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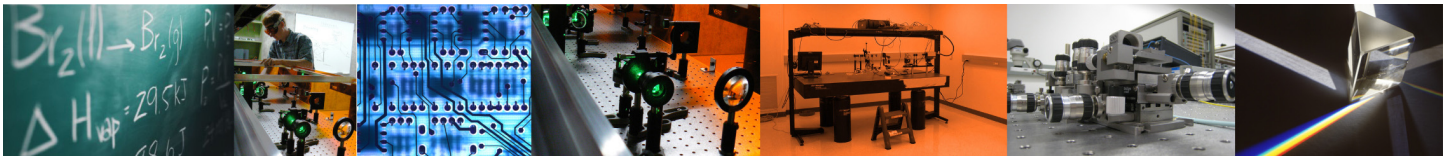

Construction Documents - Volume 2
Divisions 02 through 14

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VOLUME TWO

Index

DIVISION 2 - SITE CONSTRUCTION

02230 SITE CLEARING
02240 DEWATERING
02282 TERMITE CONTROL
02300 BUILDING EARTHWORK
02455 AUGERED PRESSURE GROUTED (APG) PILES
02510 WATER DISTRIBUTION
02521 DETECTABLE/TACTILE WARNING SURFACES
02530 SANITARY SEWERAGE
02630 STORM DRAINAGE
02741 ASPHALT PAVING
02751 CEMENT CONCRETE PAVING
02764 PAVEMENT JOINT SEALANTS
02920 LAWNS AND GRASSES
02930 EXTERIOR PLANTS

DIVISION 3 – CONCRETE

03300 CAST-IN-PLACE CONCRETE

DIVISION 4 – MASONRY

04200 UNIT MASONRY

DIVISION 5 - METALS

05120 STRUCTURAL STEEL
05300 STEEL FLOOR DECKING
05313 STEEL ROOF DECKING
05400 COLD-FORMED METAL FRAMING
05500 METAL FABRICATIONS
05510 METAL STAIRS

DIVISION 6 - WOOD AND PLASTICS

06100 ROUGH CARPENTRY
06402 INTERIOR ARCHITECTURAL WOODWORK

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

07121 COLD FLUID APPLIED WATERPROOFING
07210 BUILDING INSULATION
07435 INSULATED METAL PANELS
07531 EPDM SINGLE PLY MEMBRANE ROOFING
07810 SPRAYED FIRE-RESISTIVE MATERIALS
07901 JOINT SEALANTS

DIVISION 8 - DOORS AND WINDOWS

08110 STEEL DOORS AND FRAMES
08120 INTERIOR ALUMINUM DOOR FRAMES
08211 FLUSH WOOD DOORS
08305 ACCESS DOORS
08410 ALUMINUM ENTRANCES AND STOREFRONTS
08450 ALL GLASS DOORS
08625 METAL FRAMED SKYLIGHTS
08710 BUILDERS HARDWARE
08800 GLAZING
08840 PLASTIC GLAZING
08920 CURTAINWALL

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DIVISION 9 - FINISHES

09220 ACRYLIC PLASTER
09255 GYPSUM BOARD ASSEMBLIES
09300 CERAMIC TILE
09512 ACCOUSTICAL PANEL CEILINGS
09651 RESILIENT TILE FLOORING
09653 RESILIENT WALL BASE AND ACCESSORIES
09671 RESINOUS FLOORING
09690 CARPET TILE
09900 PAINTING

DIVISION 10 – SPECIALTIES

10155 TOILET COMPARTMENTS
10195 LASER BLOCKING CURTAIN TRACK SYSTEMS AND CURTAINS
10522 FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES
10800 TOILET AND BATH ACCESSORIES

DIVISION 11 - EQUIPMENT

11132 PROJECTION SCREENS
11610 LABORATORY FUME HOODS

DIVISION 12 – FURNISHINGS

12310 LABORATORY SINKS AND FITTINGS
12345 LAB CASEWORK
12480 ENTRANCE MAT

DIVISION 14 – CONVEYING SYSTEMS

14240 HYDRAULIC ELEVATORS

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SECTION 02230 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Protecting existing trees shrubs plants and grass to remain.
2. Removing existing trees shrubs plants and grass.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping or sealing, abandoning site utilities in place, removing site utilities.
7. Temporary erosion and sedimentation control measures.

B. Related Sections include the following:
1. Division 1 Section "Temporary Facilities and Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities.
2. Division 2 Section "Earthwork" for soil materials, excavating, backfilling, and site grading.
3. Division 2 Sections "Lawns and Grasses and Exterior Plants" for finish grading including preparing and placing planting soil mixes and testing of topsoil material.

1.3 DEFINITIONS

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.

B. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 SUBMITTALS

A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

1.6 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

3. Do not proceed with work on adjoining property until directed by Architect.

B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 2 Section "Earthwork."

1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly flag trees and vegetation to remain or to be relocated.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction and sediment and erosion control Drawings.

B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE PROTECTION

A. Erect and maintain temporary fencing around tree protection zones before starting site clearing. Remove fence when construction is complete.

1. Do not store construction materials, debris, or excavated material within fenced area.
2. Do not permit vehicles, equipment, or foot traffic within fenced area.
3. Maintain fenced area free of weeds and trash.

B. Do not excavate within tree protection zones, unless otherwise indicated.

C. Where excavation for new construction is required within tree protection zones, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

1. Cover exposed roots with burlap and water regularly.
2. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
3. Coat cut faces of roots more than 1-1/2 inches in diameter with an emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
4. Backfill with soil as soon as possible.

D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect.

1. Employ an arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.
2. Replace trees that cannot be repaired and restored to full-growth status, as determined by Architect.

3.4 UTILITIES

A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

1. Arrange with utility companies to shut off indicated utilities.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Construction Manager not less than three days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Construction Manager's written permission.

C. Excavate for and remove underground utilities indicated to be removed.

D. Removal of underground utilities is included in Division 2 Sections covering site utilities.

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
3. Grind stumps and remove roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade.
4. Use only hand methods for grubbing within tree protection zone.

5. Chip removed tree branches and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches (200 mm), and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and nonsoil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Limit height of topsoil stockpiles to 72 inches.
2. Do not stockpile topsoil within tree protection zones.
3. Dispose of excess topsoil as specified for waste material disposal.
4. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.
2. Paint cut ends of steel reinforcement in concrete to remain to prevent corrosion.

3.8 DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

1. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

END OF SECTION 02230

SECTION 02240 - DEWATERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes construction dewatering.

B. Related Sections:

1. Division 1 Sections “Construction Progress Documentation” and “Photographic Documentation” for recording preexisting conditions and dewatering system progress.
2. Division 1 Section 01505 – Construction Waste Management
3. Division 2 Section "Excavation Support and Protection" for shoring, bracing, and sheet piling of excavations.
4. Division 2 Section "Earthwork" for excavating, backfilling, site grading, and for site utilities.
5. Division 2 Section "Subdrainage" for permanent foundation wall, underfloor, and footing drainage.

1.3 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

1. Delegated Design: Design dewatering system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
2. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, that excavation does not flood, and that damage to subgrades and permanent structures is prevented.
3. Prevent surface water from entering excavations by grading, dikes, or other means.
4. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
5. Remove dewatering system when no longer required for construction.

1.4 SUBMITTALS

A. Shop Drawings: For dewatering system. Show arrangement, locations, and details of wells and well points; locations of risers, headers, filters, pumps, power units, and discharge lines; and means of discharge, control of sediment, and disposal of water.

1. Include layouts of piezometers and flow-measuring devices for monitoring performance of dewatering system.
2. Include a written plan for dewatering operations including control procedures to be adopted if dewatering problems arise.

B. Delegated-Design Submittal: For dewatering system indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Qualification Data: For qualified installer and professional engineer.

D. Field quality-control reports.

E. Other Informational Submittals:

1. Photographs or Videotape: Show existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by dewatering operations.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer that has specialized in design of dewatering systems and dewatering work.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1. Review methods and procedures related to dewatering including, but not limited to, the following:

a. Inspection and discussion of condition of site to be dewatered including coordination with temporary erosion control measures and temporary controls and protections.
b. Geotechnical report.
c. Proposed site clearing and excavations.
d. Existing utilities and subsurface conditions.
e. Coordination for interruption, shutoff, capping, and continuation of utility services.
f. Construction schedule. Verify availability of Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
g. Testing and monitoring of dewatering system.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:

1. Notify Construction Manager and owner no fewer than two days in advance of proposed interruption of utility.
2. Do not proceed with interruption of utility without Construction Manager's and Owner's written permission.

B. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner, engineer and architect will not be responsible for interpretations or conclusions drawn from this data.

1. Make additional test borings and conduct other exploratory operations necessary for dewatering.
2. The geotechnical report is included elsewhere in the Project Manual.

C. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements, establishing exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

1. During dewatering, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Architect if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.

1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site and surrounding area.
2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Provide temporary grading to facilitate dewatering and control of surface water.

D. Monitor dewatering systems continuously.

E. Promptly repair damages to adjacent facilities caused by dewatering.

F. Protect and maintain temporary erosion and sedimentation controls, which are specified in Division 1 Section "Temporary Facilities and Controls" and Division 2 Section "Site Clearing" during dewatering operations.

3.2 INSTALLATION

A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.

1. Space well points or wells at intervals required to provide sufficient dewatering.
2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.

B. Before excavating below ground-water level, place system into operation to lower water to specified levels. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.

