allowances as they relate to the Work of this Section.

TESTING

The Work shall include complete testing of all equipment and controls at the completion of the Work and making any connection changes or adjustments necessary for the proper functioning of the system and equipment.

WORK INCLUDED

Work covered under this Section consists of furnishing all labor, materials, tools, equipment, transportation, scaffolding, services, supervision, and performing of all operations required to properly complete all mechanical work in accordance with this Division of the Specifications and as indicated on the applicable Drawings, subject to terms and conditions of the Contract.

SUPERVISION OF WORK

The Mechanical Subcontractors are required to have a qualified and experienced superintendent on the job when any related work is in progress.

RELATED WORK SPECIFIED ELSEWHERE

The Contractor is cautioned to note carefully other Sections of the project Specifications with their cross references to other specific standard specifications, standard detail, etc., describing work to be furnished under these Specifications as well as any mechanical work that may be shown on electrical, structural, architectural, or other drawings, in order that he may fully understand the requirements and work to be provided under this Section of the Specifications.

ORDINANCES AND REGULATIONS

All work shall conform with all local and State ordinances or regulations governing the installation of such equipment. If work as laid out, indicated or specified is recognized to be contrary to or conflicting with local ordinances or regulations, the Subcontractor shall report same to the Architect/Engineer before submitting a bid. The Architect/Engineer will then issue instructions to resolve the discrepancy.

CODES AND STANDARDS

The latest adopted editions of the established standards of the following organizations, and individual standards named, shall be followed the same as if they were fully written herein and constitute a part of the Specification requirements except where otherwise specified:

National Fire Protection Associations (NFPA) Standards:
- NFPA 70, National Electric Code
- NFPA 90-A, Installation of Air Conditioning and Ventilating Systems.

Florida Building Code and Related:
- FL Building Code
- FL Mechanical Code
- FL Plumbing Code
- Florida Energy Efficiency Code for Building Construction
- National Board of Fire Underwriters
- SMACNA Standards

The foregoing rules, standards, regulations, specifications, recommendations and requirements shall be followed by the Contractor as minimum requirements. They shall not relieve the Contract from furnishing and installing higher grades of materials and workmanship which are specified herein or indicated on the Drawings.

Any material, equipment or workmanship specified by reference to the number, symbol or title of Specification or detail, or other standard rules, codes, regulations, etc., shall comply with the latest edition amendments and revisions thereto in effect on the date of these Specifications.

The Contractor shall submit proof, if requested by the Engineer or his representative, that the materials, appliances, equipment or devices that he furnishes and installs under this Contract meet the requirements of the Underwriters' Laboratories, Inc., or Factory Mutual, as regards fire and casualty hazards.

PERMITS, FEES, AND INSPECTIONS

Contractor shall coordinate all permits, pay all releated fees, and coordinate requisite inspections by both the Authority Having Jurisdiction (AHJ) and those requested by the engineer. Upon completion of the work the Contractor shall deliver to the Engineer a certificate of final inspection and a Certificate of Occupancy/Completion from the local AHJ.

The Contractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus and drawings required to comply with all applicable laws, ordinances, rules and regulations.

The Contractor shall inform the Owner of any work or materials which conflict with any of the applicable codes, standards, laws and regulations before submitting his/her bid.

MINOR DEVIATIONS

The Contractor shall note that the Mechanical Drawings are intended to indicate only the extent diagrammatically, general character and location of the work included. Work intended, but having minor details obviously omitted or not shown, shall be furnished and installed complete to perform the functions intended.

Arrangements of ductwork and equipment that differ materially from the obvious intent of the Drawings will not be permitted except where necessary to avoid interferences, and only where specifically approved by the Architect/Engineer. Drawings shall be furnished showing all changes. Any change resulting in a saving in labor and materials shall be made in accordance with a Contract change order.

BASIC MATERIALS AND METHODS

The materials and methods specified in this article are to be used for work specified throughout this Section of the Specifications.

All materials and workmanship shall be of the highest quality.

Any materials on the job rejected by the Architect/Engineer shall be removed from the premises.

The installation shall be made in a workmanlike manner in accordance with acceptable industry standards except where specific procedures are called for in these Specifications, in which case they shall be followed.

All materials shall be new, free of defects and of the manufacturers latest standard design.

Reference to a particular material or specific equipment by name, make or catalog number is to describe equipment which will meet the requirements of the project and is not intended to restrict bidding.

It is the intent that all of the equipment of a similar type shall be the products of the same (one) manufacturer when practicable, providing unit responsibility for each group.

REVIEW OF MATERIALS

Submittals shall be made in compliance with the General Conditions of the Contract for Construction and the following:

Submittals shall be identified by items numbers as listed in the pertinent section of the specifications and shall be accompanied by a letter of transmittal.

Certificates shall be in triplicate and where required in conjunction with other submittals shall accompany such submittals.

Materials and other items subject to approval shall not be purchased or incorporated in the work before receipt of written approval.

Submittals shall be rendered all at one time for the entire project. Partial submittals will not be accepted or acknowledged. Exception: If a few items have long shop drawing preparation time, then these items will be accepted later to avoid delaying the shop drawing procedure.

SHOP DRAWINGS

Shop Drawings are drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are prepared by the Contractor or any subcontractor, manufacturer, supplier or distributor and which illustrates some portion of the Work.

All shop drawings submitted shall bear the stamps of approval of the Contractor as evidence that the drawings have been checked by the Contractor. Any drawings submitted without this stamp of approval will not be considered and will be returned to contractor for proper resubmission. If the shop drawings show variances from the other requirements of the contract because of standard shop practice or other reason, the Contractor shall make specific mention of such variation in his letter of transmittal in order that, if acceptable, suitable action may be taken for proper adjustment. Otherwise, the Contractor will not be relieved of the responsibility for executing the work even though such shop drawings have been approved.

Submit six (6) copies of the shop drawings to be retained and additional copies as required by the Contractor, all items required under appropriate sections of the Specifications.

All materials are to be submitted in a hard cover, three ring binder. All materials are to be labeled with the pertinent Specification Section and are to be separated with dividers for each section of the Mechanical Specifications.

All materials submitted late or re-submitted shall be 3-ring punched and marked with the appropriate Specification Section Numbers.

PROJECT CLOSEOUT

The Contractor shall remove all temporary work and temporary facilities prior to final pay request.

The Contractor shall clean spaces/areas that were occupied by temporary work and temporary facilities. Remove debris, rubbish and excess materials from the sites. Burning or burying is not permitted on the sites.

GUARANTEES, BONDS AND AFFIDAVITS

Warranties:

The Contractor shall submit to the Owner all manufacturer's warranties on equipment furnished and installed under this Contract.

In addition, to the guarantee of equipment by the manufacturer of each piece specified herein, the Contractor shall also guarantee such equipment and shall be held for a period of two (2) years from final acceptance test to make good any defects of the materials or workmanship occurring during this period, without expense to the Owner.

Affidavits:

The Contractor shall provide affidavits as required in the non-technical portion of these Specifications, if attached or otherwise directed in writing.

OPERATION AND MAINTENANCE DATA

Manuals and Instructions:

The Contractor shall deliver to the Engineer, upon substantial completion of the Work, three (3) copies of descriptive literature related to the equipment installed under this Contract, including parts lists, wiring diagrams, maintenance and operation manuals and warranties customarily supplied by manufacturers for equipment incorporated in this work. The literature shall be neatly bound in a three-ring binder and delivered to the Engineer prior to final acceptances. Each manual shall include a copy of the Control Diagrams and a complete description of the operation of the control systems.

AS-BUILT DRAWINGS

As-Built Drawings are required. Maintain a legible record set on the job. Final record prints will be drafted by the Engineer at no charge assuming the set is organized and legible. Otherwise the engineer shall be reimbursed on an hourly basis for deciphering

the documents and field changes. The Owner requests three (3) paper copies and 1 electonic set of asbuilts.

QUALITY ASSURANCE

Products Criteria:

Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products. Items of equipment shall essentially duplicate equipment that has been in satisfactory use at least five (5) years prior to bid opening. Provide list of users upon request.

Equipment having less than a five-year use record, which in the opinion of the Engineer, provided significant benefits to the Owner such as improved energy efficiency, will be acceptable if it is a product of a manufacturer who has been regularly engaged in the manufacture of that specific type of product which has been used in similar applications for a period of two years. The Engineer reserves the right to require the Contractor to submit evidence to this effect for his approval.

Equipment Service: Products shall be supported by a service organization which maintains an adequate inventory of repair parts and is located, in the opinion of the Engineer, reasonably close to the site.

Manufacturer's Nameplates: Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.

Manufacturer's Recommendations: Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Engineer prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

FIRESTOPPING

Provide for firestopping of all mechanical systems. UL listed methods conforming to the situations present shall be utilized. Submit shop drawings of intended methods, including installation instructions and proof of UL Listing.

COORDINATION - NEW WORK INSTALLATION

Coordination: Location of piping, sleeves, inserts, hangers, ductwork and equipment shall be coordinated with all other trades. Locate piping, sleeves, inserts, hangers,

ductwork and equipment clear of windows, doors, openings, light outlets, and other services and utilities. Follow manufacturer's published recommendations for installation methods not otherwise specified.

Protection and Cleaning (new equipment/systems):

Equipment and materials shall be carefully handled, properly stored, and adequately protected to prevent damage before and during installation, in accordance with the manufacturer's recommendations and as approved by the Engineer. Damaged or defective items, in the opinion of the Engineer, shall be replaced.

Protect all finished parts of equipment, such as shafts and bearings, where accessible, from rust prior to operation by means of protective grease coating and wrapping. Close pipe openings with caps or plugs during installation. Tightly cover and protect fixtures and equipment against dirt, water, chemical or mechanical injury. At completion of all work thoroughly clean fixtures, exposed materials and equipment.

Electrical Work for Mechanical Systems: Electrical components shall be U.L. listed. All wiring components and devices shall conform to the National Electrical Code.

Wiring for Mechanical Equipment: All power wiring for mechanical equipment shall be provided by Division 16. All control wiring for mechanical equipment shall be provided by the controls' contractor, section 15975. Control wiring shall be difined as all wiring related to controls and not supplying power to the mechanical equipment.

Concrete and Grout: Use concrete and shrink-compensating grout 3000 psi minimum. Install in accordance with the manufacturer's recommendations.

Install gauges, thermometers, valves and other devices with due regard for ease in reading or operating and maintaining said devices. Locate and position thermometers and gauges to be easily read by operator or staff standing on floor or walkway provided. Servicing shall not require dismantling adjacent equipment or pipe work.

Where hanger spacing does not correspond with joist or rib spacing, use structural steel channels secured directly to joist and rib structure that will correspond to the required hanger spacing, and then suspend the equipment and piping from the channels. Drill or burn holes in structural steel only with the prior approval of the Engineer.

Use of chain, wire or strap hangers, wood for blocking, stays and bracing, nor hangers suspended from piping above will not be permitted.

Use hanger rods that are straight and vertical. Turnbuckles for vertical adjustments may be omitted where limited space prevents use. Provide a minimum of 1/2 inch clearance between pipe or pipe covering and adjacent work.

Field check and lubricate equipment requiring lubrication prior to initial operation.

Paint all primed and bare metals with two coats of enamel. Prepare surfaces in accordance with the manufacturer's recommendations. Color scheme shall match existing or ANSI standards.

INSTRUCTIONS

Fully instruct the Owner's maintenance staff in the operation and maintenance of the affected systems and furnish a letter as part of the closeout affirming this training has been accomplished. The Contractor shall give physical demonstration and verbal instructions for proper operation and maintenance of equipment to the Owner or his designated representatives. Schedule these demonstrations and instructions at the Owner's convenience.

Provide two hours of tour and demonstration of all equipment & controls installed under this project.

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SECTION 15400

PLUMBING

PART 1 - GENERAL

GENERAL CONDITIONS

The work described hereunder shall be installed in accordance with the "Mechanical General Conditions," Section 15010.

DESCRIPTION OF THE WORK

The extent of the work is indicated on the Drawings. In general, the work consists of, but is not limited to, the following:

Hot and cold water supply piping and all valves, fittings, etc.

Plumbing pipe insulation

A system of waste and vent piping.

Plumbing fixtures.

Domestic water heaters

RELATED WORK

Site Utilities see Civil Engineering Sections.

Electrical wiring is specified in the Electrical Sections.

QUALITY ASSURANCE

All materials and installations are to comply with the following. If conflicts occur between plumbing codes and the specifications, the most restrictive requirements shall govern.

Florida Building Code - 6th Edition

Florida Plumbing Code - 6th Edition

Florida Energy Efficiency Code For Building Construction - 6th Edition

Florida Administrative Code, 10D-10, Sanitary Facilities for Buildings Serving the Public and Places of Employment - Current

Accessibility Requirements Manual, Florida Board of Building Codes & Standards - Current

Furnish and install equipment having the characteristics and accessories indicated on the drawings or in these specifications. The manufacturer's specifications for the

models shown on the drawings or given as basis for design, plus all features, options, and accessories indicated on the drawings or in these specifications, whether or not standard for the model scheduled or offered as a substitute, shall constitute the minimum requirements for equipment furnished under this section.

SUBMITTALS

Submit to the Architect/Engineer for approval:

Water heaters.

Water cooler.

Plumbing fixtures.

Piping, P-Traps, valves, cleanouts, and drains.

CHANGES

The Drawings indicate generally the locations of plumbing fixtures, apparatus, piping, etc., and while these are to be followed as closely as possible, if before installation, it is found necessary to change the location of same to accommodate the conditions at the building, such changes shall be made without additional cost to the Owner and as directed by the Architect/Engineer.

PART 2 - PRODUCTS

PLUMBING FIXTURES, TRIM AND FITTINGS

Furnish and install all plumbing fixtures and trim, floor drains and cleanouts as shown on the Drawings. Fixtures shall be as specified or equivalent quality fixtures by American Standard, Kohler, Universal Rundle or Eljer. P-traps, Stops, etc. equal to Mcguire or Brasscraft.

Provide all items of brass and chrome plated finish except where otherwise noted.

Brackets, Anchors, and Cleats: Furnish and install where required for support, conceal behind finished wall.

PIPING

Where more than one material is specified for a particular application, the contractor may select.

All materials shall comply with latest ASTM specifications in each instance that ASTM has specifications and standards relating to such materials.

PVC Sewer Pipe, schedule 40, ASTM D2665.
Copper tubing, Type L, conforming to ASTM B88, with brazed or solder-joint copper, brass or bronze fittings conforming to ANSI B16.18 or B16.22.

Copper tubing, DWV grade, hard temper conforming to ASTM B306, with solder joint, cast bronze fittings conforming to ANSI B16.23. Tubing larger than 2 inches shall use wrought copper fittings conforming to ANSI B16.29.

Condensate Waste Pipe Above Grade

Copper tubing, DWV grade, hard temper conforming to ASTM B306, with solder joint, cast bronze fittings conforming to ANSI B16.23. Tubing larger than 2 inches shall use wrought copper fittings conforming to ANSI B16.29.

Condensate Waste Pipe Below Grade

PVC Sewer Pipe, schedule 40, ASTM D2665.

Above Ground Domestic Water Pipe:

Above ground domestic water pipe shall be type L seamless copper conforming to ASTM B88. Piping above grade shall be hard temper.

Press-Connect Fittings: ASME B16.51 cast or wrought copper or copper alloy press-connect pressure fittings.

Alternate Brazed Fitting: ASME B16.50 wrought or copper alloy. ANSI /AWS A5.8 filler materials according to Article 2.4 paragraph D.

Below Ground Domestic Water Pipe:

Below ground domestic water pipe shall be type provide type K seamless copper conforming to ASTM B88. Piping below grade shall be protected with a bituminous coating.

Exposed Pipe in Toilet Areas:

Exposed pipe shall be chrome plated brass, American Brass Co., or equivalent. Furnish and install chrome plated brass wall plates.

Lavatory and Similar Waste Arms:

Type M or L copper water tube, Mueller or equivalent.

PIPE ACCESSORIES:

Pipe sleeves: metal (pvc may be used where appropriate) sized to allow minimum clearance between pipe and sleeves or insulation and sleeves.

Provide chrome-plated brass escutcheon plates where exposed pipe passes through walls, floors, or ceiling in finished areas.

Furnish and install dielectric or isolation fittings at all points where copper pipe connects to steel pipe.

Adjustable wrought clevis type hanger and rods: Grinnel Company or equivalent. Provide copper hangers for copper piping.

Install water hammer arrestors as shown on the Drawings.

VALVES

Ball Valves: 125 lb., bronze ball valve.

TRAPS

For Lavatories and Sinks: Brass, chrome plated.

PART 3- EXECUTION

INSTALLATION OF WATER HEATERS

Provide ball valves on both the incoming cold water and leaving hot water supply piping. Provide unions to facilitate replacement of the heater. See details.

INSTALLATION OF PIPING

On vertical sanitary drain lines, connect all soil and waste inlets through sanitary tees, wyes, or wyes and eighth bends. Short radius fittings may be used for vent piping. On horizontal lines connect all waste and soil connections through wyes or wyes and eighth bends. Double branch fittings may be used on vertical lines and horizontal runs, providing proper grades can be maintained.

Make joints in PVC plastic pipe with solvent cement in accordance with pipe manufacturer's instructions.

Lay horizontal drain pipes to uniform grade; riser pipes, vertical. Make changes in directions of drain pipes with long bends. No screwed joints permitted in drain pipes, except as described herein.