C. Provide an adequate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Install sufficient dewatering equipment to drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.

1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.

D. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.

1. Maintain piezometric water level a minimum of 24 inches below surface of excavation.

E. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.

F. Provide standby equipment on site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, restore damaged structures and foundation soils at no additional expense to Owner.

1. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.

G. Damages: Promptly repair damages to adjacent facilities caused by dewatering operations.

3.3 FIELD QUALITY CONTROL

A. Observation Wells: Provide, take measurements, and maintain at least the minimum number of observation wells or piezometers indicated; additional observation wells may be required by authorities having jurisdiction.

1. Observe and record daily elevation of ground water and piezometric water levels in observation wells.
2. Repair or replace, within 24 hours, observation wells that become inactive, damaged, or destroyed. In areas where observation wells are not functioning properly, suspend construction activities until reliable observations can be made. Add or remove water from observation-well risers to demonstrate that observation wells are functioning properly.
3. Fill observation wells, remove piezometers, and fill holes when dewatering is completed.

B. Provide continual observation to ensure that subsurface soils are not being removed by the dewatering operation.

END OF SECTION 02240

SECTION 02282 - TERMITE CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes soil treatment for termite control.

1.3 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

B. Product data and application instructions.

C. Certification that products used comply with U.S. Environmental Protection Agency (EPA) regulations for termiticides.

1.4 QUALITY ASSURANCE

A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for preparing substrate and application.

B. Engage a professional pest control operator who is licensed according to regulations of governing authorities to apply soil treatment solution.

C. Use only termiticides that bear a federal registration number of the EPA and are approved by local authorities having jurisdiction.

1.5 JOB CONDITIONS

A. Restrictions: Do not apply soil treatment solution until excavating, filling, and grading operations are completed, except as otherwise required in construction operations.

B. To ensure penetration, do not apply soil treatment to frozen or excessively wet soils or during inclement weather. Comply with handling and application instructions of the soil toxicant manufacturer.

1.6 WARRANTY

A. Warranty: Furnish written warranty, executed by Applicator and Contractor, certifying that applied soil termiticide treatment will prevent infestation of subterranean termites. If subterranean termite activity is discovered during warranty period, Contractor will re-treat soil and repair or replace damage caused by termite infestation.

B. Warranty Period: 5 years from date of Substantial Completion.

C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 SOIL TREATMENT SOLUTION

A. General: Use an emulsible, concentrated termiticide that dilutes with water, specially formulated to prevent termites infestation. Fuel oil will not be permitted as a diluent. Provide a solution consisting of one of following.

B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

1. Termidor, BASF

2. Premise, Bayer Environmental

C. Dilute with water to concentration level recommended by manufacturer.

D. Other solutions may be used as recommended by Applicator if approved for intended application by local authorities having jurisdiction. Use only soil treatment solutions that are not harmful to plants.

PART 3 - EXECUTION

3.1 APPLICATION

A. Surface Preparation: Remove foreign matter that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and foundations. Toxicants may be applied before placing compacted fill under slabs if recommended by toxicant manufacturer.

B. Application Rates: Apply soil treatment solution as follows:

1. Under slab-on-grade structures, treat soil before concrete slabs are placed, using the following application rates:

a. Apply 4 gallons of chemical solution per 10 linear feet (5.1 L of chemical solution per meter) to soil in critical areas under slab, including entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab, and around interior column footers.
b. Apply 1 gallon of chemical solution per 10 sq. ft. (4.1 L of chemical solution per sq. m) as an overall treatment under slab and attached slab areas where fill is soil or unwashed gravel. Apply 1-1/2 gallon of chemical solution per 10 sq. ft. (6.1 L of chemical solution per sq. m) to areas where fill is washed gravel or other coarse absorbent material.

2. At foundations or grade beams, treat voids at rate of 2 gallons per 10 linear feet 2.6 L per meter, poured directly into the hollow spaces.
3. At expansion joints, control joints, and areas where slabs will be penetrated, apply at rate of 4 gallons per 10 linear feet (5.1 L per linear m) of penetration.

C. Post signs in areas of application to warn workers that soil termiticide treatment has been applied. Remove signs after areas are covered by other construction.

D. Reapply soil treatment solution to areas disturbed by subsequent excavation, landscape grading, or other construction activities following application.

END OF SECTION 02282

SECTION 02300 - BUILDING EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Preparing subgrades for slabs-on-grade.
2. Excavating and backfilling for buildings and structures.
3. Drainage course for slabs-on-grade.

B. Related Sections include the following:

1. Appendix 1: Geotechnical Evaluation, by Duffield Associates, dated October 17, 2012.
2. Division 1 Section "Unit Prices" for authorized additional excavation provisions.
3. Division 1 Section "Construction Progress Documentation" for recording pre-excavation and earthwork progress.
4. Division 1 Section "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities.
5. Division 2 Section "Excavation Support and Protection" for shoring, bracing, and sheet piling of excavations.
6. Divisions 2, 15, and 16 Sections for installing underground mechanical and electrical utilities and buried mechanical and electrical structures.

1.3 UNIT PRICES

A. Unit prices for earthwork are included in Division 1 Section "Unit Prices."

B. Quantity allowances for earthwork are included in Division 1 Section "Allowances."

1.4 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

B. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

C. Drainage Course: Course supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

D. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices and changes in the Work.
2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

E. Fill: Soil materials used to raise existing grades.

F. Structures: Buildings, footings, foundations, slabs, tanks, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Each type of plastic warning tape.
2. Geotextile.
3. Controlled low-strength material, including design mixture.

B. Samples: 12-by-12-inch Sample of subdrainage and separation geotextile.

C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

1. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for fill and backfill.
2. Laboratory compaction curve according to ASTM D 1557 for each on-site and borrow soil material proposed for fill and backfill.

D. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earthwork operations. Submit before earthwork begins.

1.6 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.

B. Pre-excavation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.7 PROJECT CONDITIONS

A. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM AASHTO M 145 Soil Classification Groups A-1, A-2-4, A-2-5, and A-3, or a combination of these groups; free of rock or gravel larger than 8 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter. ML, SC or CL when approved by Geotechnical Engineer.

C. Unsatisfactory Soils: Soil Classification Groups [GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487] [A-2-6, A-2-7, A-4, A-5, A-6, and A-7 according to AASHTO M 145], or a combination of these groups. ML, SC or CL may be deemed satisfactory for building pad when approved by geotechnical engineer.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Engineered Fill: Naturally or artificially graded mixture of natural or crushed sand, or sand and gravel (soil aggregates), ASTM D 1241, Type 1-D, with 100% passing a 1-inch (25.0 mm) sieve and less than 25% passing a No. 200 (0.075 mm) sieve, or as recommended by Geotechnical Engineer.

E. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

F. Sand: ASTM C 33; fine aggregate, natural, or manufactured sand.

2.2 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Grab Tensile Strength: 157 lbf; ASTM D 4632.
3. Sewn Seam Strength: 142 lbf; ASTM D 4632.
4. Tear Strength: 56 lbf; ASTM D 4533.
5. Puncture Strength: 56 lbf ; ASTM D 4833.
6. Apparent Opening Size: No. 70 sieve, maximum; ASTM D 4751.
7. Permittivity: 0.1 per second, minimum; ASTM D 4491.
8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Grab Tensile Strength: 247 lbf; ASTM D 4632.
3. Sewn Seam Strength: 222 lbf ; ASTM D 4632.
4. Tear Strength: 90 lbf; ASTM D 4533.
5. Puncture Strength: 90 lbf; ASTM D 4833.
6. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
7. Permittivity: 0.02 per second, minimum; ASTM D 4491.
8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.3 CONTROLLED LOW-STRENGTH MATERIAL

A. Controlled Low-Strength Material: Low-density, self-compacting, flowable concrete material as follows:

1. Portland Cement: ASTM C 150, Type I.
2. Fly Ash: ASTM C 618, Class C or F.
3. Normal-Weight Aggregate: ASTM C 33, 3/8-inch nominal maximum aggregate size.
4. Foaming Agent: ASTM C 869.
5. Water: ASTM C 94/C 94M.
6. Air-Entraining Admixture: ASTM C 260.

B. Produce low-density, controlled low-strength material with the following physical properties:

1. As-Cast Unit Weight: 36 to 42 lb/cu. ft. at point of placement, when tested according to ASTM C 138/ C 138M.
2. Compressive Strength: 140 psi, when tested according to ASTM C 495.

C. Produce conventional-weight, controlled low-strength material with 140-psi compressive strength when tested according to ASTM C 495.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Division 2 Section "Site Clearing."

C. Provide protective insulating materials to protect subgrades and foundation soils against freezing temperatures or frost.

D. See Membrane Waterproofing specifications for base material requirements at vault pit slab.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
2. Install a dewatering system, to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.3 EXPLOSIVES

A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
2. Remove obstructions to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:

a. 24 inches outside of concrete forms other than at footings.
b. 12 inches outside of concrete forms at footings.
c. 6 inches outside of minimum required dimensions of concrete cast against grade.
d. Outside dimensions of concrete walls indicated to be cast against obstructions without forms or exterior waterproofing treatments.
e. 6 inches beneath bottom of concrete slabs on grade.

B. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by

Architect. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents. Changes in the Contract time may be authorized for rock excavation.