Lay all sewers and branches, where practicable, on undisturbed earth cut at proper grade. Where laid on fill, provide adequate supports to maintain pitch of the line.

Sizes of risers and mains of water system piping shall be as designated on the Drawings. Verify any omitted sizes before installation.

Cover pipe openings at all times that the work is not in progress at that point.

Cut brass and copper pipe by means of hacksaw. Remove all burrs and metal chips, dirt, etc., before joining pipe. Chrome plated pipe shall show no wrench marks after installation; no threads shall show.

Adequately support all piping above floors inside the building from or on the building structure. Support piping suspended from the building structure by means of the specified pipe hangers and rods. Make maximum spacing between pipe supports as follows:

Nominal Pipe Size	Maximum Span
3/4" and under	5'
1"	7'
1-1/4"	7'
1-1/2"	9'
2"	10'
2-1/2"	11'
3"	12'
4"	14'

Sanitary and other drain piping shall be supported by at least one hanger on each full length of pipe close to hub where possible and at least one within 24 inches of each fitting, and wherever else required to prevent tendency toward deflection due to load. Provide a hanger at upper angle at each drop. Locate hangers adjacent to hubs on multiple fittings not more than four feet on centers.

For support spacing of all other horizontal piping refer to MSS-SP-69 and provide additional supports at valves, strainers, in line pumps and other heavy components. Provide a support within one foot of each elbow.

Vertical Pipe Supports: Up to 6 inch 60 feet long or not over 12 inch pipe up to 30 feet long, Riser clamps bolted to pipe below couplings, or welded to pipe and resting securely on the building structure. Vertical pipe larger than the foregoing, support on base elbows or tess, or substantial pipe legs extending to the building structure.

Vertical runs less than 15 feet long may be supported by the hangers on the connecting horizontal runs.

Bases of drain stacks: If not buried in earth support on concrete, brick in cement mortar, or metal brackets permanently attached to building structure.

Make joints in PVC plastic pipe with solvent cement in accordance with pipe manufacturer's instructions.

INSTALLATION OF VALVES

Isolate all major piping assemblies as shown on the Drawings and as required for proper operation and maintenance. All valves shall be accessible. Provide valve boxes and access panels where required for accessibility.

Install service valve for hot and cold water at each plumbing fixture.

INSTALLATION OF TRAPS

Trap each fixture by water sealing trap placed as near the fixture as possible.

Vent all traps and place within 5 feet of the fixture which it serves unless otherwise noted.

INSTALLATION OF PIPE SLEEVES

Install pipe sleeves at all locations where pipe passes through walls, floors, or ceilings above or below grade.

Install pipe sleeves for all piping inside masonry walls.

Where subject to moisture or weather, seal sleeves with watertight sealant.

INSTALLATION OF FIXTURES, TRIM, AND FITTINGS

Install the fixtures, trim and fittings specified, taking care to properly anchor each fixture.

Installation of carriers shall comply with manufacturers' maximum recommendations. Carriers shall be bolted to floor slab using all bolt holes or slots provided on carrier. Bolt size shall match hole or slot. Provide lock washer on each bolt. Use "Red Head" self drilling anchors as manufactured by Phillips Drill Co. or approved equal product to set bolts.

When the use of a wrench is necessary on chrome plated piping, protect the pipe from marring by use of felt or cloth wrapping beneath wrench jaws.

TESTS AND INSPECTIONS

Make all water and air tests of the piping systems in the presence of and to the satisfaction of the Architect/Engineer or his designated representative. Conduct these tests at such places and with timing to permit work to proceed with as little interruption as possible. Make tests before work is concealed.

Test water piping to hydrostatic pressure at 125 psi and hold for 4 hours.

After the installation of sanitary piping and before the pipe is concealed or the fixtures are installed, cap or plug the ends of the system and fill all lines with water to top of vents above roof and allow to stand until a thorough inspection has been made. Should leaks appear, repeat the tests until the system is tight.

Do not use resin, candle wax or any other such substance for stopping leaks in cast iron soil, waste or vent lines or in storm drain lines. Caulking of screw joints to stop leaks will not be permitted.

STERILIZATION

The sterilization process shall comply with all governing regulations and with the sterilization procedures recommended by the American Water Works Association. The chlorination process may be simplified by first flushing the system thoroughly clean, then charging with water containing a minimum of 50 parts per million of chlorine, allowing this to stand for 24 hours, then thoroughly flushing. After sterilization and final flushing, the local health authority is to be notified and their approval obtained in writing.

END

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SECTION 15761

DUCTLESS SPLIT SYSTEMS

PART 1 - GENERAL

GENERAL CONDITIONS

The work described hereunder shall be installed in accordance with the "Mechanical General Conditions," Section 15010.

DESCRIPTION OF THE WORK

The extent of the work is indicated on the Drawings.

In general, the work consists of, but is not limited to, the following:

Split system.

Refrigerant and condensate piping.

RELATED WORK SPECIFIED ELSEWHERE

Electrical wiring is specified in the Electrical Sections.

SUBMITTALS

Submit product data indicating rated capacities, required clearances, field connections weight, specialties and accessories, electrical nameplate data, and wiring diagrams.

Submit manufacturer's installation instructions.

Submit operation and maintenance data. Include manufacturer's descriptive literature, start-up instructions, installation instructions, and maintenance procedures.

Submit to the Architect/Engineer for approval five (5) copies of brochures, technical data and/or shop drawings of the following, and as many additional copies as required for Contractor use:

Condensing units.

Air handling units.

Thermostats.

DELIVERY, STORAGE, AND HANDLING:

Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

Protect units on site from physical damage. Protect coils.

WARRANTY:

Provide a one year parts warranty and a five year replacement compressor warranty.

PART 2 - PRODUCTS

SPLIT SYSTEM HEAT PUMP

General:

See Equipment Schedule.

Furnish an air-to-air electric heat pump designed for use with Refrigerant 410-A.

All coils shall be of nonferrous construction, having copper tubes and aluminum fins.

Unit shall have 24 volt control transformer with fusing.

Capacity and performance data is scheduled on the Drawings. Ratings shall be in accordance with ARI 240 standards.

Both units shall be configured to meet the spatial and access requirements of the project.

Condensing Unit:

Compressor shall be of the welded hermetic, scroll type with internal vibration isolation. Compressor motor shall have both thermal and current sensitive overload device. Compressor shall be equipped with a crankcase heater and have internal high-pressure protection, loss of refrigerant protection and short cycle protection.

Compressor speed shall be variable using inverter technology.

Fan motor shall be factory lubricated and internally protected. Fans shall be statically and dynamically balanced.

Cabinet shall be eighteen-gauge, zinc-coated steel with baked enamel or approved equivalent finish. Coils shall be protected by louver or pvc coated steel wire guard.

Air Handling Unit:

Fan shall be forward curved with double inlet, dynamically and statically balanced. The fan motor shall have internal overload protection.

Unit shall have enclosure intended for ductless exposed ceiling mounting.

Provide extra set of throw-away filters for installation at completion of building clean-up.

Thermostats:

Provide heating/cooling thermostat, staged as necessary. Provide lockable thermostat cover.

REFRIGERANT AND CONDENSATE PIPING AND INSULATION

Refrigerant piping shall be ACR Type L copper tubing with wrought copper fittings.

Elbows shall be long radius.

Brazing shall be sil-fos with 15% silver.

Condensate piping shall be copper type DWV.

Insulate suction and condensate lines with 3/4" Armaflex.

Paint Armaflex with a white latex paint.

Provide liquid line sight glass and filter dryer.

Provide service valves both liquid and suction lines.

PART 3 - EXECUTION

INSTALLATION

Entire installation shall be in accordance with the Drawings, Specifications and applicable requirements of the manufacturers of the equipment and shall perform satisfactorily at the completion of the work.

NOISE AND VIBRATION

Equipment shall operate quietly and the design of the base shall be such that the operation of the equipment shall cause no perceptible vibration in the structure adjacent to the equipment, nor cause, directly or indirectly, vibration or objectionable noise in any other portion of the building and/or in the building structure itself.

SUPPORTS

Furnish all supports for equipment covered in this Specification, as a part of this Section, unless otherwise indicated on the Drawings. Provide concrete base for condensing unit.

PAINTING

Equipment with a factory applied finish shall have scratches, chips, etc., primed and touched up with materials which will protect the surface and match the adjacent areas.

CLEANING AND ADJUSTMENTS

Upon completion of work, clean, oil, and grease all fans, motors, other running equipment, and apparatus and make certain that all such apparatus and mechanisms are in proper working order and made ready for test.

END

SECTION 15891

METAL AND FLEXIBLE DUCTWORK AND ACCESSORIES

PART 1 - GENERAL

GENERAL CONDITIONS

The work described hereunder shall be installed in accordance with the "Mechanical General Conditions," Section 15010.

DESCRIPTION OF WORK:

Extent of metal ductwork is indicated on drawings and in schedules, and by requirements of this section. In general, the work consists of, but is not limited to, the following:

A system of heating and air-conditioning supply and return air ductwork.

Dampers, air diffusers, and miscellaneous accessories.

QUALITY ASSURANCE:

Manufacture's Qualifications: Firms regularly engaged in manufacture of metal ductwork products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

Installer's qualifications: Firm with at least three (3) years of successful installation experience on projects with metal ductwork systems similar to that required for project.

Codes and Standards:

SMACNA Standards: Comply with SMACNA's "HVAC Duct Construction Standards, Metal and Flexible" for fabrication and installation of metal ductwork.

NFPA Compliance: Comply with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilation Systems".

SUBMITTALS:

Submit to the Architect/Engineer for approval six (6) copies of brochures, technical data and/or shop drawings of the following, and as many additional copies as required for Contractor use:

Ductwork and materials

Ductwork Insulation

Mastics

Grilles & accessories

Miscellaneous dampers and installation instructions

DELIVERY, STORAGE AND HANDLING:

Handle ductwork and equipment carefully to prevent damage. Do not install damaged sections or components; replace with new.

Store ductwork and equipment in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.

PART 2 - PRODUCTS

DUCTWORK MATERIALS:

Sheet Metal: Except as otherwise indicated, fabricate ductwork from galvanized sheet steel complying with ASTM A 527, lockforming quality; with G-90 zinc coating in accordance with ASTM A 525.

Single-Wall Spiral Round Duct: Round duct with mechanical fastening, spiral flat seams, complying with ASTM A527, with G-90 zinc coating in accordance with ASTM A 525.

DUCTWORK INSULATION MATERIALS:

Fiberglass Duct Wrap: Federal Specification HH-1-558B, 1 pcf density, k=0.24, rated to 450 degrees F operating temperature. FSK reinforced foil vapor retarder. Owens / Corning Type 100 or an approved equivalent.

Ducts located inside the conditioned envelope (in plenum): R>4.2, 1inch.
Ducts located above the insulation (in attic areas): R>6.0, 1.5 inch.
Ducts located exterior (outside): R>8.0, 2 inch.

MISCELLANEOUS MATERIALS:

General: Provide miscellaneous materials and products of types and sizes indicated and, where not otherwise indicated, provide type and size required to comply with

ductwork system requirements including proper connections of ductwork and equipment.

Duct Sealant: Non-hardening, non-migrating mastic or liquid elastic sealant, type applicable for fabrication/installation detail, as compounded and recommended by manufacturer specifically for sealing joints and seams in ductwork.

Ductwork Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork.

Flexible Ducts: Insulated spiral-wound spring steel with flame proof vinyl sheathing complying with UL 181, Class I air duct (duct connectors will not be accepted).

Grilles & Registers: Provide as scheduled on the drawings or an approved equivalent.

FABRICATION:

Duct sizes are internal free area unless otherwise noted.

Shop fabricate ductwork of gages and reinforcement complying with SMACNA "HVAC Duct Construction Standards".

Construct supply duct for 2” static pressure.

Limit angular tapers to 30 degrees for contracting tapers and 20 degrees for expanding tapers.

PART 3 - EXECUTION

INSTALLATION OF METAL DUCTWORK

Examine areas and conditions under which metal ductwork is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to installer.

Install metal ductwork in accordance with SMACNA HVAC "Duct Construction Standards". Assemble and install ductwork in accordance with recognized industry practices, which will achieve airtight and noiseless systems, capable of performing each indicated service. Install each run with minimum number of joints. Support ducts rigidly with suitable ties, braces, hangers and anchors of type which will hold ducts true-to-shape and to prevent buckling.

Use single-wall spiral seam round duct where specified and/or as needed to accommodate existing conditions.

Duct sizes shown are internal dimensions. Maintain free area equivalence when making transitions or when transforming between round and/or rectangular duct.

Seal all transverse and longitudinal joints, seams, etc. regardless of pressure class with approved duct mastic.

Routing: Field verify duct route prior to any fabrication. Coordinate layout with existing structure, suspended ceiling and lighting layouts and similar finished work.

Hangers for steel ducts shall be fabricated from sheet metal. Ducts shall be supported from the structure.

Penetrations: Where ducts pass through interior partitions and exterior walls, conceal space between construction opening and duct or duct insulation with sheet metal flanges/collars two gauges heavier than duct. Minimum width of flanges/collars shall be 1-1/2” or as required to completely seal opening. Overlap opening on rectangular openings by at least 1-1/2". Fasten to duct and substrata. Where ducts pass through fire-rated floors, walls, or partitions, provide in accordance with approved UL listed details and accepted industry practice.

Hard Ceiling or Sidewall Connections: Provide insulated sheet metal boots sized to fit the grille size as indicated. Secure boot to ceiling structure. Boot insulation shall be semi-rigid foil faced where exposed to the air stream and sealed with tape.

INSTALLATION OF FLEXIBLE DUCTS:

Maximum Length: For any duct run using flexible ductwork, do not exceed ten (10) feet extended length – use round spiral seam steel duct for longer runs. Install shortest possible length.

Installation: Install in accordance with Section III of SMACNA “HVAC Duct Construction Standards, Metal and Flexible". No bends shall be made with center-line radius of less than one duct diameter.

Flexible duct hangers shall be constructed from hanger wire and 3” wide sheet metal saddles. Wire gauge shall be per SMACNA and saddles shall have hemmed edges and corners. Support as needed to avoid kinks and flow obstructions.

END

SECTION 16010

ELECTRICAL - GENERAL PROVISIONS

PART 1 - GENERAL

APPLICATION

The work described hereunder shall be installed subject to the Contractual Conditions for the entire Specifications.

These provisions apply to all sections of Division 16 of this project except as specified otherwise in each individual section. Codes, standards, policies and requirements contained in this Section are applicable to all contract documentation.

CORRELATION

This Section of the Specifications and its accompanying Drawings are made separate for the convenience of the General Contractor / Construction Manager in preparing his bid and in no way relieves the General Contractor / Construction Manager of his responsibility to correlate the work under this Section with that of all other trades as regards the items to be furnished by various Subcontractors, the exact location of all equipment and materials and the necessity of planning the work of all trades to avoid interference.

DESCRIPTION OF WORK

Furnish all labor, materials, equipment and incidentals required to complete all electrical work as specified in this Division and as shown on the Contract Drawings. Division 16 work shall include the installation of a complete and properly operating electrical system. This system required consists basically of, and is not limited to, the following:

Extend the distribution system for lighting and power including the necessary feeders, branch circuits, installation of and connection to lighting fixtures, devices, panelboards, transformers, switches, and all other equipment shown or specified, and the connection to motors, and other power loads furnished under separate divisions.

Extend the building ground system and provide special grounds as indicated.

Connect all control devices as indicated, including all line voltage connections to equipment provided under other sections of the Specification or by other trades.

Furnish and install any necessary access panels for work performed under this section.

Furnish and install a complete emergency lighting system and exit signage as indicated.

Furnish and install a system of empty raceways, cable trays, backboards and equipment as indicated for telephone and network cabling, environmental controls, access controls and like.

Refer to other Divisions of this specification for electrical requirements of factory installed motors, controllers, power supplies, etc. Electrical connections to equipment furnished as specified in other sections of these Specifications or shown on other than the Electrical Drawings shall be governed by this Division of the Specifications.

The bidder shall inspect the present jobsite conditions before preparing his bid. The submission of a bid will be considered evidence that such a visit and inspection was performed by the bidder and that he takes full responsibility for all factors governing his work.

The electrical work shall be complete, fully operational, and suitable in every way for the service required. Drawings are generally diagrammatic in nature and do not show all details, devices and incidental materials necessary to accomplish their intent. Therefore, it shall be understood that such devices and incidental materials required shall be furnished at no cost to the Owner.

RELATED WORK

Drawings and general provisions of Contract, including General Conditions, Supplementary General Conditions, and Special Conditions sections apply to work specified in Division 16.

The Contractor shall be aware that other divisions of these Specifications may apply to related work required to perform Division 16 requirements. All related work shall be performed in accordance with those divisions.

CONFORMANCE

If the Contractor takes no exceptions to these Specifications in the Submitted Bid, the Contractor will be held totally responsible for failure to comply.

Any exception to the Specification shall reference the affected paragraph(s), subject(s), and list benefit to the Owner.

The Owner reserves the right to have the Contractor replace installed material or equipment which does not comply with these Specifications at the Contractor's expense.

SUBMITTALS

Obtain approval before procurement, fabrication, or delivery of items to the job site. Submit manufacturers' data on the equipment listed below and as directed in other Sections of Division 16. Follow the procedures required in Division 1 of this specification. Data shall be in the form of manufacturer's descriptive data sheets and engineering drawings and will be reviewed by the Architect/Engineer before materials and equipment are delivered to the work site. Review of the submittal by the Architect/Engineer is to check for general conformance to the design intent and will not relieve the Contractor of the responsibility for the correctness of all dimensions, conformance and the proper fitting of all parts of the work.

Panelboards and Circuit Breakers
Disconnect Switches
Plugs and Receptacles
Motor Starters
Transformers
Lighting Fixtures
Lamps and Ballasts
Lighting Controls and Installation Drawings*

* prepared by Manufacturer or System Supplier

Submit manufacturers' names and catalog numbers for the following materials:

Conduit, Fittings, and Couplings
Boxes and Fittings
600 Volt Wire and Cables
Grounding Equipment

The Contractor shall thoroughly check the submittal for accuracy and compliance with the contract requirements. Shop drawings and data sheets shall bear the date checked and shall be accompanied by the Contractor's statement that they have been checked for conformity to the Specifications and Drawings. Submittals not so checked and noted will be returned without review.

Deliver the entire electrical submittal to the Architect/Engineer complete and in one package. An incomplete or partial submittal may be returned to the Contractor without review.

EQUIPMENT SUBSTITUTIONS

Substitutions that do not increase installation value will not be accepted.

The Architect's review of the proposed substitutions and coordination documents is for the benefit of the Owner and not the Contractor and does not relieve the Contractor of responsibility for making any corrections necessary to insure the Owner receives full benefit of the original design intent.

No cost increase to the Owner for any changes due to coordination will be considered. The Architect/Engineer shall be compensated for any and all efforts associated with review and coordination of non-conforming equipment

CODES, INSPECTION AND FEES

Comply with the indicated edition of the following codes and ordinances. Where specific edition is not indicated, comply with the latest published edition.

American National Standards Institute - ANSI
- C2 – 1994 - The National Electrical Safety Code
- ANSI/IEEE C37.90.1 2012 Surge Withstand Capability (Swc) Tests For Relays And Relay Systems Associated With Electric Power Apparatus
- C62.41 - 2002 Transient Voltage Surge Suppressors (3rd revision)
- ANSI/NEMA MG 1 - Motors and Generators
- ANSI/NEMA MG 2 - Safety and Use of Electrical Motors and Generators

American Society for Testing and Materials - ASTM

National Fire Protection Association - NFPA
- NFPA 37-2015; Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines
- NFPA 70 - 2014; The National Electrical Code
- NFPA 72 – 2013;The National Fire Alarm Code
- NFPA 75 – 2013; Standard for the Protection of Electronic Computer/Data Processing Equipment
- NFPA 90A – 2015; Standard for the Installation of Air Conditioning and Ventilating Systems
- NFPA 99 – 2015; Standard for Health Care Facilities
- NFPA 101 – 2015; The Life Safety Code
- NFPA 110 - 2013; Standard for Emergency and Standby Power Systems
- NFPA 111 – 2013; Standard on Stored Electrical Energy Emergency and Standby Power Systems
- NFPA 780 – 2011; Standard for the Installation of Lightning Protection Systems
- NEMA ICS 1 and 2, and

Florida Building Code
- FBC-B 2017; The Florida Building Code 6th Edition
- FPC 2017; The Florida Fire Prevention Code 6th Edition
- FBC-M 2017; The Florida Mechanical Code 6th Edition

FBC-P 2017; The Florida Plumbing Code 6th Edition
State Requirements for Educational Facilities

Electronic Industries Association/Telecommunications Industries Association - EIA/TIA
568C - Commercial Buildings Telecommunications Cabling Standards – 3rd Revision
569 - Commercial Buildings Standard for Telecommunications Pathways and Spaces
606 - Administrative Standard for Telecommunications Infrastructure of Commercial Buildings
607B - Commercial Building Grounding and Bonding Requirements for Telecommunications

Federal Communications Commission - FCC

Insulated Cable Engineers Association - ICEA

Institute of Electrical and Electronic Engineers – IEEE
383 Vertical Flame Test
446 Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications
587 Transient Voltage Surge Suppressors
802 Specifications for Local Area Networks

National Electrical Manufacturers Association

Serving Utility Company Policies

Underwriters Laboratories - UL
5 Surface Raceway
444 Communications Cable
467 Electrical Grounding and Bonding Equipment
506 Enclosures 514A Outlet Boxes and Fittings
514C Non-metallic Outlet Boxes and Fittings
869 Electrical Service Equipment 1449 Transient Voltage Surge Suppressors
1008 Automatic Transfer Switches
1863 Communications Devices
2200 Standard for Stationary Engine Generator Assemblies

Obtain all permits required. Contractor shall pay all fees for permits and inspections.

COMPLIANCE AND REVIEW

Within two weeks of the awarding of the contract, and before any work is commenced, the Contractor shall meet with all legal authorities having jurisdiction, review all materials and details of this project, and agree on any required revisions. A letter shall be forwarded to the Architect/Engineer listing the names, dates and place of such review and the revisions required. A copy of the letter shall also be sent to the reviewing authority.

The Contractor shall also meet with each serving utility and repeat the above procedure. A letter certifying each meeting shall also be written with the information as described above.

TEMPORARY LIGHTING AND POWER

Provide temporary lighting and power during construction. The Contractor shall contract directly with the serving utility company for temporary and construction power. Temporary power shall be 120/240 volt, single phase.

The Contractor shall pay unless otherwise prearranged with the serving utility company all service connection fees for temporary power installation and all electrical bills for temporary construction power until the facility is switched over to main building power.

Temporary wiring shall be done in a safe and neat manner. See Article 590 of the NEC.

Provide a minimum of one (1) 100 watt incandescent lamp for every 300 square feet of interior space being constructed.

Provide 30 amp, 120/240 volt single phase power points throughout the construction area such that a power point will be within fifty feet of where any saws, drills, or other electrical tool is being used. Each power point shall have a disconnecting safety switch.

Provide 20 amp receptacles with ground fault interrupting circuitry. Outdoor or otherwise exposed receptacles shall have weatherproof covers. Provide any necessary special outlets required.

Size temporary power conductors so that voltage drop is kept below 5% at maximum designed load at the delivery point.

RECORD DOCUMENTS

Prepare record documents in accordance with Division 1 requirements. Record documents shall be complete and accurate and clearly show deviations to the Contract Drawings. Additionally, indicate major raceway sizes and routings, locations of all control devices, all equipment and locations to scale, and fuse and circuit breaker ratings and arrangements.

Prepare bound sets of equipment Operation and Maintenance Instructions. These instructions shall include the name and location of the system, the name and telephone number of the Contractor, and all subcontractors installing the system or equipment, and the name and telephone number of each local manufacturer’s representative for the system or equipment.

Furnish bound copies of all test results required in other sections of this division.

GUARANTEES

Equipment (excluding lamps): one (1) year from final acceptance by the Owner. Materials and labor: one (1) year from final acceptance by the Owner.

All equipment shall be warranted to be free from defects in workmanship, design and materials. If any part of the equipment should fail during the warranty period, it shall be replaced and the unit(s) restored to service at no expense to the Owner.

In addition to the guarantee of equipment by the manufacturer the Contractor shall also guarantee such equipment for a period of one (1) year from final acceptance by the Owner. The Contractor's one (1) year guarantee shall be for equipment, materials, and labor.

The manufacturer's warranty period shall run concurrently with the Contractor's warranty period. No exception to this provision will be allowed.

Additional guarantee requirements specific to certain parts or assemblies or installations may be in the General and Special Conditions, or other Sections of these Specifications.

PART 2 - PRODUCTS

EQUIPMENT AND MATERIALS

Furnish materials or equipment specified by manufacturers named.

Materials furnished shall be new, undamaged and packed in the original manufacturer's packing.

All equipment and apparatus shall bear the seal of approval of the Underwriter’s Laboratory where testing and listing performance criteria has been established for like items.

Protect equipment and materials from mechanical and water damage during construction. Suitable storage facilities shall be provided. Equipment shall not be stored out-of-doors except as follows:

> Concrete items, plastic conduit if protected from sunlight, rigid metal conduit if protected from water and debris, padmounted equipment for outdoor installation if maintained in a normal weathertight condition, ground rods, and large spools of cables with ends properly sealed. In no case will materials be

stored directly on the ground. Provide suitable timbers or billets on which items will be stored out of direct contact with the earth.

All items to be installed shall be free of rust and dirt. Damaged materials and equipment shall be replaced by the Contractor at no cost to the Owner.

All electrical panels, enclosures, raceways, conduit, and boxes shall be fabricated of metal unless indicated otherwise.

EQUIPMENT AND MATERIALS STANDARDS

Design and fabrication of electrical equipment and materials:

The American National Standards Institute (ANSI)
The American Society of Mechanical Engineers (ASME)
The American Society for Testing and Materials (ASTM)
The Institute of Electrical and Electronic Engineers (IEEE)
The National Electrical Manufacturers Association (NEMA)
The Occupational Safety and Health Administration (OSHA)
The Underwriters Laboratories (UL)
The National Fire Protection Association (NFPA)

Comply with the latest edition and revisions of these codes and standards.

EQUIPMENT RATINGS

Horsepower and wattages of equipment shown on the Drawings are estimated and comply with a certain basis of design. It is the Contractor's responsibility to coordinate with, and furnish proper connections to equipment substituted and accepted as equivalent to the basis of design.

Conduit, wire, disconnects, fuses, and circuit breakers shall be sized to suit the horsepower and wattage of equipment actually furnished. However, conduit, boxes, wire or disconnects shall not be sized smaller than shown on the Drawings.

PART 3 - EXECUTION

QUALITY ASSURANCE

Installer's Qualifications: At least three years of successful installation experience on projects with electrical work similar to that required for this project.

Manufacturer's Qualifications: Manufacturers regularly engaged in the manufacture of electrical components and equipment of the types and sizes required, whose products have been in satisfactory use in similar service for not less than five years.

Electrical work shall be performed by experienced persons skilled in the trade.

Work shall be supervised by a licensed journeyman or master electrician who shall be on the job site at all times while work is in progress.

Work shall be done neatly and in keeping with good practice and conventions of the trade. The electrical installation shall be of high quality, and of the performance level associated with top level commercial electrical installations as determined by the Architect/Engineer and the National Electrical Code.

IDENTIFICATION

Provide laminated plastic nameplates for each panelboard, automatic transfer switch, safety disconnect, equipment enclosure and all other major pieces of equipment installed or modified as part of this contract.

Furnish all starters, disconnect switches and control panels with engraved name plates identifying the equipment served. Attach nameplates to equipment, aligned with structural features of equipment, with two pressure pins or #4 stainless steel screws, nuts, and lockwashers.

Identification of flush mounted panelboards and other cabinets shall be on the inside of the cabinet only.

Panelboards shall have typewritten directories with all loads thoroughly described for each circuit. Update existing panelboards and their directories to reflect new work.

CLEANING AND PAINTING

Clean all equipment and boxes thoroughly inside and outside at the completion of installation. Do not leave dirt and debris inside panelboard and equipment cabinets, device and junction boxes, etc.

All painting shall be done according to the Finishes Section of these specifications.

Touchup scratched or marred surfaces of lighting fixtures, panelboards, motor control centers, switchboards, etc. with paint furnished by the equipment manufacturer specifically for the purpose.

Plywood backboards shall be of fire retardant plywood, painted with two coats of fire-resistive finish.

EXCAVATION, TRENCHING AND BACKFILLING

Perform all excavation and trenching to install raceways indicated on the drawings.

No tunneling shall be allowed unless written permission is received by the Architect/Engineer.

Excavated material not suitable for backfill shall be removed from the job site.

Insure that the bottom of trenches are uniform, without large rocks or lumps of dirt which could damage the raceway or conductors.

Backfill with material that will compact readily. Compact backfill material from bottom of excavation up, to within 2” of surrounding undisturbed material.

Cover shall not be less than surrounding grade and no greater than 2" above surrounding grade.

TESTS

Contractor shall test all wiring for shorts and all equipment for proper grounding before energizing. Equipment shall be thoroughly checked and adjusted for proper operation. Check motors for proper rotation before energizing and adjust if necessary.

END

SECTION 16100

BASIC MATERIALS AND METHODS

PART 1 - GENERAL

SCOPE OF WORK

Furnish all labor, materials and equipment and incidentals required to construct and install the complete electrical systems as indicated on the Drawings and as specified in this Section.

STANDARD OF MATERIALS

All materials, equipment and apparatus covered by this specification shall be new, of current manufacture and shall bear the seal of approval of the Underwriters' Laboratories.

All equipment and materials shall have ratings established by a recognized independent agency or laboratory. The Contractor shall apply the items used on this project within the ratings and subject to any stipulations or exceptions established by the independent agency or laboratory.

All conduits and raceways, wire, devices, panelboards, switches, etc. of a given type shall be the product of one manufacturer.

SUBMITTALS

Manufacturer's data and shop drawings for all components, fixtures, assemblies and accessories indicated in this Division. Submit in accordance with Division 1.

PART 2 - PRODUCTS

RIGID CONDUIT, TUBING AND FITTINGS

Rigid steel conduit: zinc coated, threaded type conforming to the requirements of UL 6 and ANSI C80.1 standards. Zinc coating shall be applied to both inner and outer surfaces.

Intermediate metal conduit: hot-dipped galvanized, threaded type conforming to the requirements of UL 1242 and ANSI C80.6 standards.

A fitted thread protector shall protect threaded ends from damage during shipment and handling.

Fittings for rigid steel and IMC conduit: zinc coated, threaded type, conforming to Federal Specification W-F-408.

Electrical Metallic Tubing (EMT): UL 797 and ANSI C80.3 standards.

Fittings for electrical metallic tubing: Federal Specification W-F-408. Steel compression or set-screw type, galvanized or cadmium plated, and suitable for location of installation. Conduit bushings shall be metallic with insulated throats. Insulating grounding type bushings shall be provided where required under "Grounding". EMT connectors shall be similar to T&B "Insuline" with completely insulated throats. Field applied insulated throats are not acceptable.

Rigid aluminum conduit: UL 6 and ANSI C80.5 standards.

Couplings, fittings, pipe straps and spacers used with aluminum conduit shall be fabricated of aluminum.

Fittings for rigid aluminum conduit: threaded type, fabricated of aluminum.

Plastic conduit for direct burial: UL labeled Schedule 40 PVC manufactured to NEMA TC-2 specifications, and UL 651 specifications. Plastic conduit concrete encased may be Type EB.

Plastic interduct for installation in PVC conduits: UL labeled and listed for installation of inside/outside communication cable.

Couplings, fittings, pipe straps and spacers used with rigid plastic conduit shall be fabricated of plastic.

Fittings for plastic conduit: manufactured to NEMA TC-3 specifications.

Acceptable Metal Conduit and Tubing Manufacturers:

EMT: Allied Tube & Conduit Co.
Wheatland Tube Co.
Triangle PWC, Inc.

Fittings: Steel City
Thomas & Betts (T&B)
Raco Inc.

FLEXIBLE METAL CONDUIT, COUPLINGS AND FITTINGS

Flexible metal conduit for dry interior applications: Federal Specification WW-C-566 and UL 1, continuous, spiral wound galvanized steel type.

Fittings (connectors) for flexible metal conduit: UL E 23018. Squeeze Type malleable iron zinc plated.

Flexible metal conduit for damp or exterior applications: liquid tight, UL listed, spiral wound galvanized steel with PVC outer jacket.

Fittings for liquid tight conduit: Federal Specification W-F-406. Provide cadmium plated, malleable iron fittings with compression type steel ferrule and gasket sealing rings and insulated throats.

Acceptable Metal Conduit and Fittings Manufacturers:

FMC:	Alflex Corp. American Flexible Conduit Co. Anaconda Metal Hose, ANAMET Inc.
FMC Fittings:	Steel City Thomas & Betts (T&B) Raco Inc.
Wall and Floor Seals:	O-Z/Gedney Co. Spring City Electrical Mfg. Co. Chase Technology Corp.

CONDUIT MOUNTING EQUIPMENT

Hangers, rods, backplates, beam clamps etc. shall be hot-dipped galvanized iron or steel. They shall be as manufactured by the Appleton Electric Co., Thomas and Betts Co., Unistrut Corp., or approved equal.

JUNCTION BOXES

Sheet Steel Outlet Boxes: conform to UL 514A, “Metallic Outlet Boxes, Electrical”, UL 514B, “Fittings for Conduit and Outlet Boxes, Covers, and Box Supports”, and NEMA OS1, “Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports”.

Sheet Steel: Flat-rolled, code gauge galvanized steel.

Acceptable Manufacturers: Sheet-steel boxes shall be manufactured by RACO, Steel City or equal.

All junction boxes and pull boxes shall be sized per NEC requirements and be of the proper NEMA classification for the locations where they are installed. Where boxes occur above other than lift-out ceilings, access panels must be provided.

Wet location covers shall meet NEC wet location requirements (shall comply with NEC 2014 Article 406.9). Covers shall be “in-use” type and shall mount vertically or horizontally and be of gasketed heavy-duty polycarbonate construction with clear cover with lockable hasp for 1/8" shank lock.

OUTLET BOXES

Switch, receptacle and wall or ceiling mounted junction boxes shall be the 4" X 2 1/8" square type. Tile, dry wall, or flat cover plates for one or two devices shall be furnished for each box as required.

LIGHTING FIXTURE BOXES

Lighting fixture boxes shall be the 4" X 1 1/2" octagonal type.