1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation.

    a. Intermittent drilling; blasting, if permitted; ram hammering; or ripping of material not classified as rock excavation is earth excavation.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

3.6 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs with heavy vibratory roller, such as a Dynapac CA-25 or equal, to identify loose or soft pockets and areas of excess yielding. Where the subgrade consists of the fine-grained cohesive soils, proof-rolling may be done in a static, mode, or a pneumatic-tired or sheepsfoot roller weighing at least 15 tons (13.6 tonnes) should be used. Do not proof-roll wet or saturated subgrades. See geotechnical report for site specific subgrade and fill requirements.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices and changes in the Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.7 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.

1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

3.8 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.9 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.10 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Backfill trenches excavated under footings and slabs and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 3 Section "Cast-in-Place Concrete.

C. Backfill voids with satisfactory soil while installing and removing shoring and bracing.

D. Place and compact final backfill of satisfactory soil to final subgrade elevation.

E. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.

F. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under slabs.

3.11 SOIL FILL

A. Bench sloped surfaces steeper than 1 vertical to 2.5 horizontal so fill material will bond with existing material. Benches are to be a minimum of 30" horizontal.

B. Place and compact fill material in layers to required elevations as follows:

1. Under steps and ramps, use engineered fill.
2. Under building slabs, use engineered fill.
3. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.12 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.13 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 12 inches in loose thickness, to be determined by the Geotechnical Engineer for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:

1. Under building foundations or footings, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent or as recommended by Geotechnical Engineer to maintain allowable bearing value. Under ground floor slabs, compact to at least 95%.

3.14 SUBSURFACE DRAINAGE

A. Subdrainage Pipe: Specified in Division 2 Section "Subdrainage."

B. Subsurface Perimeter Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches of filter material, placed in compacted layers 6 inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches.

1. Compact each filter material layer to 95 percent of maximum dry unit weight according to ASTM D 1557 or a minimum of two passes of a plate-type vibratory compactor for floor slab support.

C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with 1 layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.

1. Compact each filter material layer to 95 percent of maximum dry unit weight according to ASTM D 1557 or with a minimum of two passes of a plate-type vibratory compactor.
2. Place and compact impervious fill over drainage backfill in 6-inch-thick compacted layers to final subgrade.

3.15 DRAINAGE COURSE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place drainage course 6 inches or less in compacted thickness in a single layer.
3. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick.
4. Compact each layer of drainage course to required cross sections and thicknesses to the minimum required densities, as specified in Article 3.13 COMPACTION OF SOIL BACKFILLS AND FILLS.

3.16 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing

agency to perform field quality-control testing.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least 1 test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than 3 tests.

D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.17 PROTECTION

A. Repair and reestablish grades to the specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Geotech engineer; reshape and recompact.

B. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

B. Disposal: Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Owner.

1. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

+ + END OF SECTION + +

SECTION 02300 - EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Preparing subgrades for slabs-on-grade walks, pavements, lawns, and grasses.
2. Excavating and backfilling for buildings and structures.
3. Drainage course for slabs-on-grade.
4. Subbase course for concrete walks and pavements.
5. Subbase and base course for asphalt paving.
6. Subsurface drainage backfill for walls and trenches.
7. Excavating and backfilling for utility trenches.
8. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.

B. Related Sections include the following:

1. Division 1 Section "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities.
2. Division 1 Section 01505 – Construction Waste Management
3. Division 2 Section "Site Clearing" for temporary erosion and sedimentation control measures, site stripping, grubbing, stripping and stockpiling topsoil.
4. Division 2 Section "Lawns and Grasses" for finish grading, including preparing and placing topsoil and planting soil for lawns.
5. Division 2 Section "Exterior Plants" for planting bed establishment and tree and shrub pit excavation and planting.
6. Division 3 Section "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.
7. Divisions 2, 15, and 16 Sections for installing underground mechanical and electrical utilities and buried mechanical and electrical structures.

1.3 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Course placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Course supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect.
2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect.

G. Fill: Soil materials used to raise existing grades.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Subbase Course: Course placed between the subgrade and base course for hot-mix asphalt pavement, or course placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

J. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Each type of plastic warning tape.

B. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

1. Classification according to ASTM D 2487 of each on-site proposed for fill and backfill.
2. Laboratory compaction curve according to ASTM D 1557 for and borrow soil material proposed fill and backfill.
3. If results are unsuitable contact project civil engineer.

1.5 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing.

1. Notify Architect/Owner not less than two days in advance of proposed utility interruptions if encountered.
2. Do not proceed with utility interruptions without Architect's/Owner's written permission if encountered.
3. Contact utility-locator service for area where Project is located before excavating.

B. If existing underground are encountered coordinate with utility companies to shut off services if lines are active.

C. Surface Conditions: Subsurface soils in investigation have been made at the site. The report and logs of the test borings and test pits are included in the Appendix of these specifications. Such investigations have been made for the purposes of design only and neither the Engineers, the Owner, nor the Geotechnical Engineer guarantee adequacy or accuracy of the data, or that data are representative of all conditions to be encountered. If soil conditions other than outlined in the report exist, contractor shall notify the engineer.

D. Erosion and sediment control, in addition to erosion control specified in Division 1:

1. Standards: Comply with the requirements of the "Standards and Specifications for Soil Erosion and Sediment Control in Developing Areas" by the U.S.D.A. Soil Conservation Service.

2. General Erosion: Prevent erosion of earthwork; repair and correct any ditches, gullies or erosion immediately and upon occurrence.
3. Excavations: Prevent water from flowing into open excavations and toward building walls.
4. Slopes: Cover and stake all slopes steeper than 1 horizontal to 1 vertical.

E. Environmental Conditions:

1. Do not apply soil treatment when temperature is at or below freezing or when ground is frozen or frost is expected.
2. Do not apply soil treatment when surface water is present.

F. Existing Conditions: At the time of the award of the contract, perform all work to the grades indicated if contractor encounters conditions other that shown on the plan contractor shall contact the engineer for course of action.

1. Protect bench marks, existing structures, fences, sidewalks, paving and curbs from excavating equipment and vehicular traffic.

G. Existing Utilities: Locate existing underground utilities in areas of work.

1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility Owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility Owner.
2. Do not interrupt existing utilities serving facilities occupied and used by others, except when permitted in writing by utility company. Provide a minimum of 48-hour notices to utility Owners and receive written notice to proceed before interrupting any utility.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: When sufficient satisfactory on-site soil materials are not available from excavations, contact engineer for direction.

B. Satisfactory Soils: ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter. If soil is found unsatisfactory, contact engineer on-site.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups. If soil is found unsatisfactory, contact engineer on-site.

1. Unsatisfactory soils also include satisfactory soils not within 2 percent of optimum moisture content at time of compaction.

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

I. Sand: ASTM C 33; fine aggregate, natural, or manufactured sand.

2.2 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:

B. Detectable Warning Tape: The tape shall have a solid aluminum foil core encased between 2 layers of plastic, manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 5 mils thick, continuously inscribed with a description of the utility:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.
6. Brown: Force main.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Division 2 Section "Site Clearing."

C. Protect and maintain erosion and sedimentation controls, which are specified in Division 2 Section "Site Clearing," during earthwork operations.

3.2 DEWATERING

A. Prevent water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area. Provide localized sumping to prevent water from entering excavations during construction.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
2. Install a localized sumping system to keep subgrades dry.
3. If excessive groundwater is encountered contact engineer for direction.

3.3 EXPLOSIVES

A. Explosives: The use of explosives is not permitted.

3.4 EXCAVATION, GENERAL

A. Excavation: If materials such as rock, unsuitable soil, materials, or other obstructions are encountered, contact engineer for direction.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, contact engineer.

B. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross-braces, in good serviceable condition.

1. Establish requirements for trench shoring and bracing to comply with local codes and authorities having jurisdiction.
2. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.

1. Clearance: 12 inches each side of pipe or conduit.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit less than 6 inches in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
3. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.8 SUBGRADE INSPECTION

A. Notify the project Geotechnical Engineer employed by the design/builder when excavations have reached required subgrade.

B. If project Geotechnical Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

1. Additional excavation and replacement material will be paid for according to contract provisions for changes in work.

C. Proof-roll subgrade below the building slabs and pavements (as directed by the on-site Project Geotechnical Engineer) with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Project Geotechnical Engineer, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Project Geotechnical Engineer.

3.9 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.

1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

3.10 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.12 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Place and compact initial backfill of subbase material, free of particles larger than 1 inch in any dimension.

1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

D. Backfill voids with satisfactory soil while installing and removing shoring and bracing.

E. Place and compact final backfill of satisfactory soil to final subgrade elevation.

F. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.13 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

C. Place soil fills on subgrades free of mud, frost, snow, or ice.

3.14 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to the modified proctor method (ASTM D 1557):

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
3. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.16 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1 inch.
3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.17 SUBBASE AND BASE COURSES

A. Place subbase and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase and base course under pavements and walks as follows:

1. Place base course material over subbase course under hot-mix asphalt pavement.
2. Shape subbase and base course to required crown elevations and cross-slope grades.
3. Place subbase and base course 6 inches or less in compacted thickness in a single layer.
4. Place subbase and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
5. Compact subbase and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

C. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.18 DRAINAGE COURSE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

1. Place drainage course 6 inches or less in compacted thickness in a single layer.
2. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
3. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.19 FIELD QUALITY CONTROL

A. Testing Agency: The Construction Manager will engage a qualified independent geotechnical engineering testing agency to perform field quality control testing.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work complies with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design-bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least 1 test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than 3 tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least 1 test for each 100 feet or less of wall length, but no fewer than 2 tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least 1 test for each 150 feet or less of trench length, but no fewer than 2 tests.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

3.20 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove waste material, including trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 02300

SECTION 02455 - AUGERED PRESSURE GROUTED (APG) PILES

PART 1 - GENERAL

1.01 REQUIREMENTS

A. Furnish all labor, materials, equipment, and tools required to complete the installation of all piles, and pile as indicated on Contract Documents and as specified herein.