TELEPHONE AND NETWORK SYSTEM OUTLETS

Wall outlets shall in general consist of four inch (4") square boxes with single gang switch ring. Conduits shall be supplied turned out of wall above ceiling assembly. Conduits shall be ¾” or larger, with insulated bushing installed on all bare ends.

Install finished blank plates on all unused openings.

OUTDOOR BOXES

Cast Aluminum Boxes: exposed, exterior locations; copper free aluminum, threaded raceway entries, and features and accessories suitable for each location including mounting ears, threaded screw holes for devices, and closure plugs.

Boxes shall have a rear opening in addition to necessary top and bottom openings. Boxes shall be provided complete with a minimum of two closure plugs and self-threading ground screw. Boxes shall have a thermoset, baked enamel silver gray finish. Weatherproof cover plates for one or two devices shall be furnished for each box as required.

Nonmetallic boxes shall be thermoplastic or polyester fiberglass types as manufactured by Carlon or Pass & Seymour.

LOCATION OF OUTLETS

The approximate locations of outlets, etc. are shown on the drawings. The exact locations shall be determined at the building.

It is the responsibility of the Contractor to note the locations and heights of cabinets, counters, shelving units, etc. before the installation of outlets.

CONDUIT BODIES

Conduit bodies shall be constructed of galvanized or cadmium plated malleable iron or copper-free aluminum. Galvanized steel or aluminum covers and gaskets shall be supplied.

LB's 3" and greater shall be mogul type with domed covers.

CONDUCTORS

Compliance: Provide wires, cables and connectors that comply with the following standards as applicable:

UL Standard 83	Thermoplastic Insulated Wires and Cables
UL Standard 486A	Wire Connectors and Soldering Lugs for Use with Copper Conductors
UL Standard 854	Service Entrance Cable
NEMA/ICEA WC-5	Thermoplastic Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
NEMA/ICEA WC-8	Ethylene Propylene Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
IEEE Standard 82	Test procedures for Impulse Voltage Tests on Insulated Conductors

Wire and cable manufactured more than twelve months before delivery to the jobsite shall not be used.

All conductors shall be soft-drawn copper of not less than ninety-eight percent (98%) conductivity, with NEC Type THW, THHN, or THWN for No. 4 and smaller, and Type RHW, THW, or THWN for No. 2 and larger, 600 volt insulation.

Jackets: Factory applied nylon or PVC external jacketed wires and cables for installation in raceways and where indicated.

Color coding of all ungrounded service, feeder, and branch circuits conductors shall be required according to the following convention:

120/240 Volt, 1 phase: black and red

Ground wires shall be green and neutrals shall be white. Isolated grounding conductors shall be green with yellow stripe or green with applied yellow tape to indicate isolated ground. Green and white shall be used for these purposes only. Where grounded conductors of different systems are installed in the same raceway, box, auxiliary gutter, or other type of enclosure, each grounded conductor shall be individually identified by system. Additional grounded conductors shall be white with a readily distinguishable colored stripe, other than green, running along the insulation.

Conductors No. 12 AWG through No. 10 AWG shall be solid and No. 8 AWG and larger shall be stranded. No conductors smaller than No. 12 AWG shall be used except as otherwise noted.

Control conductors shall be No. 14 AWG Type TW, stranded unless indicated otherwise.

Multi-conductor control cable shall be stranded copper, 600 volt polyvinyl chloride insulated and jacketed Type PNR.

Conductors for installation in cable tray shall be specifically approved for installation in cable trays per Article 336 of the NEC.

Acceptable manufacturers: Anaconda Wire and Cable Co., General Electric Co., Okonite Co., Southwire Co., or Rome Cable Co.

CABLE AND WIRE SPLICES

General: the materials shall be compatible with the conductors, insulations and protective jackets of the respective cables and wires. Use connectors with ampacity and temperature ratings equal to or greater than those of the wires upon which used.

In locations where moisture might be present, the splice shall be watertight and submersible.

Connectors: UL 486A. Aluminum and aluminum alloy fittings will not be accepted. Connectors shall be plated with tin or tin alloy.

Conductor Sizes No. 6 AWG and Larger: Splices in conductors shall be made with indenter, crimp connectors and compression tools or with bolted clamp type connectors to insure a satisfactory mechanical and electrical joint.

INSTRUMENTATION CABLE

Process instrumentation wire shall be twisted pair, 600 Volt, polyethylene insulated, copper tape shielded, polyvinyl chloride jacketed, manufactured by General Electric Co., Okonite Co., Belden Corp., or equal.

WIRE AND CABLE MARKERS

Wire and cable markers shall be "Omni-Grip" as manufactured by Brady Worldwide, Inc., or equal.

Wire and cables with diameters exceeding the capacity of the “Omni-Grip” shall be marked with pre-printed, self-adhesive vinyl tapes as manufactured by Brady Worldwide, Inc., 3M Co., or equal.

RECEPTACLES

Receptacles shall be furnished and installed where shown on the drawings and shall conform to the following requirements:

Grounding type duplex receptacle: rated 20 amperes, 125 volt, 2 wire, 3 pole with grounded shunt (yoke permanently grounded to third clip), NEMA Configuration No. 5-20R, and conforming to Federal Specification W-C-596F (submit proof of compliance).

All receptacles listed on the drawings shall be specification grade receptacles.

All exterior devices shall be designed for the application and shall be installed in a waterproof enclosure with proper cover.

Acceptable manufacturer: Eagle, GE, Hubbell, Leviton or Pass and Seymour.

SWITCHES

Flush, enclosed type, specification grade, rated at 20 amperes, 120/277 volts, alternating current only, quiet operation, and shall comply with Federal Specification W-S-896F (submit proof of compliance). Switch housing shall be color coded for current rating.

Acceptable manufacturer: Eagle, GE, Hubbell, Leviton or Pass and Seymour.

Motor switches with inherent thermal overload protection shall be Square D, Type F for flush or surface mounting as required by the location of the unit. Units shall be furnished with pilot lights as indicated.

DEVICE PLATES

All plates for switch, receptacles and telephone outlets located on finished walls shall be UL listed stainless steel with the number of gangs required for the application. All plates for outlets located on unfinished walls or on condulet type fittings shall be zinc coated sheet metal with rounded or beveled edges.

Weatherproof plates shall be of stainless steel, gasketed, sized with twin covers for duplex receptacles, and weatherproof switch for switch plates.

Device plates shall be factory engraved where indicated on the drawings. Letters shall be black filled.

RELAYS

Relays shall be electrically held and operated. Relays shall be mounted in a NEMA-1 enclosure. The contactors shall be capable of switching inductive and resistive loads.

TIME CLOCK

The electronic time switch shall be a solid state digital type capable of distributing set points on independent daily schedules throughout a 7 day time period. The time switch shall provide for 5 weekday programming, 2 weekend day programming or all 7 day programming to simplify program entry for typical 5/2 day load control. A copy feature shall be provided for duplicating full daily schedules where the 5/2 day scheduling is not applicable. The time and set points shall be programmable to the nearest minute with a minimum ON duration of 1 minute and a maximum of 6 days, 23 hours and 59 minutes. The time switch shall have a digital LED readout and prompt LEDs for each function to further simplify program entry. Each load control shall include an ON/OFF pushbutton, an ENABLE/DISABLE switch and an LED load status indicator. The time switch shall provide an operating temperature range of -40° F (-40°C) to 122° F (50° C).

The time switch shall provide astronomic programming and momentary or interval programming for any or all circuits independently. Astronomic control shall automatically calculate center of time zone times for both sunrise and sunset, and allow user-selectable offset of actual times. Pulse output shall be programmable for any duration of 1 to 127 seconds and interval output for up to 6 days, 23 hours and 59 minutes. Interval output shall also provide for user selectable override to turn load(s) on for a limited programmed time period up to 6 days, 23 hours and 59 minutes.

The time switch shall provide full year control by providing automatic leap year and daylight saving time adjustment. A user selectable override shall be provided for states not observing daylight saving time. The time switch shall also provide holiday or special day control requirements by providing up to 99 holiday schedules. Each of the holiday schedules shall be programmable for a single day or any duration as required. Each holiday schedule shall provide automatic no load activity and shall be independently programmable for a unique load schedule if required.

A non-volatile memory shall maintain all program data for the life of the time switch without the need for battery backup. The time switch shall include a factory installed lithium battery backup which shall maintain clock time and calendar data for 8 years minimum. The single coin cell backup shall be user replaceable without removing the field wiring.

The time switch logic control circuitry shall be isolated and shielded to prevent EMI and RFI interference, for reliable operation in electrically noisy environments. The power board circuitry shall provide protection for transients up to 6,000 volts. All control times shall be accurate to the minute and synchronized to the 50 or 60 Hz input. The time switch shall provide user-selectable 12 hour AM/PM or 24 hour clock formats.

The time switch shall be enclosed in a lockable steel NEMA 1 enclosure. The time switch shall be powered by a user selectable 120, 208, 240 or 277 VAC 50 or 60 Hz source. Switch configuration to be SPDT for each circuit with a UL 916 Energy Management Equipment listed rating of:

Normally Open Contacts C
- 20 amp resistive/general purpose, 120/277 VAC
- 20 amp resistive/general purpose, 28 volts DC

PANELBOARDS

Compliance: NFPA 70 National Electrical Code, UL 67, “Electric Panelboards”, NEMA Publication PB1, “Panelboards”, Federal W-P-115a Type 1, Class 1 specifications and NEMA PB 1.1, “Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less”.

Provide factory assembled panelboards in sizes and rating as indicated. Panelboards shall be UL listed and labeled.

Acceptable manufacturers: panelboards shown on the drawings shall be manufactured by Cutler-Hammer, Square D, or Siemens.

LIGHTING AND APPLIANCE PANELS

Provide dead front safety type lighting and appliance panelboards as indicated, with panelboard switching and protective devices in quantities, ratings, types, and with arrangement shown; with anti-turn solderless pressure type main lug connectors approved for use with copper conductors.

Refer to the drawings to determine each panelboards pertinent characteristics such as bus rating, main circuit breaker or lugs only, voltage rating, number of phases, number of positions required, etc.

Select unit with feeders connecting at the top of the panel. Equip with copper bus bars with not less than 98 percent conductivity, and with full size neutral bus; provide suitable lugs on neutral bus for outgoing feeders requiring neutral connections.

Interrupting ratings shall be coordinated with the available short circuit current. Provide molded case main and branch circuit breaker types for each circuit, with toggle handles that indicate when tripped. Where multiple pole breakers are indicated, provide with common trip so overload on any pole will trip all poles simultaneously.

All panels shall be provided with an equipment grounding bus similar to, but isolated from the solid-neutral bus. Provide panelboards with bare uninsulated grounding bars suitable for bolting to enclosures.

Panels shall be carefully aligned and rigidly secured in place with the top of the cabinets located 78 inches above the finished floor.

Each panel shall be furnished with an identification plate as specified in the "Equipment Identification" section of this specification.

Distribution panels which are flush mounted must have door on front of panel.

Circuit Breakers:

Qualifications: NEMA AB3 - 1984 “Molded Case Circuit Breakers”.

Panelboards shall be equipped with thermal-magnetic molded case circuit breakers with trip ratings as shown on the drawings.

Circuit breakers shall be quick-make and quick-break units with positive trip indicating mechanism and common trip on all multi-pole breakers.

Single pole 15 and 20 amp circuit breakers shall be UL listed as "Switching Breakers" and be marked SWD.

Circuit breakers shall be the bolt-on type.

Bus Assembly:

Bus bar connections to the branch circuit breakers shall be the "phase sequence" type.

Bus bars shall be of copper construction. All current carrying parts of the bus shall be plated.

Buses shall be full length with constant cross sectional area, designed for the bus current indicated.

Cable lugs shall be furnished in the quantity and size required for the size and number of conductors indicated.

Mains ratings: as shown on the drawings.

Short circuit current rating: as shown on the drawings. Panelboards, as a complete unit, shall have a short circuit current rating equal to or greater than that indicated. It shall be understood that the minimum rating for 240 and 480 volt rated panelboards shall be 10,000 and 14,000 RMS symmetrical amperes respectively.

Cabinet construction:

Panel enclosures: UL 50. Enclosures shall be furnished without knockouts. All knockouts shall be field cut.

The panelboard bus assembly shall be enclosed in a dead front safety constructed steel cabinet.

The size of the wiring gutters and gauge of steel shall be in accordance with NEMA and UL standards; except that the thickness of steel shall not be less than 16 gauge.

The box shall be fabricated from galvanized steel. Boxes intended for outdoor duty, or where indicated, shall be rated NEMA 3R.

Select enclosures which are fabricated by same manufacturer as panelboards, which mate and match properly with panelboards.

Construction shall be such that circuit breaker mounting hardware is not required when circuit breakers are added in the future.

The panelboard front cover shall be hinged 1-piece with integral door. The integral door shall have completely concealed hinges and door swings, flush lock and key mechanism, and steel door pull.

A circuit directory frame and card with a clear plastic covering shall be provided on the inside of the door. Typed directory cards shall be furnished in each panel.

All panelboards throughout project shall be keyed alike.

SAFETY DISCONNECT SWITCHES

Compliance: NFPA 70 National Electrical Code, UL 98, “Enclosed and Dead Front Switches”, NEMA Publication KS1, “Enclosed Switches”, and NEMA KS 250, “Enclosures for Electrical Equipment (1000 Volts Maximum)”.

Safety switches shall be provided for all motors and equipment indicated or required by the National Electrical Code.

Safety switches shall be Type "HD" (heavy duty) unless noted otherwise, fused or non-fusible as indicated with number of poles as shown or required. Safety switches for equipment may be non-fused only if equipment is UL tested with circuit breaker protection.

Fuses: general use, dual element time-delay, current limiting. Manufactured by Bussman, Littlefuse, Edison, or equivalent.

Safety switches for indoor general purpose application shall be NEMA 1 and for exterior application shall be NEMA 3R.

Acceptable manufacturer: provide safety switches manufactured by Cutler-Hammer, Square D, or Siemens.

Construction: Gray baked enamel finish. NEMA 3R enclosures shall be manufactured from galvanized steel.

Ratings: Fusible disconnects shall be 240 or 600 volt rated depending on the service voltage.

Fusible disconnects shall be furnished with Class R fuses of the indicated ampere rating (up to 600 amps) and be equipped with rejection clips.

Fusible disconnects shall be UL listed for 200,000 RMS symmetrical ampere short circuit current when equipped with Class R or Class L fuses.

Lugs shall be front removable and be UL listed for aluminum or copper conductors at 60 degrees C or 75 degrees C.

Disconnect switches shall be horsepower rated.

GROUNDING AND BONDING

Conductors: type THW, THHN/THWN, or RHW to match power supply wiring.

Bonding Jumper Braid: copper braided tape, constructed of 30 gage bare copper wires and properly sized for application.

Flexible Jumper Strap: flexible flat conductor, 48,250 circular mils, with copper bolt hole ends sized for 3/8” diameter bolts.

Grounding Electrodes: solid steel core with a heavy uniform covering of electrolytic copper, 5/8" X 10'. Provide sectional rods if required. Threads, on sectional rods, shall be rolled (not cut) into the composite metal after the copper covering has been applied. Sectional rod couplings shall be of a corrosion resistant alloy.

Plate Electrodes: plate electrodes are not permitted. If sufficiently low resistance cannot be obtained with driven rods, the Architect shall be notified and will provide written instruction on grounding methodology.

SURGE PROTECTION DEVICES

General: provide hybrid high-energy filter units utilized for a facility wide protection system. Each unit in the system shall incorporate surge suppression and high frequency electrical line noise filtering. The system shall provide effective high-energy surge voltage suppression, surge current diversion, high frequency attenuation in all environments connected on the load side of the facility's main overcurrent device. Connection shall be parallel, located as shown on the Drawings. System shall feature fast response time and low clamping voltage with high current capability. SPD's shall be manufactured specifically for the intended service by a manufacturer having a least five years continuous experience designing and manufacturing power conditioning equipment of the type specified.

Manufacture units using redundant metal oxide varistors (MOV) installed in a parallel arrangement. Not less than two MOV's are required per mode regardless of suppression rating.

Standards: Surge Protective Devices shall comply with the following:

1. ANSI/IEEE Std C62.41.1™-2002, IEEE Guide on the Surge Environment in Low- Voltage (1000 V and Less) AC Power Circuits
2. ANSI/IEEE Std C62.41.2™-2002, IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits
3. ANSI/IEEE Std C62.45™ -2002, IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits
4. ANSI C84.1, American National Standard for Electric Power Systems and Equipment – Voltage Ratings (60 Hertz)
5. ANSI/IEEE Standard 1100-2005, IEEE Recommended Practice for Power and Grounding Electronic Equipment (Emerald Book) - Clause 8.6.1
6. National Fire Protection Association (NFPA) 70 (N.E.C.) – 2002 - Article 285
7. ANSI/UL Standards 1449-2006 Listed (UL 1449 Current Edition), UL 1283 Listed, CUL Listed & CE compliant "low-voltage directive."
8. IEEE Standard C62.72™ - 2007 – IEEE Guide for the Application of Surge-Protective Devices for Low-Voltage (1000 V or less) AC Power Circuits

The system and each SPD module shall be UL listed for the service and conditions indicated on the Drawings and specified here and shall be enclosed in NEMA 1, 12, or 3R enclosure.

Module shall be tested in accordance with ANSI/IEEE C62.11, C62.41 and C62.45 Categories A, B and C3. Current diverter modules shall withstand one thousand Category C3 surges per IEEE C62.45.

The system shall be protected from fault currents up to 200,000 amperes by suitable integral fuse network. All components shall be protected. High current capacitors shall effectively sink harmonic currents generated by line distortion and shall effectively attenuate line noise (RFI/EMI filtering).

The system shall be equipped with built-in monitoring with status indicators, audible alarm and test switch front panel mounted. Form C dry contacts shall be provided for remote annunciation.

SPD shall be UL labeled with 20kA I-nominal (I-n) for compliance to UL 96A Lightning Protection Master Label and NFPA 780.

UL 1449 Listed Voltage Protection Ratings (VPRs) shall not exceed the following:

System Voltage	L-N	L-G	L-L	N-G
208Y/120	700V	700V	1200V	700V
480Y/277	1200V	1200V	1800V	1200V

Warranty: 10 years.

Service entrance locations: The nominal unit operating voltage shall be coordinated with the service voltage indicated. The maximum continuous operating voltage of all components utilized in the unit shall not be less than 115% of nominal operating voltage. Operating frequency shall be 60+3 hertz. Protection modes shall be (10-mode): line-to-line, line-to-neutral, line-to-ground and neutral-to-ground.

Maximum repetitive surge current capacity per phase, in amps, shall not be less than: 200kA

Minimum line noise attenuation above 10 MHz - 50 dB

Install protective module adjacent to main switchboard as indicated on the Drawings. Provide molded case circuit breaker as indicated for isolating module.

Conductors shall be #8AWG, stranded copper, minimum, and shall be as short (less than 24”) and as straight as possible. All conductors shall cut to precisely the same length before installation. Conductor requirements apply to grounded conductor. Installer may reasonably rearrange breaker locations to ensure short and straightest possible leads to SPDs.

SURGE ARRESTERS

Secondary surge arresters shall be UL listed and CSA Certified.

Surge arresters shall utilize MOV technology for fast clamping and low clamping voltage.

Housing shall be of high-temperature thermoplastic. Cover shall be permanently bonded to housing. Wire exist shall be suitably sealed. Arrester shall be suitable for indoor and outdoor use.

Each unit shall have an integral, non-replaceable fuse link that opens in the event of varistor overload.

NAMEPLATES

Nameplates: 0.125 inch thick laminated plastic; white and black finish; rectangular shaped; minimum of 1.0 X 2.5 inches with 0.25 inch high block style engraved lettering.

PART 3 - EXECUTION

RACEWAY INSTALLATION

All interior and above grade exterior wiring shall be installed in a metal conduit and all embedded in concrete or below grade wiring shall be in PVC conduit unless indicated otherwise on the drawings.

Exterior low voltage (less than 50 volts) wiring may be installed in liquid tight, non-metallic flexible conduit (“Sealtite”) where installation is above grade and not subject to damage.

No conduit smaller than 1/2 inch electrical trade size shall be used, nor shall any have more than three 90 degree bends in any one run. Pull boxes shall be provided as required or directed.

No wire shall be pulled until the conduit system is complete in all details.

The ends of all conduits shall be tightly plugged to exclude dust and moisture during construction.

Conduit support shall be spaced at intervals of 8 ft. or less, as required to obtain rigid construction.

Single conduits shall be supported by means of two-hole pipe clamps. Multiple runs of conduits shall be supported on trapeze type hangers with steel horizontal

members and threaded hanger rods. The rods shall be not less than 3/8 inch diameter. The channel shall be not less than 1 1/2" nominal size.

Conduit hangers shall be attached to structural steel by means of beam or channel clamps.

All conduits on exposed work shall be run at right angles to and parallel with the surrounding walls and shall conform to the form of the ceiling. No diagonal runs will be allowed. Bends in parallel conduit runs shall be concentric. All conduit shall be run straight and true.

Conduit terminating in sheet steel boxes shall have double locknuts and insulated bushings.

Flexible metal conduit shall be used for all motor terminations and other equipment where vibration is present. Flexible conduit length shall not exceed 1'-6" in length for this application.

Provide expansion coupling every 100 feet for long runs of conduit and at concrete expansion joints. Provide ground bonding jumpers around expansion couplings, used on metallic conduit, sized according to Table 250-122 of the NEC.

Transitions from below grade to above grade shall be with rigid galvanized steel long sweep nineties with a bituminous coating where in contact with earth or concrete. Area of transition shall not be subject to standing puddles of water.

Seal all wall penetrations to watertight condition. Finish as applicable to location.

Aluminum conduit shall not be embedded in concrete. Aluminum and steel conduit, when buried in soil, shall be treated with a protective coating of bitumastic or asphalt-base paint, or wrapped with plastic tape.

Approval by the Architect shall be required to install conduit in structural members.

In general, the conduit installation shall follow the layout shown on the plans. This layout is, however, diagrammatic only, and where changes are necessary due to structural conditions, other apparatus or other causes, such changes shall be made without additional cost to the Owner. It is recognized that branch circuit routing shown on the drawings may not always be the most economical or the most feasible method. Routing may be changed by the Contractor subject to the following provisions:

Conduits shown routed overhead may not be installed in or below slabs or in walls.

Not more than two circuits may be installed in any one conduit. Care must be taken to provide the appropriate number of neutrals.

All conduit shall be concealed unless otherwise noted on the drawings.

Exposed conduit will be permitted only as shown on the drawings. Exposed conduit shall be run parallel with or at right angles to the building walls.

All empty conduits shall be provided with a plastic pull wire rated for a minimum of 200 lbs.

Conduit stub-ups at panels shall be secured in place by use of Unistrut and clamps.

Conduit and tubing shall be kept at least twelve (12) inches from parallel runs of flues, steam pipes or hot water lines.

Telephone and network raceways shall be 3/4” minimum. This includes conduits stubbed up into ceiling cavity.

Flexible conduit in all areas subject to moisture shall be liquid-tight flexible conduit.

All electrical connections to vibration isolated equipment shall be made with flexible conduit.

All conduit entering the building shall be suitably sealed to prevent the entrance of moisture.

All conduit passing through a structural expansion joint shall be provided with a UL approved expansion joint fitting and bonded as required by the National Electrical Code.

Any wiring in a finished area which cannot be concealed in conduit shall be installed in a surface metal raceway system as manufactured by Wiremold or equal. Utilization of surface metal raceway, if not indicated as such on the plans, will be accomplished only with the written approval of the Architect.

Conduit run in areas with hung ceilings shall be installed in the space above the hung ceiling as close to the structure as possible. Conduits shall be supported from the structure.

Where flex conduit is used from junction box to light fixture it shall be supported such that it does not touch ceiling tiles or interfere with their placement.

Flexible metal conduit contions to light fixtures shall be at least 4 feet but not more than 6 feet in length per NEC 410-117(c).

Where raceways are indicated installed under slabs, they shall be placed not less than 2” below surface of prepared fill. Under no circumstances shall raceways be laid directly on vapor barrier or in or on reinforcing.

Raceways concealed in ground outside building shall be a minimum of 2 feet below grade and topped with a two inch concrete cap before backfilling. Install plastic warning tape 12 inches above raceway, buried in backfill.

RACEWAY INSTALLATION - CONDITIONS

Conduit raceways shall be installed as indicated herein. Where more than one type of raceway is listed under one condition, the Contractor may exercise his option of the raceway used. Conditions of raceway installation are as follows:

Exposed Raceway Below 8'-0" from Finish Floor and in Areas Subject to Moisture: Rigid galvanized steel conduit.

Raceway Concealed Overhead, or in Walls: Rigid galvanized steel conduit, intermediate metallic conduit or electrical metallic tubing (EMT).

Raceway Concealed in Ground Outside Building: Schedule 40 PVC or rigid steel. Rigid steel conduits installed below slab-on-grade or in the earth shall have a factory-applied PVC coating, two coats of a coal-tar system, or shall be field-wrapped with 0.010 inch thick pipe-wrapping plastic tape applied with a 50-percent overlay.

Final Raceway Connection to Recessed Fixtures in Accessible Locations: Flexible steel conduit maximum of 6'-0" long.

Final Raceway Connection to Pumps, Motors, Transformers, Etc.: Liquid-tight flexible steel conduit maximum of 1'-6" long.

Raceway That Extend Through the Slab or Above Finish Grade: 90° elbows, nipples and couplings of rigid galvanized steel or IMC shall be used where any raceway extends through the slab or above finished grade. In general PVC conduit shall not be allowed above finished slab inside the building or within 1 1/2' of finished grade outside the building.

METAL SURFACE RACEWAY

Prior to and during installation, refer to system layout drawing containing all elements of the system. Installer shall comply with detailed manufacturer’s installation instruction sheets, which accompany system components, as well as, system instruction sheets, whichever is applicable.

All raceway systems shall be mechanically continuous and connected to all electrical outlets, boxes, cabinets, in accordance with manufacturer's installation sheets.

All metal raceway shall be electrically continuous and bonded in accordance with the National Electric Code for proper grounding.

All raceway systems shall be installed complete, including wire clips and grommets where required by manufacturer's installation sheets.

WIRING

All conductors shall be carefully handled to avoid kinks or damage to insulation.

All wires, cables and each conductor of multi-conductor cables shall be uniquely identified at each end by color or with wire and cable markers. Lighting and receptacle wiring shall be distinctly differentiated and junction boxes marked.

Lubrications shall be used, if required, to facilitate wire pulling. Lubricants shall be UL approved for use with the insulation specified.

Neutral wires shall be pigtailed to receptacles so that a receptacle can be removed for replacement without the neutral connection to other receptacles on the circuit being disconnected.

Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values. Where manufacturer's torqueing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A.

OUTLET BOXES

Outlet boxes for flush mounted lighting fixtures shall be accessible. If lighting fixture is in a non-accessible ceiling the box shall be accessible when the fixture is removed.

Set boxes plumb and such that their device mounting plane is within 1/8" of the finished wall.

Surface mounted boxes and wiremold boxes, both new or existing, shall be painted to match surrounding surfaces.

Above ceiling sub-system boxes shall be labeled and color coded. Junction box covers shall be color coded. The following conventions shall be used:

Emergency Power	YELLOW

Fire alarm	RED
Intercom	BLACK
Telephone/Network	BLUE
ITV	WHITE
HVAC Controls	GREEN
Uninterruptible Power	PURPLE

The location of boxes on the electrical plans is approximate. Review architectural drawings for specific location or if not shown center and align within architectural detail. The Architect shall reserve the right to move boxes during rough in.

DEVICES

Unless indicated otherwise on the drawings all light switches shall be mounted with the centerline of the device 48" above the finished floor.

Unless indicated otherwise on the drawings or in the specifications all receptacles shall be mounted with the centerline of the device 18" above the finished floor.

Receptacles above counters shall have major axis horizontal to counter surface and device centerline 6" above counter surface or backsplash (if present).

Mount all devices so that the cover plate edges are in contact with the wall and are parallel to building features.

PANELBOARDS

Mount panelboards such that top most circuit breaker handles shall not be more than 6'-6" above finished floor.

Where panelboards are to be installed on masonry unit walls, including poured reinforced concrete or brick veneer type, install two vertical sections of galvanized steel channel between enclosure and mounting surface. Channel shall be lagged to wall in three places (each length) and the enclosure bolted to the secured channel using stainless steel or galvanized steel hardware. Galvanized channel shall run the entire length of the enclosure, but shall not be exposed at either the top or bottom of the enclosure.

Only one conductor shall be allowed under each terminal of circuit breakers. No splices are permitted in panelboards. Tighten connectors and terminals in accordance with equipment manufacturer’s published torque tightening values for equipment connectors.

Complete and install a typewritten directory for each panelboard that accurately indicates all loads being served by each breaker.

For flush mounted panelboards, provide one 3/4" conduit stubbed-up into the ceiling cavity for every three (3) spare circuit breakers and for every three (3) panelboard spaces, plus one additional.

DISCONNECTS

Motor circuit disconnects shall be mounted within fifty feet and in sight of the load being served.

Disconnects shall be labeled in accordance with Section 16010.

GROUNDING

Ground all non-current carrying metal parts of the electrical system to provide a low impedance path for ground fault current. Route ground connections and conductors to ground and protective devices in shortest and straightest paths as possible.

Insulated grounding bushings shall be required for all raceways, service entrance panels, distribution panels, all raceways one inch and larger and any raceway entering a concentric knock-out.

In general a ground wire shall be installed in every conduit. The conduit installation itself shall serve as an additional grounding means.

Where there are parallel feeders installed in more than one raceway, each raceway shall have a ground conductor.

Where conduits terminate without mechanical connection (i.e., locknuts and bushings) to panelboards, and for all terminations of conduit sizes one inch and larger; and for all sizes of metallic conduit (rigid or flexible) terminating in concentric knockouts, the following procedure shall be followed: Each conduit shall be provided with an insulated grounding bushing and each bushing connected with a bare copper conductor to the ground bus in the electrical equipment. The ground conductor shall be in accordance with Article 250 of the NEC.

Install ground rods as necessary to provide an earth ground having a test resistance of no more than 25 ohms.

Test ground rods for ground resistance value before any wire is connected. A portable ground testing megger shall be used to test each ground rod or group of rods. The instrument shall be equipped with a meter reading directly in ohms or fractions thereof to indicate the ground value of the electrode tested. Where tests show resistance to ground is over 25 ohms, reduce resistance to 25 ohms, or less, by driving additional ground rods; then retest.

Grounding connections shall be made by exothermal weld or by using a compatible mechanical connector and brazing completely over. Exothermal welds shall be made strictly in accordance with the weld manufacturer's written recommendations. Welds that have puffed up or which show convex surfaces, indicating improper cleaning, are not acceptable. No mechanical connector is required at exothermal welds.

Connect together system neutral, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and plumbing system.

The neutral conductor(s) of the incoming electrical service shall be grounded to the ground rod system, metal cold water piping system, and structural steel using Table 250-66 of the NEC for conductor sizing. Grounding conductors shall be run in rigid non-metallic conduit.

Grounding conductors shall be attached to equipment with a bolt-on lug or approved tapered screw used for no other purpose. Use crimp-on spade lugs for stranded conductors.

IDENTIFICATION

Equipment

Equipment identification shall be made using engraved laminated plastic plates (indented tape labels will not be permitted). Characters shall be white on a black background and 1/4" high minimum. Plates shall be secured to the panels by means of screws or metal pressure pins. Cement, by itself, will not be acceptable. All nameplates shall be mounted on the outside surface of the piece of equipment.

Individually enclosed safety switches, circuit breakers, and motor starters, pull boxes, control cabinets and other such items shall be identified indicating load, electrical characteristics, and source. For example, a disconnect switch for a 7-1/2 horsepower, 208 volt, 3 phase air handling unit, Number 8 feed from Panel "MDP", Circuit Number 2 shall be labeled as follows:

AHU-8
7-1/2 HP, 208V, 3Ø
Cir: MDP-2

Service entrance panel, distribution panels, panelboards, and transformers shall be identified indicating panel designation from the drawings, electrical characteristics and source. For example, a 277/480 volt 3 phase panel "LPA" feed from "MDP" Circuit No. 3 shall be labeled as follows:

LP-A
277/480V, 3Ø
(Feeder: MDP-3)

Service entrance panel and distribution panels shall also have each circuit identified as to circuit number, load, and electrical characteristics of load. For example, a 5 HP, 208 volt, 3 phase hot water pump Number 6 feed from panel MDP, Circuit No. 4 would be labeled as follows with the plate attached adjacent to the circuit:

MDP-4
HWP-6
5 HP, 208V, 3Ø

All enclosures containing energized components shall be marked with mylar labels identifying hazards. Such warning messages as "WARNING-HAZARDOUS VOLTAGE", “480 VOLTS", "240 VOLTS", etc. are acceptable. Labels shall be EZ-Code by Thomas & Betts or similar product.

Junction Box Identification: Each junction box cover shall be labeled with a permanent "magic" marker or other means to identify the circuits within. For example, a junction box containing lighting circuits 21, 23, 25 from Panel L2A would be labeled "L2A-21,23,25". Telephone junction boxes shall be labeled "T". Fire alarm system junction boxes shall be labeled “FA”. Public address, nurse call, and other system junction boxes shall be labeled accordingly.

Conductor Identification: All cables and wires shall be color coded as to phase per convention. See color coding above.

Ungrounded Conductor Identification within Panelboards: All panelboards shall have a label indicating the ungrounded conductors color schedule as noted below. Labels shall be at least 2” x 4”, laminated in plastic, and affixed to the inside of the equipment door.

For 120/240 Volt, 1 phase panels:
AØ conductors – Black
BØ Conductors – Red

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SECTION 16500

LIGHTING

PART 1 - GENERAL

SCOPE OF WORK

Lighting fixtures shall be furnished and installed as shown on the plans and as specified here.

SUBMITTALS

Submit product data for each type of lighting fixture and emergency lighting unit specified. Assemble and bind with separate sheet for each fixture type with all specifications of the proposed fixture, including all accessories clearly indicated on each sheet. As a minimum include the following data and requirements for approval:

1. Complete photometric data.

2. A description of construction details of the proposed fixture.

3. A comparison picture (for evaluating appearance) of the proposed fixture.

Submit product data for each type of lighting fixture even if furnished exactly as specified.

The Architect/Engineer will not consider any substitute fixtures unless the submittal is complete in every detail as stated above.

In addition to the above stated requirements the Architect/Engineer may require the delivery of a production fixture sample to the Architect's/Engineer’s office for inspection.