B. Coordination:

1. Review requirements of other trades and coordinate with the Work specified herein.

2. Notify other Contractors in advance of the installation of the Work included herein to provide them with sufficient time for the installation and coordination of interrelated items that are included in their contracts and that must be installed in conjunction with the Work included in this Section.

C. Related Work Specified Elsewhere:

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

2. Section 033000 - Cast-in-Place Concrete

3. Section 312000 - Earthwork

1.02 UNIT PRICES

A. General: Refer to Division 1 Section "Unit Prices."

B. Measurement: Using data obtained during pile installation, Architect will calculate measurements of actual total net effective length of piles installed. Measurements will be based on effective length of piles in place, from tip elevation to cutoff elevation, with lengths measured to nearest 12 inches.

1. Additional payment for pile lengths in excess of the Contract length, and credit for pile lengths less than the Contract length, will be calculated at unit prices stated in the Contract, based on net addition or deduction to total net effective in-place pile length.
2. Unit prices include labor, materials, tools, equipment, and incidentals for furnishing, installing, cutting off, capping, and extending piles and disposing of spoil.
3. Test piles that become part of permanent foundation system will be considered as an integral part of the Work.
4. No payment will be made for rejected piles, including piles installed out of tolerance, defective piles, or piles damaged during excavation or installing.

1.03 QUALITY ASSURANCE

A. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

1. International Building Code - 2009.

2. ASTM D1143-07 2007, Standard Test Method for Deep Foundations under Axial Compressive Load.

3. ASTM C939-81, Standard Test Method for Flow of Grout of Preplaced Aggregate Concrete.

4. ASTM C109 Standard Test method for Compressive Strength of Hydraulic Cement Mortars (using 2-inch cube specimens).

B. Qualifications: Firm which has minimum of 5 years of successful experience in installing and testing piles similar to units required for this Project. The Pile Contractor superintendent shall be thoroughly experienced in piling operations of this class of piles and nature.

C. Testing and Inspection Service: Owner will employ a qualified Geotechnical engineering firm with a Geotechnical Engineer registered in the State of Delaware to perform testing and monitoring service during pile installation operations.

1.03 SUBMITTAL

A. Submit the following:

1. Piles:

a. Full data on type of pile and pile depth and on other equipment to be utilized, to achieve an allowable design load capacity of 55 tons. Minimum diameter of pile to be 16 inches.
b. A pile layout plan referenced to the structure plans, including a numbering system to identify each individual pile.
c. A description and sketch or catalog data of the pile installation rig including but not limited to: leads, auger, grout pump, and auger motor.
d. The pile installation procedures.
e. Pile reinforcing configuration and means and methods and sequencing of installation including method of centralizing reinforcing cage within the grouted shaft.
f. Pile identification plan with grid locations to scale, identifying pile cut-off elevations.
g. The proposed grout design mix verified with laboratory strength test results of trial mixes made with materials of the proposed mix, or verified with test results from previous projects in which the exact proposed mix was used. Proposed mix submittal data shall conform to ACI 318, Section 5.3 (field experience or trial batches). Submit proposed mix and accompanying data at least 15 days prior to start of work.

2. Installation Records:

a. Submit two copies of the installation record of each pile to the Owner not later than two (2) days after each installation is completed. Include the project name, date, weather conditions, pile number, name of contractors, pile location and pile capacity, volume of grout injection, pile dimensions, tip elevation, elevation of butt, ground elevation, pile deviation, and any unusual occurrences during pile installation.
b. Submit As-built Drawings showing exact location of each pile as installed including cut-off elevations, and plan dimensions referenced to building column lines. Reinforcement of pile caps for piles installed out of tolerance, as defined herein, are subject to redesign. The Owner shall not be responsible for the re-detailing nor re-fabrication and placement of rebar requiring redesign due to piles installed out of tolerance.
c. It is recommended that monitoring of the installation of pressure-grouted auger cast piles be done using a Pile Installation Recorder (PIR) such as supplied by Pile Dynamics Inc., or equal which can record among other things, the depth of auger bottom, grout volume, the pressure of grout in the grout line or heave at the bottom of the auger, auger inclination, etc.

3. Load Test Reports

a. Submit within three days of completing test. Perform a single static compressive load test in accordance with ASTM D1143 on a “sacrificial” pile to 2 times the design load and holding for a minimum of 2 hours. Unload the pile in accordance with ASTM D1143, that the test pile then be reloaded in increments to “failure”. Include arrangement of static pile reaction frame, test and anchor piles, equipment, and instrumentation. Submit structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

4. During progress of the Work, keep a current set of Drawings showing field modifications. Immediately upon completion of work, provide Record Drawings showing the actual in place installation of all Work constructed and/or installed under this Section. Drawings shall include all necessary plans, Sections and details, with all reference dimensions and elevations required for complete Record Drawings of the Work.

1.04 JOB CONDITIONS

A. Product Delivery, Storage and Handling:

1. Contractor shall deliver, store, handle and protect all products, materials and equipment in accordance with project specifications.

2. Supplier of grout shall be located in close proximity to the project and not more than 30 minutes driving time away.

3. Deliver materials to the site in such quantities and at such times as to assure the continuity of pile installation operations for each pile.

B. Site Information:

1. A Geotechnical Engineering Report has been prepared for this project by Duffield Associates of Wilmington, Delaware and will be made available to the Contractor for information only as an Appendix to these Specifications. The subsurface data obtained in the geotechnical investigation is not intended as representations or warranties of accuracy or continuity between soil borings. The Owner will not be responsible for interpretations or conclusions drawn from this data by the Contractor.

a. Additional test borings and other exploratory operations may be performed by the Contractor, at the Contractor’s option; however, no change in the Contract Sum will be authorized for such additional exploration.

C. Line and Level:

1. A benchmark and base lines will be established on the site for the use of the Contractor in establishing lines and levels for the work. The Contractor shall establish and locate all other lines and levels and be responsible for the correct location and deviation measurements of all piles.

D. Protection:

1. Protect structures, underground utilities and other construction from damage caused by pile installation operation.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete:

1. Portland cement shall conform to current ASTM C150.

2. Mineral admixture, if used, shall be Pozzolanic Fly Ash, and, shall conform to ASTM C618, Class F, or Class C.

3. If the Contractor elects to use a grout fluidifier, he shall submit manufacturers data on the use of this product to the Owner for review and approval. The fluidifier shall be a compound possessing characteristics which will increase the fluidity of the mixture, and act as a water reducing agent and retardant.

4. Water shall be potable, fresh, clean, and free of sewage, oil, acid, alkali, salts, or inorganic matter, or other objectionable materials that may be detrimental to the grout.

5. Other admixtures shall not be used.

6. Fine aggregate shall meet the requirements of current ASTM C33 standards.

B. Reinforcing Bars shall conform to the requirements of ASTM A 615, Grade 60. Reinforcing cage shall be detailed and fabricated in accordance with the manual of Standard Practice for Detailing Reinforced Concrete Structures (ACI 315 - latest edition).

1. Acceptable methods, such as steel or plastic centralizers shall be used to facilitate proper centering of reinforcing cage in the piles.

C. Grout Mix for Auger Pressure Grouted Piles:

1. The grout used to fill the shafts shall consist of a mixture of Portland cement, fluidifier, approved mineral admixture if used, and water so proportioned and mixed as to provide a grout capable of maintaining the solids in suspension without appreciable water gain yet which may be placed without difficulty, and which will laterally penetrate and fill any voids in the foundation soil. The materials shall be so proportioned as to provide a hardened grout having an ultimate compressive strength of 5,000 psi at 28 days when tested in accordance with ASTM C109.

2. The grout mix shall be tested by a qualified testing laboratory at the Owner's expense by making one set of 2-inch cubes in accordance with ASTM C109 and C492 for each 50 cubic yards of grout placed. However, as a minimum at least one set shall be made for each day during which grout it placed. A set of cubes shall consist of a total of six (6) cubes, two (2) cubes to be tested at 7 days and 2 cubes to be tested at 28 days. The remaining 2 cubes will be held in reserve and tested at a later date, if required. Cube specimens may be restrained from expansion as described in ASTM C-942.

3. Only approved pumping, continuous mixing and agitating equipment shall be used in the preparation and handling of the grout. All oil and other rust inhibitors shall be removed from mixing drums and grout pumps. All materials shall be such as to produce homogeneous grout of the desired consistency.

4. The grout pump shall be a positive displacement piston type pump capable of developing displacing pressures at the pump up to 350 psi. The minimum volume of grout pumped for each shaft shall be at least equal to 120 percent of the volume of the augered shaft. The maximum grout volume per pump stoke shall be 0.50 cf/stroke.

2.02 EQUIPMENT FOR INSTALLING PILES

A. Equipment for Installing Auger Pressure Grouted Piles

1. The hole through which the high-strength grout is pumped during the placement of the pile shall be located at the bottom of the auger head below the cutting teeth.