Substitute fixtures shall be equal to or superior to specified fixtures in every detail in order to be approved.

PART 2 - PRODUCTS

LIGHTING FIXTURES

Compliance: NFPA 70, NFPA 101, NEMA LE1 and LE2, and UL 486A. Comply with applicable local codes and regulations for emergency lighting and exit signage.

Lighting fixture types shall be as shown on the Drawings. The catalog numbers listed are given as a guide to the design and quality of fixture desired. Equivalent designs and equal quality fixtures of other manufacturers shall be considered by the Architect for approval (see **SUBMITTALS** section above).

EMERGENCY SOURCES FOR LIGHTS

Compliance: UL 924 “Emergency Lighting and Power Equipment”; National Electrical Code NFPA-70 (2002); National Life Safety Code NFPA 101 (2000).

Battery: sealed, maintenance free, high temperature ni-cad type with 10 year nominal life.

Charger: fully automatic, solid-state type with sealed transfer relay. Recharge time shall be 24 hours or less. Provide charging indicator light, double pole test switch, and installation hardware.

Operation: automatic with maintained light output. Illumination time shall be 90 minutes.

Warranty: 5 years.

EMERGENCY LIGHT SETS

Battery: sealed, maintenance free, lead-acid or ni-cad type with 10 year nominal life.

Charger: minimum two-rate, fully automatic, solid-state type with sealed transfer relay. The unit shall be capable of full recharge in compliance with UL.

Lighting fixtures: provide units with two heads where indicated.

Operation: transfer shall be automatic and instantaneous. The unit shall be furnished with an electronic circuit which will connect the battery when normal AC circuit is activated, and an electronic brownout circuit which shall activate the unit when the utility power dips below 80% of nominal voltage.

Accessories: provide units with charge indicator LED and push-to-test switch. A low voltage battery protection circuit shall be provided and shall disconnect the load and all circuitry from the battery when it reaches 90% discharge.

EMERGENCY LIGHT/EXIT SIGN

Self-contained, AC/battery illuminated exit sign, universal mounting.

Lamps: circuit board mounted light emitting diode (LED) type in replaceable circuit board.

Housing: universal mounting, matte white.

Faceplate: stencil face with universal punch-out arrows. Lens shall mount behind faceplate.

LIGHTING CONTROLS

Motion Detectors, Automatic Wall Switches: shall be designed to replace standard wall switch and shall offer 180 degree coverage, maximum 1000 square feet, 500 square feet for desktop activity. Detector shall have option of Manual ON or Auto ON operation with time delay adjustment from 15 seconds to 30 minutes and feature adjustable unit sensitivity. LED display to indicate occupancy detection. Unit shall operate at 120 volts or 277 volts and shall be compatible with all electronic ballasts and PL lamp ballast systems. There shall be no voltage to load in the OFF mode.

Motion Detectors, Ceiling Mount Switches: shall consist of a dual element pyroelectric sensor, low profile design and shall offer 360 degree coverage, maximum 1200 square feet in circular pattern, 500 square feet for typical desktop activity. Provide units with time delay adjustment from 15 seconds to 30 minutes and feature adjustable unit sensitivity. LED display to indicate motion detection. Unit shall operate at 24 volts DC. Provide power pack for switching of lighting loads with fully self-contained transformer and relay. Power pack shall be rated 20 amps (ballast), 120V/277VAC and up to 1 HP inductive loads. Supply units of the proper voltage for the application. Units shall be compatible with all electronic ballasts and PL lamp ballast systems. There shall be no voltage to load in the OFF mode.

Warranty: five years.

Acceptable Manufacturer: Sensorswitch, Inc. Equivalent products by Leviton or WattStopper.

PART 3 - EXECUTION

INSTALLATION

Each fixture shall be a completely finished unit with all components, mounting and hanging devices necessary, for the proper installation of the particular fixture in its designated location and shall be completely wired ready for connection to the branch circuit wires at the outlet.

When fixtures are noted to be installed flush, they shall be complete with the proper accessories for installing in the particular ceiling involved. All flush mounted fixtures shall be supported from the structure and shall not be dependent on the hung ceilings or ceiling grids for their support.

Support recessed fixtures from two places using steel suspension wires to the structure.

Install flush mounted fixtures to eliminate light leakage between fixture frame and finished surface.

Install emergency units plumb and level with ceilings and walls and in accordance with NFPA 101 Life Safety Code. Install units to provide sufficient and complete coverage of the required area. Adjust aiming and secure position with mechanisms provided.

Install exit signage plumb and level with ceilings and walls and in accordance with NFPA 101 Life Safety Code. Install unit to be readily visible along the intended egress path. Locate signage so as not to conflict with door swings, equipment operation, etc.

INSTALLATION QUALITY ASSURANCE

All fixtures shall be left in a clean condition, free of dirt and defects, before acceptance by the Architect.

All fixtures shall operate properly, with no noticeable noise, flicker or other difficulty, and all fixtures shall operate properly and with no color shift before acceptance by the Architect.

Demonstrate proper operation of emergency lighting units by interrupting electrical energy to each lighting circuit in the area of operation. Demonstration by disconnection of the main service is not acceptable.

END

SECTION 221113

WATER PIPING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Construct and/or install a water distribution system including all mains, laterals, services, valves, fittings, joints, fire hydrants, meters and appurtenances as shown on the drawings.

1.02 GOVERNING AUTHORITY

A. Water system installation, components and workmanship shall conform to the City of Tallahassee “Standard Specifications for the Design and Construction of Water and Wastewater Facilities”.

1.03 QUALITY ASSURANCE

A. Qualification of workmen: Provide at least one person who shall be present at all times during the construction who is thoroughly familiar with the Work involved and who shall direct the Work.

B. Codes and standards: Conform to all Federal, State and local laws and regulations.

1.04 SUBMITTALS

A. Submit manufacturer’s cut sheets, product data and for all components of the water distribution system.

B. Submittals shall be clearly marked for the specific product, size and material proposed for use and shall include certifications that the product meets the specified ASTM Sections and/or AWWA Standards and other references indicated on the drawings or in the specifications.

1.05 JOB CONDITIONS

A. Protection:

1. Use all means necessary to protect all materials and existing utilities before, during, and after installation and to protect all objects designated to remain.

B. Existing underground facilities:

1. Locate all underground facilities in advance of excavation to avoid conflicts with new construction.

C. Conflicts:

1. Perform work in such a manner as to cause a minimum of interference with the service rendered by the facility disturbed.

PART 2 - PRODUCTS

2.01 GENERAL

A. All pipe, fittings, valves, fire hydrants and appurtenances shall be capable of full service at a working pressure not less than one-hundred fifty (150) pounds per square inch.

2.02 PIPE AND FITTINGS

A. PVC Pipe

1. All PVC pipe shall conform to AWWA C900, latest revision.
2. 4 inches to 12 inches water lines:
   a. Pipe shall be a minimum of Class 150, DR 18.
   b. Pipe below pavement or gravel surfaces shall be Class 200, DR 14.

c. Elastomeric gasket rings and bell and spigot construction shall meet the requirements of ASTM F477 and D2122 respectively, latest revision.

3. Provide detectable warning tape for all PVC lines

2.03 VALVES

A. Gate Valves:

1. General: All valves shall be a resilient-wedge gate type, non-rising stem for underground direct burial service and shall close when the operating nut is turned in a clockwise rotation.
2. Valves (twelve (12) inches and Smaller): Each valve shall have mechanical joint bell ends. Valve shall be for horizontal mounting and valve stem shall be furnished with a two (2) inch square water works nut. Resilient seat gate valves are acceptable.

B. Check Valves:

1. All check valve bodies shall be cast iron per ASTM A126 Class B, having integral (not wafer) flanges.
2. The seat shall be centrifugally cast bronze with an O-ring seal and be locked in place with stainless steel lock screws and be field replaceable, without the use of special tools.

C. Butterfly Valves:

1. General: Butterfly valves shall be rubber seated for one-hundred fifty (150) psi minimum working pressure and line velocities up to sixteen (16) fps. The bodies of all valves shall be cast iron construction per ASTM A126, Class B, or ASTM A48, Class 40. Valves shall be as manufactured by M & H, Mueller, Pratt, American Darling, or an approved equal.
2. Except as modified herein, the butterfly valves and operators shall meet, or exceed, the applicable requirements of the Specifications for Rubber Seated Butterfly Valves, AWWA C504, latest revision, by the American Water Works Association for Class 150B.

D. Valve Boxes: Cast iron valve boxes shall be provided for all valves installed below ground and shall consist of a base covering the operating nut and head of the valve, a vertical shaft at least five and one-fourth (5 1/4) inches in diameter, and a top section extending to a point even with the finished ground surface, provided with a cast iron cover marked "water", and placed concentrically over the operating nut. Valve boxes shall be rated for H-20 loading, and shall be Mueller Type H-10380, Opelika Foundry #19, or an approved equal.

2.04 MISCELLANEOUS MATERIALS

A. Rust Proof Rods and Clamps for Anchorage: The threaded rods and clamps for anchorage shall be mild steel conforming to ASTM A-36. The rods and clamps shall be brushed clean of all rust and foreign matter and completely coated with "No-Oxide" or an approved equal before backfilling.

B. Anchoring Couplings: Shall meet the requirements set forth for cast iron or ductile iron fittings.

C. Locked Mechanical Joint Retainer Glands: Shall be ductile iron retainer glands equipped with hardened cupped and set screws. Assembly shall be designed for minimum pressure of 250 psi. Retainer gland screws shall be tightened as recommended by the manufacturer.

D. Tapped Valves and Sleeves: Tapping valves shall meet the requirements set forth for gate valves. Tapping sleeves shall be all stainless steel or ductile iron construction.

E. Corporation Stops: Corporation stops shall be Mueller No. H-9971, H-15009 or equals from Hays, McDonald, Ford or Jones.
F. Curb Stops: Curb stops shall be Mueller No. H-15175, H-15211 or H-15171 or equals from Hays, McDonald, Ford or Jones.
G. Concrete: The minimum compressive strength required for formed concrete at twenty-eight (28) days is three thousand (3,000) pounds per square inch. The minimum amount of water shall be used to produce a workable mix and shall not exceed six U.S. gallons per sack of cement.

2.05 BACKFLOW PREVENTION
A. Reduced Pressure Zone (RPZ) Assembly, Double Check Valve Assembly (DCVA) and Double Detector Check Valve Assembly (DDCVA) backflow preventers shall be furnished and installed by the Contractor in conformance with the City of Tallahassee standards and the Cross-Connection Control Manual.
B. Backflow preventer models shall be in accordance with the City of Tallahassee Cross-Connection Control Manual.
C. Backflow preventer sizes shall be as called for in the plans.

2.06 BACKFLOW PREVENTOR ENCLOSURES
A. Shall be heavy duty fiberglass, hinged and lockable manufactured by FLORIDA FIBERGLASS PRODUCTS, INC. of Monticello, Florida, HOT BOX of Jacksonville, Florida, or approved equal.

2.07 TAMPER SWITCHES
A. Provide tamper switches compatible with the fire alarm system on the post indicator valve, both valves in the DDCVA on the fire line and all other components required to be wired to the fire alarm system.

PART 3 - EXECUTION

3.01 HANDLING PIPE AND ACCESSORIES
A. Care: Pipe, fittings, valves, hydrants, and other accessories shall, unless otherwise directed, be unloaded at the point of delivery, hauled to and distributed at the site of the project by the Contractor; they shall at all times be handled with care to avoid damage. In loading and unloading, they shall be lifted by hoists or slid, or rolled on skidways in such manner as to avoid shock. Under no circumstances shall they be dropped. Pipe handled on skidways must not be skidded or rolled against pipe already on the ground.
B. Care of Pipe Coating: Pipe shall be handled in such a manner that a minimum amount of damage to the coating will result. Damaged coating shall be repaired in accordance with the pipe manufacturer's recommendations.
C. Pipe Kept Clean: The interior of all pipe, fittings, and other accessories shall be kept free from dirt and foreign matter at all times. Each pipe shall have a swab run through it until all foreign matter has been removed.

3.02 ALIGNMENT AND GRADE
A. General: All pipe shall be laid and maintained to the required lines and grades; with fittings, valves, and hydrants at the required locations; and with joints centered and spigots home; and with all valve and hydrant stems plumb.
B. Protecting Underground and Surface Structure: Temporary support, adequate protection and maintenance of all underground and surface utility structures, drains, sewers and other obstructions encountered in the progress of the work shall be furnished by the Contractor at his own expense.
C. Deviations: When an obstruction is encountered, make necessary changes in

alignment or grade as directed by the Engineer to avoid same.

3.03 EXCAVATION AND PREPARATION OF TRENCH

A. Description: The trench shall be dug to the alignment and depth required and only a minimum distance in advance of pipe laying. The trench shall be so drained that workmen may work there efficiently. It is essential that the discharge from pumps be led to natural drainage channels, to drains, or to storm sewers.

B. Width: The trench width may vary with and depend upon the depth of trench and the nature of the excavated material encountered, but in any case shall be of ample width to permit the pipe to be laid and jointed properly and the backfill to be placed and compacted property. The minimum width of unsheeted trench shall be eighteen (18) inches.

C. Pipe Foundation in Good Soil: The trench, unless otherwise specified, shall have a flat bottom conforming to the grade to which the pipe is to be laid. The pipe shall be laid upon sound soil cut true and even so that the barrel of the pipe will have a bearing for its full length.

D. Correcting Faulty Grade: Any part of the trench excavated below grade shall be corrected with approved material, thoroughly compacted.

E. Pipe Foundation in Poor Soil: When the bottom uncovered at subgrade is soft and cannot support the pipe, a further depth and/or width shall be excavated and refilled to pipe foundation grade as required.

F. Bell Holes Required: Bell holes of ample dimensions shall be dug in earth trenches at each joint to permit the joining to be made properly.

G. Bracing: When the material through which the trench is excavated tends to fall in, run, or cave, the sides of the trench shall be braced, open sheet or close sheeted, to an extent necessary to protect the pipe being laid.

H. Care of Surface Material for Re-Use: If local conditions permit their re-use, all surface materials suitable for re-use in restoring the surface shall be kept separate from the general excavation material.

I. Trenching by Machine or by Hand: The use of trench digging machinery will be permitted except in places where operation of same will cause damage to trees, buildings, or existing facilities above or below ground in which case hand methods shall be employed.

J. Barricades, Guards, and Safety Provisions: To protect persons from injury and to avoid property damage, adequate barricades, construction signs, torches, red lanterns and guards as required shall be placed and maintained during the progress of the construction. Rules and regulations of the local authorities and OSHA respecting safety provisions shall be observed.

K. Traffic and Utility Controls: Excavations for pipe laying operations shall be conducted in a manner to cause the least interruption to traffic. Where traffic must cross open trenches, the Contractor shall provide suitable bridges at street intersections and driveways.

L. Property Protection: Trees, fences, poles, and all other property shall be protected unless their removal is authorized; and any property damaged shall be satisfactorily restored by the Contractor.

M. Interruption of Water Service: No valve or other control on the existing system shall be operated for any purpose by the Contractor without approval of the Local Governing Agency. All consumers affected by such operation and the Local Governing Agency shall be notified by the Contractor at least six (6) hours before the operation and advised of the probable time when the service will be restored.

3.04 PIPE LAYING

A. Manner of Handling Pipe and Accessories into Trench: Proper implements, tools

and facilities shall be provided and used by the Contractor for the safe and convenient prosecution of the Work. All pipe, fittings, valves, and hydrants shall be carefully lowered into the trench, piece by piece, by means of derrick, ropes or other suitable tools or equipment, in such manner as to prevent damage to pipe or pipe coating. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.

B. Pipe Kept Clean: All foreign matter of dirt shall be removed from the inside of the pipe before it is lowered into its position in the trench, and it shall be kept clean by approved means during and after laying.

C. Preventing Trench Water from Entering Pipe: At times when pipe laying is not in progress, the open ends of pipe shall be closed by approved means, and no trench water shall be permitted to enter the pipe

D. Bell Ends to Face Direction of Laying: Pipe shall be laid with bell ends facing in the direction of laying. For lines on an appreciable slope, bells shall face upgrade.

E. Permissible Deflection at Joints: Wherever necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, to avoid obstructions, to plumb stems, or where long radius curves are permitted, the degree of deflection shall be in accordance with the pipe manufacturer's recommendations.

F. Unsuitable Conditions for Laying Pipe: No pipe shall be laid in water, or when the trench conditions or weather is unsuitable for such work.

3.05 JOINTING PIPE

A. All types of pipe joints shall be installed in strict accordance with the recommendations of the joint manufacturer.

3.06 SETTING VALVES, VALVE BOXES, FITTINGS AND BLOW-OFFS

A. General: Gate valves, butterfly valves and pipe fittings shall be set and jointed to new pipe in the manner heretofore specified for cleaning, laying and jointing pipe.

B. Valve Boxes: Cast iron valve boxes shall be firmly supported, and maintained centered and plumb over the wrench nut of the valve, with box cover flush with the surface of the finished pavement or at such other level as may be directed. In other than paved areas, after setting valve box, construct a protective concrete collar around cover at ground level and slope away from valve box cover. Concrete collar shall be a minimum of six (6) inches thick by 2 feet in length by 2 feet in width.

C. Back-Siphonage to be Prevented: Drainage branches or blowoffs shall not be connected to any sewer or submerged in any stream or be installed in any other manner that will permit back-siphonage into the distribution system.

3.07 PLUGGING DEAD ENDS

A. Standard plugs shall be inserted into the bells of all dead ends of pipes, tees, or crosses, and spigot ends shall be capped. Plugs or caps shall be jointed to the pipe or fittings in the appropriate manner.

3.08 ANCHORAGE OF BENDS, TEES AND PLUGS

A. Limiting Pipe Diameter and Degree of Bend: Reaction or thrust backing shall be applied on all pipelines four (4) inches in diameter or larger at all tees, plugs, caps and at bends deflecting twenty-two and one-half (22 1/2) degrees or more according the details on the plans, or movement shall be prevented by attaching rust proof tie rods, or other anchorage approved by the Local Governing Authority.

B. Material for Reaction Backing: Reaction or thrust backing shall be of concrete of a mix not leaner than one (1) cement, two and one-half (2-1/2) sand, five (5)

stone, having compressive strength of not less than two thousand (2,000) psi. Backing shall be placed between solid ground and the fitting to be anchored. The backing shall be so placed that the pipe and fitting joint will be accessible for repairs.

C. Retainer Glands: Mechanical joint retainer glands of adequate strength to prevent movement or other suitable means may be used instead of concrete backing.

3.09 BACKFILLING

A. Before backfilling any trench, the Contractor's foreman shall examine the completed line and all joints and shall correct any deficiencies that exist.

B. No trenches or excavations shall be backfilled until concrete in the structures placed therein has acquired a suitable degree of hardness, and the work shall be prosecuted expeditiously after it has commenced.

C. Undercutting of trench bottom shall be backfilled with select material from the excavations and compacted to not less than ninety-five percent (95%) maximum density as determined by Modified Proctor (ASTM D 1557) prior to placing of pipe. Select material shall be granular soil free from rock, grass, wood or other deleterious material. If the material from the excavation is not satisfactory for backfill, the under-cut shall be backfilled with gravel or slag.

D. After the pipe has been installed, selected material from the excavation shall be placed along side the pipe in layers not exceeding four (4) inches in depth to a depth of at least two (2) feet above the top of the pipe. Select material shall be as specified above for filling undercut. Care shall be taken to insure thorough compaction of the fill under the haunches of the pipe. Each layer shall be thoroughly compacted by hand tamping with iron tampers (the tamping face area of which shall not exceed fifty (50) square inches) to not less than the density specified in Section 02310, TRENCHING, BACKFILLING AND COMPACTING. All material shall be deposited carefully in the trench to avoid damaging the water line. The operation of heavy equipment shall be conducted so that no damage to water line will result.

E. The remainder of the trench above an elevation of two (2) feet higher than the top of pipe shall be backfilled with material from the excavation.

F. Sand: Flooding or jetting will be permitted where the clay and silt content of the backfill material is low enough to permit this method of consolidation. When allowed, this method will be used from a point two (2) feet above the top of pipe to the original ground line.

G. Deficiency of Backfill, By Whom Supplied: Any deficiency in the quantity of material for backfilling the trenches, or for filling depressions caused by settlement, shall be supplied by the Contractor.

3.10 EROSION AND PROPERTY CONTROL

A. Flow of Drains and Sewers Maintained: Adequate provisions shall be made for the flow of sewers, drains and water courses encountered during construction, and the lines and structures which may have been disturbed shall be immediately restored to their original condition at the expense of the Contractor.

B. Property Protection: Trees, grass, fences, signboards, poles and all other property shall be protected unless their removal is authorized; and any property damage shall be satisfactorily restored by the Contractor and at the expense of the Contractor.

C. Erosion: The Contractor shall at all times take necessary precautions to prevent erosion or transportation of soil due to natural or induced water flows. Spoil banks and soil stockpiles shall be contained to prevent transportation of soil by run-off waters.

3.11 GRASSING AND MULCHING

A. Conform to the Grassing Section of this specification.

3.12 DISINFECTION OF COMPLETED PIPELINE

A. Before placing into service, all new water distribution systems or extensions to existing systems, or any valved section of such extension or any replacement in the existing water distribution system shall be chlorinated in accordance with AWWA 651-05. Any of the following methods of procedure may be followed:
   1. Liquid chlorine gas-water mixture
   2. Direct chlorine feed
   3. Calcium hypochlorite and water mixture

B. Preliminary Flushing: Prior to chlorination all dirt and foreign matter shall be removed by a thorough flushing through the hydrants, or by other approved means. Each valved section of newly laid pipe shall be flushed independently. This shall be done after the pressure test is completed.

C. Liquid Chlorine: A chlorine gas-water mixture shall be applied by means of a solution-fed chlorinating device, or, if approved by the Local Governing Agency, the gas shall be fed directly from a chlorine cylinder equipped with proper devices for regulating the rate of flow and the effective diffusion of gas within the pipe. (Chlorination with the gas-water mixture is preferred to direct feed.)

D. Point of Application: The preferable point of application of the chlorinating agent shall be at the beginning of the pipeline extension, or any valved section of it, and through a corporation stop inserted in the horizontal axis of the newly laid pipe. The water injector for delivering the gas-water mixture into the pipe shall be supplied from a tap on the pressure side of the gate valve controlling the flow into the pipeline extension. In a new system, application may be at the pumping station, or the elevated tank, or the standpipe, or the reservoir if available. If a supply of water is not available, the Contractor shall haul the water by tank truck or other means. All water used for testing or chlorinating shall be approved by a state certified water testing laboratory. Report test results to the Engineer.

E. Rate of Application: Water from the existing distribution system or other source of supply shall be controlled to flow very slowly into the newly laid pipeline during the application of chlorine. The rate of chlorine gas-water mixture flow shall be in such proportions to the rate of water entering the pipe that the chlorine dose applied to the water entering the newly laid pipe shall be at least forty (40) to fifty (50) ppm.

F. Back Pressure Prevented: Back pressure, causing a reversal of flow in the pipe being treated shall be prevented.

G. Retention Period: Treated water shall be retained in the pipe long enough to destroy all non-spore-forming bacteria. This period shall be at least twenty-four (24) hours and preferably longer as may be directed. 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 twenty-four (24) ppm. Water samples must be taken from suitable taps.

H. Chlorinating Valves and Hydrants: In the process of chlorinating newly laid water pipe, all valves or other appurtenances shall be operated while the pipe is filled with the chlorinating agent.

I. Final Flushing and Test: Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipe line at its extremities until the replacement water throughout its length shall, upon test, both chemically and bacteriologically, be proven equal to the water quality served the public, and approved by a state certified water testing laboratory. On dead end lines, temporary flushing outlets shall be provided and dead ends thoroughly flushed.

Temporary outlets shall be removed and end of line plugged after flushing is complete.

J. Repetition of Procedure: Should the initial treatment prove ineffective, the chlorination procedure shall be repeated until confirmed tests show that water sampled from the newly laid pipe conforms to the requirements of Paragraph (I) above.

K. Calcium Hypochlorite or Chlorinated Line in Water: On approval by the Engineer, a mixture of either calcium hypochlorite or chlorinated lime of known chlorine content and water may be substituted as an alternative for liquid chlorine.
   1. Calcium hypochlorite (comparable to commercial products known as "HTH", Perchloron", and "Maxochlor") or
   2. Chlorinated lime (frequently called chloride of lime and known to industry as bleaching powder) may be used.

L. Proportions of Calcium Hypochlorite or Chlorinated Lime and Water Mixture: A five percent (5%) solution shall be prepared, consisting of five percent (5%) of either powder to ninety-five percent (95%) of water by weight.

M. Application: This calcium hypochlorite or chlorinated lime and water mixture, first made into a paste and then thinned to a slurry shall be injected or pumped into newly laid pipe under conditions heretofore specified for liquid chlorine applications, after preliminary flushing.

N. Approval: Provisions for final flushing, testing, and approval under this alternative shall be the same as those described previously.

O. Procedure When Cutting Into Existing Pipelines: Cuts made in existing pipelines for the insertion of valves, fitting, repairs, or for any other purpose shall be chlorinated by shaking a predetermined quantity of the powder into the pipe on each side of the cut-in. After slowly filling the section and reversing the flow, the chlorinated water shall be retained for at least four (4) hours, then flushed until no odor of chlorine can be detected in the flushed water, or until a check has been made for residual chlorine as provided for herein. If the Contractor has any knowledge of foreign material entering the water line, or if the unfinished connection has been left unattended, service shall not be restored until the absence of bacteria in the water has been demonstrated by a state certified testing laboratory.

P. Resumption of Service: After satisfactory chlorination by any of these alternative procedures, the consumer may be served from the newly laid pipeline.

Q. In the case of any discrepancies between the procedures in AWWA C651-05 and those listed above, AWWA C651-05 shall govern.

3.13 CLEAN-UP

A. Where these operations are on City, State, County or Private Property the job shall be kept clean at all times. Loose dirt shall not be allowed to clog ditches or cover sidewalks. Soft clay or other undesirable material removed from the trenches shall be removed from the streets, sidewalks or ditches.

3.14 PREVENTION OF CONTAMINATED WATER AT LINES IN SERVICE

A. Sections of water lines adjacent to existing water lines that are in service shall be chlorinated, flushed and checked for absence of bacteria before the new section of line can be pressure tested. The Contractor may at his option pressure test the line before chlorination, provided the new line is not connected to the existing line during the pressure test. This procedure is set forth to prevent contaminated water or water with high chlorine content from being forced into a line in service through a faulty valve or other defect during pressure tests.

3.15 DISTURBED AREAS

A. All areas that are disturbed due to direct or indirect construction operations shall be restored by the Contractor to a condition equal to or better than the condition of the area prior to the operations.

3.16 USE OF CHEMICALS

A. All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant or of other classification, must be approved by EPD. Use of all such chemicals and disposal of residues shall be in strict conformance with manufacturer's instructions.

3.17 EXISTING UTILITIES

A. The Contractor shall protect, maintain, and keep in service all existing utilities and service connections during construction operations on the new water lines. Any existing utilities cut or damaged shall be repaired immediately and the service restored on the existing lines.

PART 4 - INSPECTION AND TESTING

4.01 INSPECTION

A. Of Material at Factory: All materials are subject to inspection and approval at the plant of the manufacturer. All material shall meet the requirements specified and suppliers of pipe and fittings shall furnish an affidavit to the Engineer stating that all pipe and fittings furnished under this Contract conform to the requirements as set forth in these Specifications.

B. Of Materials at Delivery Point: During the process of unloading and during laying operations, all pipe and accessories shall be inspected by the Contractor for loss or damage in transit and storage.

C. Field Inspection: All pipe and accessories shall be laid, jointed, tested for defects and for leakage with pressure in the manner herein specified.

D. Disposition of Defective Material: All material found during the progress of the Work to have flaws, or other defects, will be rejected and the Contractor shall promptly remove from the site of the Work such defective material.

4.02 HYDROSTATIC TESTS

A. Pressure During Test: After the pipe has been laid and backfilled as specified, all newly laid pipe, or any valved section of it, shall, unless otherwise specified, be subjected to hydrostatic pressure of 150 psi in accordance with AWWA C600-99.

B. Duration of Pressure Test: The duration of each pressure test shall be until the line has been completely inspected for visible leaks, but in no case shall the pressure test duration be less than six (6) hours.

C. Procedure: Each section of pipe shall be slowly filled with water and the specified test pressure, measured at the lowest point of elevation, shall be applied by means of a pump connected to the pipe in a satisfactory manner. The pump, pipe connection, gauges, and all necessary apparatus shall be furnished by the Contractor.

D. Expelling Air: Before applying the specified test pressure all air shall be expelled from the pipe. To accomplish this, taps shall be made, if necessary, at points of highest elevation, and afterwards tightly plugged. Tapping clamps and saddles shall be used on PVC pipe.

E. Permissible Leakage: Suitable means shall be provided by the Contractor for determining the quantity of water lost by leakage under normal operating pressure. No pipe installation will be accepted if the leakage (evaluated on a pressure basis of 150 psi) is greater than that determined by the following

formula:

$$L = \frac{SD(P)^{.5}}{133{,}200}$$

In which L is the allowable leakage, in gallons per hour; S is the length of pipe tested, in feet; D is the nominal diameter of the pipe, in inches; and P is the average test pressure during the leakage test, in pounds per square inch gauge.

F. Variation From Permissible Leakage: Should any sections of pipe show leakage greater than the specified limit, the Contractor shall, at his own expense, locate and repair the defective part of the section until the leakage is within the specified allowance. When existing valves are used to isolate a section of line being tested, the Contractor shall provide temporary caps or plugs to isolate the line being tested if the existing valve will not hold the required test pressure without leaking.

G. Leakage Defined: Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved section of it, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.

H. Time for Making Test: Pipe may be subjected to hydrostatic pressure, inspected, and tested for leaking at any convenient time after partial completion of backfill. NOTE: ENGINEER MUST BE NOTIFIED AND ALLOWED OPPORTUNITY TO WITNESS HYDROSTATIC TESTING.

4.03 WATER QUALITY TESTS

A. Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipe line at its extremities until the replacement water throughout its length shall, upon testing both chemically and bacteriologically, be proven equal to the water quality served the public and approved by a state certified water testing laboratory.

END OF SECTION 221113.

SECTION 311000

SITE CLEARING AND PRELIMINARY SITEWORK

PART 1 - GENERAL

1.01 PROTECTION

A. Reference Points

1. Establish and maintain at least 2 benchmarks on the site referenced to the datum indicated on the project site survey. All vertical dimensions shall be checked from these bench marks.
2. Protect and maintain all bench marks, monuments and reference points. Replace if disturbed or destroyed. If found at variance with the drawings, notify the Engineer before proceeding with layout work.

B. Existing Trees to Remain

1. All trees shall be retained except as designated by the Removal Drawings and shall be protected throughout period of construction.
2. Low-hanging branches on trees to be retained shall not be cut without permission of the Engineer. All cuts or accidental injuries to the bark or trunk shall be immediately cleaned, trimmed, and painted with protective tree wound and sealing compound.
3. Trees and shrubs, indicated to be retained, which are damaged beyond repair by construction operations shall be replaced to the approval of the Engineer at no additional cost.
4. Protect structures, utilities, sidewalks, pavements and other facilities from damage.
   a) Locate, stake or otherwise visibly mark, all underground utilities. Contact and coordinate with owners of all utilities before commencing operations.
   b) In the event of damage, make repairs or replacements, or pay all cost necessary for repair or replacement necessary to the approval of the Engineer, Utility or other improvement Owner.

C. Unless otherwise shown on the plans or specified herein, all trees outside limits of construction shall remain.

D. Provide barricade between construction phases to protect the public and workers, while allowing access to the existing buildings and local traffic.

1.02 PROJECT SITE/LIMITS OF WORK

A. Prior to commencing Sitework, the Contractor shall stake out all proposed work to define limits of new construction and shall mark the clearing perimeter

B. Contractor shall provide Surface Water Control, Clearing and Grubbing, and Stripping and Stockpiling of Topsoil.

PART 2 - PRODUCTS

2.01 Not used in this Section.

PART 3 - EXECUTION

3.01 LAYOUT

A. Protect and maintain bench marks throughout execution of this work.

B. Stake building and site improvements relative to reference lines, property lines, easements, and right-of-way.

3.02 DEMOLITION

A. Demolish and remove existing features as specified, as well as miscellaneous debris from within the limits of construction.

3.03 CLEARING AND GRUBBING

A. Fell and cut up all standing trees designated to be removed. In building areas remove trees and shrubs, including their entire root systems which occur within building area and within an area 5'-0" adjacent to building area.

B. In site cut and fill areas, remove shrubs and shrub root systems and trees (except as noted below), including tree root system down to a point at least 24" below finish grade.

C. Remove all downed timber, logs, snags, brush and rubbish from the site.

3.04 DEBRIS

A. Clear site of existing broken concrete, stones, bricks, glass, and debris, and haul away from site for legal disposal.

B. Off-site legal disposal area shall be the responsibility of the Contractor.

C. Burning of debris on site shall not be allowed.

3.05 STRIPPING AND STOCKPILING OF TOPSOIL

A. Areas to be stripped shall first be scraped clean of all brush, weeds, grass, roots, wood, glass, stones, broken concrete, brick and concrete block. Topsoil shall be free from subsoil, debris, and stones larger than 2-inches in diameter.

B. Strip existing topsoil to its entire depth from within graded areas.

C. Stockpile topsoil in on-site locations where it will not interfere with building or paving construction, site or utility operations, or adjacent facilities and functions. Materials stockpiled shall be placed in a manner to afford positive drainage. Protect against erosion using bales of hay or silt fence placed continuously around perimeter.

D. Topsoil shall be re-spread outward from the pavement and building areas at the close of the job.

END OF SECTION 311000.

SECTION 312000

EARTHWORK

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Work included:

1. Earthwork required for this project may include, but is not necessarily limited to:
   a) Excavation.
   b) Filling and backfilling to attain indicated grades.
   c) Trenching and trench backfilling.
   d) Rough and finish grade of the site.
   e) Conservation of topsoil.
   f) Proofrolling.
   g) Compaction.
   h) Undercutting of loose soils.
   i) Soil Compaction and Testing

1.02 BENCHMARKS

A. Maintain two existing bench marks on the site for references. All vertical dimensions shall be checked from these bench marks.

1.03 FINISHED GRADES

A. Finished grades, as used herein, mean the final grade elevations indicated on the drawings. Should finished grades shown on spot elevations conflict with those shown by the contours, the spot elevations shall govern.