2. The auger flighting shall be continuous from the auger head to the top of auger with no gaps or other breaks. The auger flighting shall be uniform in diameter throughout its length and be the diameter specified for the piles less a maximum of 3%. The auger

cutting teeth shall be regularly inspected for wear and tear, and shall be replaced if the above specified reduction in diameter tolerance occurs. The auger flight length is to be of sufficient length to accommodate at least 20% longer piles than estimated in Geotechnical Report.

3. Augers over 40 feet in length shall contain a middle guide.

4. The piling leads may be prevented from rotating by a stabilizing arm or by firmly placing the bottom of the leads into the ground or by some acceptable means.

5. The leads shall be adequately marked at one (1) foot intervals to facilitate measurement of auger penetration below the ground surface.

6. Drilling equipment will be capable of developing a minimum of 50,000 ft.-lbs. of torque on a downward force of 10,000 lbs, or as determined by the pile contractor to be suitable for installation of piles with their equipment based on the available subsurface data and their experience with similar projects in the area.

PART 3 - EXECUTION

3.01 PREINSTALLATION WORK

A. Piling Contractor must examine the areas and conditions wherever piles are to be installed. Notify the General Contractor and/or Architect/Engineer, in writing of conditions detrimental to the proper and timely completion of work.

B. Do not install piles until earthwork in area which piles are to occupy has been completed, as follows:

1. Excavations: Earth excavations will be complete to the approximate bottom of subgrade before piles are installed.

2. Fills: Fills will be constructed and compacted to the approximate bottom of subgrade prior to pile installation.

3.02 GENERAL REQUIREMENTS

A. Piles shall be installed with due consideration for the safety of adjacent structures and existing active utilities by a method which leaves their strength unimpaired and which develops and retains the required load bearing capacity. The Contractor shall verify the location of existing utilities prior to start of pile installation.

B. Auger Pressure Grouted Piles shall be made by rotating a continuous flight hollow-shaft auger into the ground to a tip elevation, as determined by the Geotechnical Engineer and confirmed by the PIR. Grout shall then be injected through the hollow auger shaft as the auger is being withdrawn. Grout injection and the rate of auger withdrawal will be coordinated so that a sufficient pressure is maintained, allowing the grout to fill the hole, preventing its collapse, and permitting lateral intrusion of grout into the surrounding soil.

3.03 PILE INSTALLATION

A. General:

1. The installation shall be performed in an orderly sequence progressing in one direction across the job site.

2. Continuously install each pile at the locations indicated, to the tip elevation determined for each pile.

3. Carefully maintain the center of gravity for each group or cluster of piles to conform to the locations shown.

4. Carefully plumb the leads and the auger before installation.

5. In the event that non-augerable material is encountered prior to reaching the required bearing stratum, or if non-augerable material causes the pile to drift from its location, the pile shall be completed to the depth of the non-augerable material in accordance with these Specifications, and one or more additional adjacent piles shall be installed as directed by the Architect/Engineer.

    a. Non-augerable material: Non-augerable material includes but is not limited to, boulders, metal, timbers or debris.
    b. Auger refusal for non-augerable material: Auger refusal for non-augerable material is defined as a rate of auger penetration of less than 1 foot per five minutes of drilling and signs of no penetration using drilling equipment with minimum torque capabilities of 50,000 ft/lbs. and minimum crowd of 10,000 lbs.

6. All piles will be drilled down to the design specified depth. Pile tip elevation should not exceed elevation -19 (i.e., the pile tip should not be installed any deeper than elevation -19)

7. All piles will have each a reinforcing cage as designed by the the structural Engineer to be placed in the pile immediately after grouting. Centralizers or other acceptable methods will be used to center the reinforcing cage in the pile.

B. Installation:

1. Only approved mixing and pumping equipment shall be used in the preparation and handling of grout. A screen to remove oversize particles shall be placed at the pump inlet. All oil or rust inhibitors shall be removed from the mixing drums, stirring mechanisms, and other portions of the equipment in contact with the grout before the mixers are used.

2. All materials shall be accurately measured by volume or weight as they are fed into mixture. Time of mixing shall be not less than one minute. If agitated continuously, the grout may be held in the mixer or agitator for a period not exceeding two hours. Grout shall not be placed when the grout mix temperature exceeds 100 deg. F.

3. Accurate records shall be maintained showing the depth to which piles are drilled and the quantity of grout placed. Any unusual conditions encountered during pile installation shall be noted. The leads of the rig shall be clearly marked in one foot increments along its entire length.

4. Adjacent piles shall not be installed within five pile diameters center to center of a pile filled with grout less than 12 hours old.

5. The hole in the bottom of the auger shall be plugged while being advanced into the ground. The plug shall be fabricated to fit snugly into the augered shaft. The plug shall be removed by grout pressure or with a reinforcing bar.

6. Advance pile auger at a continuous rate that prevents excessive removal of soil. Drill to required depth as specified in section 3.03 item A.6.

7. The grout shall be pumped with sufficient pressure as the auger is withdrawn allowing the grout to fill the hole, preventing its collapse, and permitting lateral intrusion of the grout into the surrounding soil.

8. The grout pump shall be provided with a calibrated pressure gauge in clear view of the equipment operator. A digital counter shall be used to measure the number of grout pump strokes during installation. The grout pump shall be calibrated at the beginning of the

project, and as needed during the duration of the project if equipment changes or modifications are made, to determine the number of pump strokes to fill a 55 gallon drum with grout. Calibration shall be performed using the approved design mix at the same consistency to be used for the project. The pump shall be recalibrated following repair or switching pumps or at least once at the request of the Geotechnical Engineer during pile installation. The Contractor shall have on hand a spare counter and a spare pump. The spare pump shall be utilized when the primary pump is not functioning properly and when directed by the Geotechnical Engineer. Maximum grout volume per pump stroke is 0.50 cf/stroke.

9. Positive rotation of the auger shall be maintained throughout placement of the grout. Rate of grout injection and rate of auger withdrawal from the soil shall be so coordinated as to maintain at all times a positive pressure on the gauge, which will, in turn, indicate the existence of a removing pressure on the bottom of the auger flight. The total volume of grout installed shall be at least 20 percent greater than the theoretical volume of the void created by the auger, as measured in 5 foot increments, except after grout is flowing at the ground surface from the auger blade, a minimum of 10 percent shall be pumped. Do not withdraw auger until soil cuttings or water are no longer observed issuing and a clean flow of grout is evident at the surface. If pumping of grout is interrupted for any reason, the contractor shall re-insert the auger at least five (5) feet into the pile and regrout.

10. If less grout is placed than the net volume required for any five foot increment, the piles shall be reinstalled by rotating the auger to the bottom of the pile followed by controlled removal and grout injection.

11. A head of at least five (5) feet grout above the injection point shall be maintained around the perimeter of the auger flights during raising of the auger so that the grout has a displacing action, removing any loose material from the hole. This head shall be initially established by raising the auger six (6) inches from the bottom while rotating, pumping grout until a sufficient quantity is measured, lowering the auger to its original level, and finally starting the removal process. The auger shall not be extracted in a manner that would result in an open, unsupported hole. Should it become necessary to raise and subsequently reinsert the auger during the pile construction process, the depth of the pile shall be increased or alternative remediation measures be employed at the Contractor's expense as directed by the Geotechnical Engineer.

12. Auger hoisting equipment shall be so designed as to enable the auger to be withdrawn smoothly and steadily. Augers in excess of 40 feet in length shall be provided with traveling guide.

13. Magnitude of removing pressure and performance of other augering and grouting operations such as the rate of augering, rate of grout injection, and control of grout return around the auger flight are dependent on soil conditions and equipment capability and shall be entirely the responsibility of the Contractor.

14. The spoil that accumulates around the auger during injection of the grout shall be continuously cleared away so that the installation can be properly inspected.

15. The Laboratory Testing Company shall test periodic truckloads (atleast twice daily) of grout using the Flow Cone Test ASTM C939-81, with a flow cone fitted with a 3/4-inch diameter outlet. Maintain grout fluidity of between 15 and 25 seconds.

16. Should water or ponding collect at the top of a freshly grouted pile, the water shall be removed immediately by bailing-out and replaced with fresh grout.

17. See drawings for pile reinforcing requirements.

18. After the auger is removed from the pile, remove by hand any visible deleterious material or soil from the top of the grout column. Adjust the grade of the grout column as necessary by addition or removing grout.

19. Use centralizers or acceptable means in placing the reinforcing cage in the pile such that the steel does not contact the earth sides of the pile and introduce earth into the grout. Do not use equipment to force reinforcing cage into the grout. If grout has become stiff prior to placement of reinforcing, redrill pile and place fresh grout.

20. Where the pile cut off is near or above the surrounding ground surface or above the bottom of the excavation, sleeves or casing of the proper diameter and at least 18-inches in length shall be placed around the pile tops. (Special conditions may require metal sleeves of additional length.)

C. Installation Tolerances: Install piles within the following maximum tolerances:

1. Location: 3 inches from the location indicated for the center of gravity of each single pile or pile groups.

2. Plumbness: Maintain 2-inch in 10 feet from the vertical (approximately 1.67%).

3. Any battered piles shall be within four (4) percent of the specified batter as determined by the angle from the horizontal.

4. Cutoff: Maximum 1-inch + from elevation indicated.

D. Corrective Action:

1. As soon as possible, after completion of installation of piles, Contractor shall prepare an accurate survey made by a licensed surveyor and furnish it to the Owner with a record showing the final position and elevation of the top of each pile.

2. The Geotechnical Engineer will verify the piling's acceptability. If not acceptable, the Geotechnical Engineer will advise the Contractor as to corrective measures to be taken.

3. Partial surveys of piles at cutoff elevation may be submitted, as installation proceeds, in order to expedite the Work.

E. Damaged Piles or Piles Out of Tolerance:

1. Damaged piles, improperly reinforced piles, and piles installed outside the required installation tolerances, will not be accepted.

2. Cut-off and abandon piles rejected after installation, and replace with new piles.

3. Install additional piles where the centerline deviation exceeds 3 inches and a redesign indicated a load on any pile exceeding 110 percent of the design load.

F. Cutting-Off: Cut-off the tops of piles, square with pile axis and at the elevations indicated by cutting off hardened grout down to final cut-off point at any time after initial set has occurred. Removing fresh grout from the top of the pile will also be permitted.

G. Cold Weather Placing: Protect grout work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in accordance with ACI 306.

H. Hot Weather Placing: when hot weather conditions exist that would seriously impair the quality and strength of grout, place grout in accordance with ACI 305.

3.04 FIELD QUALITY CONTROL

A. A compressive pile load test shall be performed . Perform a single static compressive load test in accordance with ASTM D1143 on a “sacrificial” pile to 2 times the design load and holding for a minimum of 2 hours. Unload the pile in accordance with ASTM D1143, that the test pile then be

reloaded in increments to “failure”. Include arrangement of static pile reaction frame, test and anchor piles, equipment, and instrumentation. Submit structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation. Performance of a tension load test is not required .

B. Inspector: The Owner will retain a Geotechnical Engineering Firm to inspect the pile installation operation. The pile contractor shall cooperate with the Geotechnical Inspector in the performance of this work. The presence of the inspector shall in no way relieve the pile contractor of his obligation to perform the pile installation in accordance with the Contract Drawings and these specifications.

C. Pile Acceptance: The Owner's representative will determine the acceptability of the piles. The engineer will immediately notify the contractor if a pile is not in conformance with these specifications.

D. The pile inspector retained by the Owner shall submit two copies of the installation record of each pile no later than three days after installation is completed. Include: the project name and number; name of the contractors; pile location and design pile capacity; pile diameter; tip elevation; elevation of butt; drilling elevation; (total and/or continuous) quantity of grout placed; reinforcing cage; and any unusual occurrences during the pile installation.

+ + END OF SECTION + +

SECTION 02510 - WATER DISTRIBUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes water-distribution piping and related components outside the building for combined water service and fire-service mains.

B. Utility-furnished products include water meters that will be furnished to the site, ready for installation.

1.3 DEFINITIONS

A. DIP: Ductile iron pipe.

1.4 SUBMITTALS

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

B. Field quality-control test reports.

C. Operation and Maintenance Data: For water valves and specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. Comply with FMG's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.

D. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.

E. NSF Compliance:
1. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:

1. Ensure that valves are dry and internally protected against rust and corrosion.
2. Protect valves against damage to threaded ends and flange faces.
3. Set valves in best position for handling. Set valves closed to prevent rattling.

B. During Storage: Use precautions for valves, including fire hydrants, according to the following:

1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.7 PROJECT CONDITIONS

A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:

1. Notify Construction Manager no fewer than three days in advance of proposed interruption of service.
2. Do not proceed with interruption of water-distribution service without Construction Manager's written permission.

1.8 COORDINATION

A. Coordinate connection to water main with utility company.

PART 2 - PRODUCTS

2.1 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.

1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.

1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
2. Gaskets: AWWA C111, rubber.

2.2 GATE VALVES

A. AWWA, Cast-Iron Gate Valves: As specified on the drawings

2.3 CHECK VALVES

A. AWWA Check Valves: As specified on the drawings

2.4 CORPORATION VALVES AND CURB STOPS

A. Manufacturers: As specified on the drawings

2.5 WATER METERS

A. As specified on the drawings.

2.6 FIRE HYDRANTS

A. Fire Hydrants: As specified on the drawings.

2.7 FIRE DEPARTMENT CONNECTIONS

A. Fire Department Connections: as specified on the drawings

PART 3 - EXECUTION

3.1 EARTHWORK

A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.

B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.

C. Do not use flanges or unions for underground piping.

D. Flanges, unions, grooved-end-pipe couplings, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.

E. Underground water-service piping shall be as specified on the drawings:

3.3 VALVE APPLICATIONS

A. General Application: Use mechanical-joint-end valves for NPS 3 (DN 80) and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FMG, nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 (DN 50) and smaller installation.

B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

3.4 PIPING INSTALLATION

A. Water-Main Connection: Arrange with utility company for tap of size and in location indicated in water main.

B. Make connections larger than NPS 2 (DN 50) with tapping machine according to the following:

1. Install tapping sleeve and tapping valve according to MSS SP-60.
2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.

C. Make connections NPS 2 (DN 50) and smaller with drilling machine according to the following:

1. Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company standards.
2. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.
3. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.
4. Install corporation valves into service-saddle assemblies.
5. Install manifold for multiple taps in water main.
6. Install curb valve in water-service piping with head pointing up and with service box.

D. Comply with NFPA 24 for fire-service-main piping materials and installation.

1. Install PE corrosion-protection encasement according to ASTM A 674 or AWWA C105.
2. Install copper tube and fittings according to CDA's "Copper Tube Handbook."

E. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.

1. Install PE corrosion-protection encasement according to ASTM A 674 or AWWA C105.

F. Bury piping with depth of cover over top at least as indicated on the drawings.

G. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed.

H. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations and pipe sizes indicated.

1. Terminate water-service piping at building wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building-water-piping systems when those systems are installed.

I. Sleeves are specified in Division 15 Section "Basic Mechanical Materials and Methods."

J. Mechanical sleeve seals are specified in Division 15 Section "Basic Mechanical Materials and Methods."

K. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

L. See Division 15 Section "Fire Protection" for fire-suppression-water piping inside the building.

M. See Division 15 Section "Domestic Water Piping" for potable-water piping inside the building.

3.5 JOINT CONSTRUCTION

A. See Division 2 Section "Piped Utilities - Basic Materials and Methods" for basic piping joint construction.

B. Make pipe joints according to the following:
1. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.
2. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.
3. Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with grooved-end, ductile-iron-piping couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions.
4. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure. Refer to Division 2 Section "Piped Utilities - Basic Materials and Methods" for joining piping of dissimilar metals.

3.6 ANCHORAGE INSTALLATION

A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:

1. Concrete thrust blocks.

B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:

1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.

3.7 VALVE INSTALLATION

A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.

B. AWWA Valves Other Than Gate Valves: Comply with AWWA C600 and AWWA M44.

C. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.

3.8 WATER METER INSTALLATION

A. Install water meters, piping, and specialties according to utility company's written instructions.

3.9 ROUGHING-IN FOR WATER METERS

A. Rough-in piping and specialties for water meter installation according to utility company's written instructions.

3.10 FIRE HYDRANT INSTALLATION

A. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.

3.11 FIRE DEPARTMENT CONNECTION INSTALLATION

A. Install ball drip valves at each check valve for fire department connection to mains.

B. Install protective pipe bollards in front of fire department connection. Pipe bollards are specified in Division 5 Section "Metal Fabrications."

3.12 CONNECTIONS

A. Piping installation requirements are specified in other Division 2 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect water-distribution piping to existing water main. Use tapping sleeve and tapping valve.

C. Connect water-distribution piping to interior domestic water and fire-suppression piping.

3.13 FIELD QUALITY CONTROL

A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.

1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

C. Prepare reports of testing activities.

3.14 IDENTIFICATION

A. Install continuous underground detectable warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Division 2 Section "Earthwork."

B. Permanently attach equipment nameplate or marker indicating plastic water-service piping, on main electrical meter panel. See Division 2 Section "Piped Utilities - Basic Materials and Methods" for identifying devices.

3.15 CLEANING

A. Clean and disinfect water-distribution piping as follows:

1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:

    a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
    b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
    c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
    d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports of purging and disinfecting activities.

END OF SECTION 02510

SECTION 02521- DETECTABLE/TACTILEWARNING SURFACES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 1 Specifications Section, apply to this Section.

1.2 DESCRIPTION

A. This Section specifies furnishing and installing Cast In Place Detectable Tactile Warning Surface Tiles where indicated. Not recommended for asphalt applications.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's literature describing products, installation procedures and routine maintenance.

B. Samples for Verification Purposes: Submit two (2) tile samples minimum 6"x6" of the kind proposed for use.

C. Shop drawings are required for products specified showing fabrication details, composite structural system, tile surface profile, sound on cane contact amplification feature, plans of tile placement including joints, and material to be used as well as outlining installation materials and procedure.

D. Material Test Reports: Submit complete test reports from qualified accredited independent testing laboratory's to qualify that materials proposed for use are in compliance with requirements and meet or exceed the properties indicated on the specifications. All tests shall be conducted on a Cast In Place Detectable Tactile Warning Surface Tile system as certified by a qualified independent testing laboratory and be current within a 24 month period.

E. Maintenance Instructions: Submit copies of manufacturer's specified installation and maintenance practices for each type of Detectable Warning Surface Tile and accessory as required.