1.04 BORROW PITS

A. Submit representative samples of all fill material requiring compaction to the Contractor's Testing Laboratory. **Material and borrow pits shall be approved by the Engineer prior to filling operations.** If the quantity available from site grading is not sufficient, purchasing, hauling, and blending of fill shall be done by the Contractor.

1.05 CONTROLLED FILL

A. Class I Fill is all Structural Fill to underside of slabs and to support foundations or footings. Class I Fill shall extend to 10 feet outside the building footprint.

B. Class II Fill is all Backfill below finish grade immediately behind walls and in trenches and embankments under walks, drives, parking areas, and all areas to be paved or surfaced with gravel for vehicular traffic. The top two-feet of fill under drives and parking areas or areas surfaced with gravel for vehicular traffic shall be Class I Fill. The area shall extend to 10 feet outside paved areas.

C. Class III Fill is all Backfill used for filling trenches not under paved or building areas.

1.06 DESIGNATED TESTING LABORATORY

A. Designated Testing Laboratory shall be obtained and paid by the Owner.

B. Designated Testing Laboratory shall:

1. Witness proofrolling and make recommendations concerning undercutting loose subgrade areas and surface scarification.
2. Observe and make recommendations concerning temporary surface drainage.
3. Perform Modified Proctor and field density tests.
4. Provide advice concerning fill soils on site and the selection of borrow soils.
5. Evaluate the suitability of the subgrade soils at the foundation bearing level.

6. The Designated Testing Laboratory shall report to the Engineer in writing, on a daily basis, the results of the tests including a statement that all tests have been performed as required by the specifications.

1.07 COMPACTION TESTING

A. Existing Subgrade under Building Slabs and Paved Areas: One field density test for each 500 sf of building or paved area.
B. Class I and II Fills: One Field Density Test for each 500 sf of building area, 1,000 sf of paved and gravel surfaced areas after each lift of fill, and one test per 100 lineal feet of trench per one foot lift of fill.
C. Class III Fills: One field density test per 200 lineal feet of trench at a depth of one foot above pipe.
D. Exact locations of tests shall be as directed by the Engineer.

1.08 DENSITY TESTING IN FOUNDATIONS

A. One test per 30 linear feet of continuous grade beam and monolithic footing subgrade.
B. One test for every other column footing.

1.09 INSUFFICIENT FILL MATERIAL

A. If quantity of grading material is insufficient to provide finish grade elevations indicated on the drawings, obtain additional fill material of specified quality from an off-site source at no additional cost to the owner.

1.10 EXCESS CUT MATERIAL

A. If quantity of grading material is in excess of quantities required to provide finished grade elevations indicated on the drawings, any excess material shall be disposed of off-site at no additional cost to the owner.

1.11 DUST CONTROL:

A. Use all means necessary to control dust on and near the Work and on and near all off-site borrow areas if such dust is caused by the Contractor's operations during performance of the Work or is resulting from the condition in which the Contractor leaves the site.
B. Thoroughly moisten all surfaces as required to prevent dust being a nuisance to the public, neighbors, and concurrent performance of other work on the site.

1.12 MATERIAL PROTECTION

A. Use all means necessary to protect all materials and existing utilities before, during, and after installation and to protect all objects designated to remain.
B. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

1.13 EXISTING UNDERGROUND FACILITES

A. Underground structures and utilities, as indicated, are located according to best available information.
B. Locate all underground facilities in advance of excavation to avoid conflicts with new construction.

1.14 CONFILICTS

A. Perform Work in such a manner as to cause a minimum of interference with the service rendered by the facility disturbed.
B. Immediately repair or replace structures or facilities damaged.
C. Restore to condition existing prior to damage in accordance with best standard practices as approved by the Engineer and at no additional cost to the Owner.

1.15 SCHEDULING:

A. The Engineer reserves the right to direct the order of work as may be in the best interest of the Owner

PART 2 - PRODUCTS

2.01 FILL MATERIAL

A. All fill material shall be subjected to approval of the Engineer.

B. Sand Fill (capillary water barrier) material shall consist of a clean sand with a fineness modulus of 1.6 to 3.1 and containing not more than 10 percent by weight finer than No. 200 U.S. Standard Sieve.

C. Structural Fill material shall consist of inorganic material free of roots, cobbles and boulders and classified as GM, GC, SW, SP, SM, SC, or CL by ASTM D2487-85 "Standard Methods for Classification of Soils for Engineering purposes". Earth Fill shall also conform to the following:

1. Liquid Limit = 40 maximum
2. Plasticity Index = 15 maximum
3. Dry Unit Weight = 100 pcf minimum density
4. Unsuitable material includes vegetable matter, sod, muck, roots, rubbish, highly plastic clay soils, and organic soils.

D. Notification:

1. For approval of imported fill material, notify the Engineer at least four (4) working days in advance of intention to import material, designate the proposed borrow area, and permit the Engineer to sample as necessary from the borrow area for the purpose of making acceptance tests to prove the quality of the material.

2.02 OTHER MATERIALS:

A. All other materials not specifically described but required for proper completion of the Work of this Section, shall be as selected by the Contractor subject to the approval of the Engineer.

PART 3 - EXECUTION

3.01 GENERAL:

A. Familiarization:

1. Prior to all Work of this Section, become thoroughly familiar with the site, the site conditions, and all portions of the Work falling within this Section.

B. Backfilling prior to approvals:

1. Do not allow or cause any of the Work performed or installed to be covered up or enclosed by Work of this Section prior to all required inspections, tests, and approvals.
2. Should any of the Work be so enclosed or covered up before it has been approved, uncover all such Work at no additional cost to the Owner.
3. After the Work has been completely tested, inspected, and approved, make all repairs and replacements necessary to restore the Work to the condition in which it was found at the time of uncovering, all at no additional cost to the Owner.

C. Conservation of topsoil:

1. When indicated on plans or directed by the Engineer, remove topsoil and spread on areas already graded and prepared, or transport and deposit in storage piles at locations approved by the Engineer.

2. Excavate topsoil to full extent of depth.
3. Keep topsoil, when stored, separate from other excavated materials.
4. Store or place topsoil free from roots, stones and other undesirable material.
5. Topsoil shall be stripped and stockpiled. Disturbed areas not designated as parking, building, sidewalks, gravel surfaced travel ways, or other impervious areas shall receive topsoil to a depth of 6 inches.

3.02 PREPARATION:

A. Temporary drainage:
   1. Maintain adequate drainage over site while construction is in progress.
B. Unfavorable weather:
   1. Do not place, spread, or roll any fill material during unfavorable weather conditions.
   2. Do not resume fill operations until moisture content and fill density are satisfactory to the Engineer.

3.03 GEOTECHNICAL EVALUATION AND UNDERCUTTING

A. After clearing, grubbing and topsoil removal is complete, the Designated Testing Laboratory (DTL) shall evaluate the site areas under the new buildings, gravel surfaced areas and pavements.
B. The DTL shall evaluate the extent of loose or unsuitable material.
C. All material that is unsuitable or can not be compacted shall be undercut or re-worked in the presence of, and as recommended by, the DTL.
D. The contractor shall provide access and assistance to the DTL.

3.04 INSPECTION OF SUBGRADE, PROOFROLLING, SCARIFYING, AND COMPACTION

A. After stripping and excavation of the cut areas and removal of unsuitable materials as outlined in the preceding section of this Specification, and prior to filling, the exposed subgrade shall be approved by the Engineer. The exposed subgrade, enclosed by a line drawn 10 feet outside the building and paved and gravel surfaced areas, shall be predensified and proofrolled by rolling the surface with compaction equipment.
B. Rolling shall consist of a minimum of eight overlapping coverages in each of two perpendicular directions and shall continue until density test at a depth of 12 inches below the surface indicates the attainment of 95% of the Modified Proctor maximum, ASTM D 1557. In cut areas under building foundations and slabs and pavements, the top one foot of the subgrade shall be compacted to of 95% of the Modified Proctor maximum.
C. The equipment used for rolling shall be a 20-ton, fully loaded, pneumatic tired tandem axle dump truck.
D. Proofrolling shall be performed in the presence of the Designated Testing Laboratory Representative and the Engineer.
E. Soft, loose or unstable surface zones which are detected during proofrolling and compaction shall be scarified and recompacted or undercut and replaced with controlled fill as directed.
F. Undercut materials which qualify as Structural Fill may be used in Class I & II Fill areas.

3.05 EXCAVATION

A. General
   1. Conform to dimensions, lines and grades indicated on plans.
   2. Transport suitable excavated material and place in fill areas within specified limits of Work and compact as specified.
   3. If directed by the Engineer, stockpile excavated material suitable for fill and backfill in approved locations.

4. Remove unsuitable material occurring within or below the limits of excavation to the depth directed by the Engineer. Legally dispose of excess and unsuitable material offsite.
5. Backfill and compact all over excavated areas as specified at no additional cost to the Owner.
6. It shall be the Contractors responsibility to shore excavations where necessary to protect workmen, banks, adjacent paving, structures, utilities and other existing facilities.

B. Structures:
1. Excavated to elevations and dimensions indicated.
2. In stable soil, sides and bottom of footing excavations may be cut clean in order that concrete may be poured without forming.
3. In unstable soil, extend excavations sufficient distance from footings to allow for placing and removing forms.

C. Ditch excavation:
1. Excavate ditches to cross sections and grades indicated on plans.
2. Cut all roots, stumps and foreign matter in the sides and bottom of ditches to conform to the slope, grade and shape of the section shown.
3. Exercise care to prevent excavating ditches below grades indicated. Backfill excessive ditch excavation to grade with suitable, thoroughly compacted material.
4. Maintain ditches free from detrimental quantities of leaves, sticks and other debris until final acceptance.

D. Utility trenches:
1. Perform excavation for storm sewers, sanitary sewers, water lines and other utility trenches as specified in sections pertaining to the appropriate utility.

3.06 COMPACTION GENERAL
A. TOPSOIL
1. Scarify the compacted subgrade, in those areas to receive topsoil, prior to the placing of topsoil, to a depth of two (2) inches to allow the bonding of topsoil with the subsoil.
2. Spread topsoil evenly and compact to elevation, grade and thickness specified.

B. Plastic pipe:
1. Do not allow compacting equipment to come in direct contact with pipe.
2. Exercise extra care in obtaining adequate compaction under pipe to prevent injurious shear or bending loads.
3. No sharp gravel or object may be placed adjacent to plastic pressure pipe.
4. Remainder of backfill may be placed by standard procedures.
5. Dress off to conform to adjacent contours.
6. Where settlement occurs or improper filling is evident, refill and redress trench to grade.
7. Backfill areas of paving and walks immediately after testing and/or approval of pipe or conduit installation.
8. Maintain surface in paved areas in a smooth riding condition until paving or gravel is placed.
9. Excavated and removed materials:
a) Do not include destroyed pavement or walk materials, curbs, and similar material in backfill.
b) Unsuitable material such as muck, mud, or other unstable material may

be replaced in excavations after suitable material has been placed and compacted to provide two (2) feet of cover over the top of the bell of the pipe except under paved areas, structures or other areas so designated by the Engineer.

c) Excavated rock may be used under the same conditions as specified for unsuitable material, provided it is broken into pieces not larger than three (3) inches in diameter.

C. Protection:
1. Protect newly graded areas from the action of the elements.
2. Repair and reestablish to slope and grade any settlement, washing or other damage occurring prior to final acceptance.

3.07 GRADING:
A. General:
1. Grade all areas as indicated and required.
B. Grading tolerances:
1. Rough grade - plus or minus 0.1 foot.
2. Finish grade:
a) Beneath concrete slabs or foundations - plus or minus 0.1 foot.
b) All other areas - plus or minus 0.1 foot.
C. Existing surfaces disturbed by construction:
1. Grade existing surfaces disturbed by construction as required to provide surfaces at a 3:1 slope Max unless otherwise approved by Engineer.

1.02 INSTALLATION OF CLASS I FILL
A. Class I Fill shall be Structural Fill material.
B. Compact within $\pm$ 3 percent of optimum moisture content in 12-inch (maximum) loose layers to a density equivalent to 95 percent of the Modified Proctor Maximum (ASTM D 1557).

1.03 INSTALLATION OF CLASS II FILL
A. Class II Fill shall be Structural Fill materials except that fill immediately behind walls and under floor slabs as indicated on drawings shall be Sand Fill material.
B. Compact within $\pm$ 3 percent of optimum moisture content in 12-inch loose layers to a density equivalent to 95 percent of the Modified Proctor Maximum (ASTM D 1557). The top two feet under paved and graveled areas and the top one foot for other areas shall be Class I fill.

1.04 INSTALLATION OF CLASS III FILL
A. Class III Fill may be Structural Fill or Site Fill.
B. Compact fill in utility trenches not under buildings or paved areas to a density equivalent to 92 percent of the Modified Proctor Maximum (ASTM D 1557).

1.05 INSTALLATION OF BACKFILL
A. Shore Foundation Walls which are to be tied into floor slabs prior to installation of Backfill and until slabs have been in place sufficient time to achieve strength and provide structural stability against overturning.
B. Where Backfill is required on both sides of walls, it shall be brought up in even layers so as not to provide an unequal lateral load.
C. Install Backfill against Foundation Walls only when directed by the Engineer, and elsewhere as construction progress permits.

END

SECTION 312500

SLOPE PROTECTION AND EROSION CONTROL

PART 1 - GENERAL

1.01 EXTENT OF WORK

A. Erosion control shall be employed during construction period and shall include all necessary temporary measures required to prevent soil erosion from the site until permanent erosion control measures are installed. Work shall be accomplished through, but not limited to, use of berms, dikes, dams, sediment barriers, silt fences, hay bales, temporary grasses, mulching and slope drains.

B. Erosion control measures described herein shall be continued until such time as permanent planting and restoration of natural areas is effectively in control of erosion from project site.

C. Erosion control measures indicated on the drawings shall be considered minimum requirements. Regulatory requirements and authorities shall govern over drawings and if directed by the governing authorities additional erosion control measures shall be provided at no additional cost.

1.02 REFERENCES

A. Erosion control measures for construction shall conform to the practices, regulations and ordinances of the Local Authority, State of Florida, and Federal regulations.

PART 2 - PRODUCTS

2.01 FILTER FABRIC FOR SILT FENCES

A. Filter fabric for silt fences shall be pervious sheet of synthetic polymer filaments forming a stable network so that fibers retain their relative positions. Filter fabric shall be of type recommended by its manufacturer for intended application and shall meet the minimum properties indicated on the drawings.

B. Silt fence shall be constructed in accordance with Florida DOT Standards and as indicated on the drawings.

C. The manufacturer shall have either an approved color mark yarn in the fabric or label the fabricated silt fence with both the manufacturer and fabric name every 100 feet.

2.02 HAY BALES

A. Hay bales shall be well compacted straw, standard size, wire bound.

2.03 GRASSING AND MULCHING

A. Planting species and rates shall be in accordance with FDOT Standards and Specifications.

B. Temporary grass shall be quick growing species suitable to area providing a temporary cover which will not later compete with grasses sown for permanent cover.

C. Areas to be mulched need not be to finished grade. Temporary mulching may be applied to slopes as steep as 2:1, horizontal to vertical, using a tractor to embed mulch into slope.

PART 3 - EXECUTION

3.01 GENERAL

A. Temporary erosion control shall be directed toward and have the purpose of controlling soil erosion at its potential source. Downstream sediment entrapment measures may be employed, but only as a backup to primary control at the source.
B. A continuing program of installation and maintenance of sediment control measures shall be employed during construction period.
C. The contractor shall limit the surface area of erodible earth materials exposed by clearing and grubbing, the surface area of erodible earth exposed by excavation and backfill operations and provide immediate permanent or temporary erosion and pollution control measures to prevent contamination of adjacent streams or other water courses.
D. Clearing and grubbing operations shall be so scheduled and performed that grading operations and permanent erosion control features can immediately follow thereafter, if the project conditions permit, otherwise temporary erosion control measures may be required between successive construction stages.

3.02 TEMPORARY EROSION CONTROL DURING CONSTRUCTION

A. Temporary Grassing and Mulching
1. Contractor shall apply temporary seeding or temporary mulch to an erodible area as soon as practical, but not longer than 14 days after disturbance.

B. Silt Fences
1. Temporary silt fences shall be located at all points where surface water can leave the construction area having bypassed a silt trap if the source area is subject to soil erosion.
2. Silt fences shall be constructed to remove sediments from flowing water through filtration and sedimentation.
3. Silt fences shall be arranged to create ponding behind them. Provisions shall be made for removing accumulated sediments and maintaining ponding capacity.
4. Silt fences shall be removed and the area restored when permanent erosion control is effective.

C. Grading Operations
1. Grading operations shall be scheduled so that ground surface will be disturbed for the shortest possible time before permanent construction is installed.
2. In no case shall surface water be allowed to flow uncontrolled down slopes.

3.03 RUN-OFF EROSION AND SEDIMENTATION CONTROLS

A. During construction, route run-off through sedimentation barriers and check dams as practical.
B. Contractor shall maintain sedimentation devices in functional condition.
C. A 6" minimum thickness of crushed stone pad shall be located at all construction exits from site to public streets. All construction vehicles leaving the construction site shall have mud cleaned from their tires at these points to protect public streets from the transportation of sediment from site.

3.04 CLEAN-UP AND REMOVAL

A. At the time that permanent erosion control is effective, temporary devices and their accumulated sediments may be removed.

END OF SECTION 312500.