F. LEED Submittals:

1. Credit MR C4: For products having recycled content, including postconsumer and pre-consumer recycled content. Provide the following information:
    a. Product Data
    b. Percent Content (post and pre-consumer)
    c. Invoices indicating cost of material (no labor included.)

1.4 QUALITY ASSURANCE

A. Provide Cast In Place Detectable Tactile Warning Surface Tiles and accessories as produced by a single manufacturer with a minimum of three (3) years experience in the manufacturing of Cast In Place Detectable Tactile Warning Surface Tiles.

B. Installer's Qualifications: Engage an experienced Installer certified in writing by Cast In Place Detectable Tactile Warning Surface Tile manufacturer as qualified for installation, who has successfully completed installations similar in material, design, and extent to that indicated for Project.

C. Americans with Disabilities Act (ADA): Provide Surface Applied Detectable Tactile Warning Surface Tiles which comply with the detectable warnings on walking surfaces section of the Americans with Disabilities Act (Title III Regulations, 28 CFR Part 36 ADA STANDARDS FOR ACCESSIBLE DESIGN, Appendix A, Section 4.29.2 DETECTABLE WARNINGS ON WALKING SURFACES).

D. Cast Iron (CI) Cast In Place Detectable Tactile Warning Surface Tiles shall be a cast iron tile with a natural finish cast iron surface. The tile shall incorporate an in-line pattern of truncated domes measuring nominal 0.2" height, 0.9" base diameter, and 0.45" top diameter, spaced center-to-center 2.35" as measured on a

diagonal and 1.67" as measured side by side. For wheelchair safety the field area shall consist of a non-slip surface cast with raised pattern.

1.5 DELIVERY, STORAGE AND HANDLING

A. Cast In Place Detectable/Tactile Warning Surface Tiles shall be suitably packaged or crated to prevent damage in shipment or handling. Finished surfaces shall be protected by sturdy plastic wrappings to protect tile from concrete residue during installation and tile type shall be identified by part number.

B. Cast In Place Detectable/Tactile Warning Surface Tiles shall be delivered to location at building site for storage prior to installation.

1.6 SITE CONDITIONS

A. Environmental Conditions and Protection: Maintain minimum temperature of 40°F in spaces to receive Cast In Place Detectable/Tactile Warning Surface Tiles for at least 24 hours prior to installation, during installation, and for not less than 24 hours after installation.

B. The use of water for work, cleaning or dust control, etc. shall be contained and controlled and shall not be allowed to come into contact with the general public. Provide barricades or screens to protect the general public.

1.7 GUARANTEE

A. Cast In Place Detectable/Tactile Warning Surface Tiles shall be guaranteed in writing for a period of five (5) years from date of final completion. The guarantee includes defective work, breakage, deformation, fading and loosening of tiles.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

1. Cast Iron "Duralast Detectable Warning Plates" as manufactured by East Jordan Iron Works Inc.
2. Cast Iron “Detectable Warning Plates” as manufactured by Neenah Foundry, Inc.
    a. Dimensions: Cast In Place Detectable/Tactile Warning Surface Tiles shall be held within the following dimensions and tolerances: Length and Width: 24x24
    b. Water Absorption of Tile when tested by ASTM D 570-98 not to exceed 0.05%.
    c. Slip Resistance of Tile tested by ASTM C 1028 the Wet or Dry Static Co-Efficient of Friction not to be less than1.06 on top of domes and field area.
    d. Tensile Strength of Tile when tested by ASTM A 48 not to be less than 35,000 psi.
    e. Impact resistance when tested by ASTM D-1709 not less than 238 Newtons.
    f. Abrasive Wear when tested by ASTM C-501: 7333.

PART 3 - EXECUTION

3.1 INSTALLATION

A. During Cast In Place Detectable/Tactile Warning Surface Tile installation procedures, ensure adequate safety guidelines are in place and that they are in accordance with the applicable industry and government standards.

B. Prior to placement of the Cast In Place Detectable/Tactile Warning Surface Tile system, review manufacturer and contract drawings with the Contractor prior to the construction and refer any and all discrepancies to the Architect.

C. The specifications of the structural embedment flange system and related materials shall be in strict accordance with the contract documents and the guidelines set by their respective manufacturers. Not recommended for asphalt applications.

D. The physical characteristics of the concrete shall be consistent with the contract specifications while maintaining a slump range of 4”- 7” to permit solid placement of the Cast In Place Detectable/Tactile Warning Surface Tile system. An overly wet mix will cause the tile to float. Under these conditions, suitable weights such as 2 concrete blocks or sandbags (25Ib) shall be placed on each tile.

E. The concrete pouring and finishing operations require typical mason's tools, however, a 4' long level with electronic slope readout, 25 lb. weights, and a large non-marring rubber mallet are specific to the installation of the Cast In Place Detectable/Tactile Warning Surface Tile system.

F. When preparing to set the tile, it is important that no concrete be removed in the area to accept the tile. It is imperative that the installation technique eliminates any air voids under the tile. Rebates in the tile flange perimeter allow air to escape during the installation process. Concrete shall engage lugs in each embedment flange on the underside of the tile which shall lock the tile solidly into the cured concrete.

H. The concrete shall be poured and finished true and smooth to the required dimensions and slope prior to the tile placement. Immediately after finishing concrete, the electronic level should be used to check that the required slope is achieved. The tile shall be placed true and square to the curb edge in accordance with the contract drawings. The Cast In Place Detectable/Tactile Warning Surface Tiles shall be tamped (or vibrated) into the fresh concrete to ensure that the field level of the tile is flush to the adjacent concrete surface. The embedment process should not be accomplished by stepping on the tile as this may cause uneven setting which can result in air voids under the tile surface. The contract drawings indicate that the tile field level (base of truncated dome) is flush to adjacent surfaces to permit proper water drainage and eliminate tripping hazards between adjacent finishes.

I. Immediately after placement, the tile elevation is to be checked to adjacent concrete. The elevation and slope should be set consistent with contract drawings to permit water drainage to curb as the design dictates. Ensure that the field surface of the tile is flush with the surrounding concrete and back of curb so that no ponding is possible on the tile at the back side of curb.

K. While concrete is workable, a 3/8" radius edging tool shall be used to create a finished edge of concrete, then a steel trowel shall be used to finish the concrete around the tile's perimeter, flush to the field level of the tile.

L. During and after the tile installation and the concrete curing stage, it is imperative that there is no walking, leaning or external forces placed on the tile that may rock the tile causing a void between the underside of tile and concrete.

M. Following tile placement, review installation tolerances to contract drawings and adjust tile before the concrete sets. Two suitable weights of 25 Ib each may be required to be placed on each tile as necessary to ensure solid contact of the underside of tile to concrete.

N. If desired individual tiles can be bolted together using stainless steel bolts and nuts or equivalent hardware. This can help to ensure that adjacent tiles are flush to each other during the installation process. Tape or caulking can be placed on the underside of the bolted butt joint to ensure that concrete does not rise up between the tiles during installation.

P. Tiles can be cut to custom sizes, or to make a radius, using a continuous rim diamond blade in a circular saw or mini-grinder. Use of a straightedge to guide the cut is advisable where appropriate.

3.2 CLEANING, PROTECTING AND MAINTENANCE

A. Protect tiles against damage during construction period to comply with Tactile Tile manufacturer's specification.

B. Protect tiles against damage from rolling loads following installation by covering with plywood or hardwood.

C. Clean Tactile Tiles not more than four days prior to date scheduled for inspection intended to establish date of substantial completion in each area of project. Clean Tactile Tile by method specified by Tactile Tile manufacturer.

D. Comply with manufacturers maintenance manual for cleaning and maintaining tile surface and it is recommended to perform annual inspections for safety and tile integrity.

END OF SECTION 02521

SECTION 02530 - SANITARY SEWERAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes gravity-flow, nonpressure sanitary sewerage outside the building, with the following components:
   1. Cleanouts.
   2. Precast concrete manholes.

1.3 DEFINITIONS

A. PVC: Polyvinyl chloride plastic.

1.4 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Nonpressure, Drainage-Piping Pressure Rating: 10-foot head of water.

1.5 SUBMITTALS

A. Product Data: For the following:

B. Shop Drawings: For the following:

   1. Manholes: Include plans, elevations, sections, details, and frames and covers.

C. Field quality-control test reports.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic pipe and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

1.7 PROJECT CONDITIONS

A. Interruption of Existing Sanitary Sewerage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Construction Manager no fewer than three days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Construction Manager's written permission.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

A. Refer to drawings for applications of pipe materials.

2.3 PVC PIPE AND FITTINGS

A. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35, with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.

2.4 NONPRESSURE-TYPE PIPE COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:
   1. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
   2. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

2.5 CLEANOUTS

A. Gray-Iron Cleanouts: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.

   1. Manufacturers:

      a. Josam Company.
      b. MIFAB Manufacturing Inc.
      c. Smith, Jay R. Mfg. Co.
      d. Wade Div.; Tyler Pipe.
      e. Watts Industries, Inc.
      f. Watts Industries, Inc.; Enpoco, Inc. Div.
      g. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.

   2. Top-Loading Classification: Medium and Extra-heavy duty.
   3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

2.6 MANHOLES

A. Standard Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints, design, configuration and details as indicated on the drawings.

2.7 CONCRETE

A. General: Cast-in-place concrete according to ACI 318/318R, ACI 350R, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

C. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 (420 MPa), deformed steel.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 2 Section "Earthwork."

3.2 PIPING APPLICATIONS

A. Pipe couplings and special pipe fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.

1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping, unless otherwise indicated.

a. Unshielded flexible or rigid couplings for same or minor difference OD pipes.
b. Unshielded, increaser/reducer-pattern, flexible or rigid couplings for pipes with different OD.

B. Gravity-Flow, Nonpressure Sewer Piping: Use the pipe materials indicated on the drawings:

3.3 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewerage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or combination of both.

F. Install gravity-flow, nonpressure, drainage piping according to the following:

1. Install piping pitched down in direction of flow, at profiles indicated on the drawings.
2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place-concrete supports or anchors.
3. Install piping below frost line, and as indicated on the drawings for amount of ground cover, vertical and horizontal distances between other piping, and all other installation requirements.
4. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.

G. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.4 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure, drainage piping according to the following:
1. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.
2. Join dissimilar pipe materials with nonpressure-type, flexible or rigid couplings.

3.5 MANHOLE INSTALLATION

A. General: Install manholes complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

3.6 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318/318R.

3.7 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use light-duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
2. Use medium-duty, top-loading classification cleanouts in paved foot-traffic areas.
3. Use heavy-duty, top-loading classification cleanouts in vehicle-traffic service areas.
4. Use extra-heavy-duty, top-loading classification cleanouts in roads.

B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch (25 mm) above surrounding grade.

C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

3.8 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping to building's sanitary building drains specified in Division 15 Section "Sanitary Waste and Vent Piping."

B. Make connections to existing piping and underground manholes as indicated on the drawings.

1. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.9 CLOSING ABANDONED SANITARY SEWERAGE SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

1. Close open ends of piping with at least 8-inch-thick, brick masonry bulkheads.
2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

B. Backfill to grade according to Division 2 Section "Earthwork."

3.10 IDENTIFICATION

A. Materials and their installation are specified in Division 2 Section "Earthwork." Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.
1. Use detectable warning tape over nonferrous piping and over edges of underground manholes.

3.11 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate report for each system inspection.
2. Defects requiring correction include the following:

a. Alignment: Less than full diameter of inside of pipe is visible between structures.
b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
c. Crushed, broken, cracked, or otherwise damaged piping.
d. Infiltration: Water leakage into piping.
e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:

    a. Allowable leakage is maximum of 50 gal./inch of nominal pipe size per mile of pipe, during 24-hour period.
    b. Close openings in system and fill with water.
    c. Purge air and refill with water.
    d. Disconnect water supply.
    e. Test and inspect joints for leaks.

6. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

    a. Option: Test plastic gravity sewer piping according to ASTM F 1417.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.12 CLEANING

A. Clean interior of piping of dirt and superfluous material.

END OF SECTION 02530

SECTION 02630 - STORM DRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes gravity-flow, nonpressurestorm drainage outside the building, with the following components:
   1. Cleanouts.
   2. Precast concrete manholes.
   3. Precast concrete catch basins
   4. HDPE catch basins

1.3 DEFINITIONS

A. HDPE: High density polyethylene plastic.

B. PVC: Polyvinyl chloride plastic.

C. RCP: Reinforced concrete pipe

1.4 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Nonpressure, Drainage-Piping Pressure Rating: 10-foot head of water. Pipe joints shall be at least silttight, unless otherwise indicated.

1.5 SUBMITTALS

A. Product Data: For the following:

   1. Special pipe fittings.
   2. Backwater valves.
   3. Drains.
   4. Storage and leaching chambers.

B. Shop Drawings: For the following:

   1. Manholes: Include plans, elevations, sections, details, and frames and covers.
   2. Catch Basins. Include plans, elevations, sections, details, and frames, covers, and grates.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic pipe and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

D. Handle catch basins according to manufacturer's written rigging instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

A. Refer to civil engineering drawings for applications of pipe, fitting, and joining materials.

2.3 PE PIPE AND FITTINGS

A. Corrugated PE Drainage Pipe and Fittings NPS 48 and Smaller: AASHTO M 252M, Type S, with smooth waterway for coupling joints.

   1. Watertight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with tube and fittings.
   2. Corrugated PE Pipe and Fittings NPS 12 to NPS 48: AASHTO M 294M, Type S, with smooth waterway for coupling joints.
   3. Watertight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings.

B. Corrugated PE Pipe and Fittings NPS 56 and NPS 60: AASHTO MP7, Type S, with smooth waterway for coupling joints.

   1. Watertight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings.

2.4 PVC PIPE AND FITTINGS

A. PVC Sewer Pipe and Fittings, NPS 15 (DN 375) and Smaller: ASTM D 3034, SDR 35, with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.

B. PVC Sewer Pipe and Fittings, NPS 18 (DN 450) and Larger: ASTM F 679, T-1 wall thickness, with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.

2.5 CONCRETE PIPE AND FITTINGS

A. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76 (ASTM C 76M), with bell-and-spigot or groove and tongue ends and gasketed joints with ASTM C 443 (ASTM C 443M), rubber gaskets, Class as indicated on the drawings.

2.6 NONPRESSURE-TYPE PIPE COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:

1. For Concrete Pipes: ASTM C 443 (ASTM C 443M), rubber.
2. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
3. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

2.7 CLEANOUTS

A. Gray-Iron Cleanouts: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.

1. Manufacturers:

a. Josam Company.
b. MIFAB Manufacturing, Inc.
c. Smith, Jay R. Mfg. Co.
d. Wade Div.; Tyler Pipe.
e. Watts Industries, Inc.
f. Watts Industries, Inc.; Enpoco, Inc. Div.
g. Zurn Industries, Inc.; Zurn Specification Drainage Operation.

2. Top-Loading Classification(s): Medium duty.

B. Plastic Cleanouts:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Canplas LLC.
b. IPS Corporation.
c. NDS Inc.
d. Plastic Oddities; a division of Diverse Corporate Technologies, Inc.
e. Sioux Chief Manufacturing Company, Inc.
f. Zurn Light Commercial Products Operation; Zurn Plumbing Products Group.

2. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.8 MANHOLES

A. Precast Concrete Manholes: ASTM C 478, precast reinforced concrete, of depth indicated with provision for rubber gasket joints.

1. Base Section: 8-inch minimum thickness for floor slab and 5-inch minimum thickness for walls and base riser section, and having a separate base slab or base section with integral floor.
2. Riser Sections: 5-inch minimum thickness; 48-inch diameter, and lengths to provide depth indicated.
3. Top Section: Eccentric cone type, unless concentric cone or flat-slab-top type is indicated. Top of cone to match grade rings.

4. Grade Rings: Provide 2 or 3 reinforced concrete rings, with 12 maximum inches total thickness and match 24-inch diameter frame and cover.
5. Gaskets: ASTM C 443, rubber.
6. Steps: Cast into base, riser, and top sections sidewall at 12-to 16-inch intervals.
7. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
8. Channel and Bench: Concrete or Brick.
9. Coat Exterior Surface with two (2) coats of coal-tar epoxy, 15 mil. Minimum thickness.

B. Manhole Steps: Wide enough for a man to place both feet on one step and designed to prevent lateral slippage off the step.

1. Material: Steel-reinforced plastic.

2. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, heavy-duty, ductile iron, 24-inch inside diameter by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter cover, indented top design, with lettering "STORMDRAIN" cast into cover.

2.9 CONCRETE

A. General: Cast-in-place concrete according to ACI 318/318R, ACI 350R, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water-cementitious materials ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 (420 MPa), deformed steel.

C. Ballast and Pipe Supports: Portland cement design mix, 3000 psi (20.7 MPa) minimum, with 0.58 maximum water-cementitious materials ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 (420 MPa), deformed steel.

2.10 CATCH BASINS

A. Standard Precast Concrete Catch Basins & inlets: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints. All materials for catch basins, steps, frames and grates, curb inlets and other appurtences and incidentals shall conform to Section 708 of DelDOT Specifications and the details shown on plans.

1. Catch basins & inlets shall be according to the local utility standard as noted on the structure schedule.

2. Ductile Iron Grates shall be considered an integral part of the surface drainage structure and shall be furnished by the same manufacturer

B. Standard HDPE Surface Drainage Inlets and In-Line Drains as indicated on the drawings.
1. Structures shall be as manufactured by Nyloplast a division of Advanced Drainage Systems, Inc. or approved equal.

C. Trench Drains.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings by ACO Polymer Products, Inc. or a comparable product by one of the following:

    a. ABT, Inc.
    b. Hubbell Inc.
4. Description: The surface drainage system shall be ACO Drain K100s complete with gratings secured by ACO Polymer Products, inc. or approved equal.
5. Materials: The trench system bodies shall be manufactured from polyester polymer concrete with minimum properties as follows;
    a. Compressive Strength: 14,000 psi
    b. Flexural Strength: 4,000 psi
    c. Water Absorption: 0.07%
    d. Frost Proof
    e. Salt Proof
    f. Dilute Acid and alkali resistant
6. Overall Widths: The nominal clear opening shall be 4.00” with overall width of 5.10”. Precast units shall be manufactured with either an invert slope of 0.6% or with a neutral invert and have a wall thickness of at least 0.50”. Each unit will feature a full radius in the trench bottom and a male to female interconnecting end profile. Units shall have horizontal cast in anchoring features on the outside wall to ensure maximum mechanical bond to the surrounding bedding material and pavement surface The galvanized edge rail will be integrally cast in by the manufacturer to ensure maximum homogeneity between polymer concrete body and edge rail. Each edge rail shall be at least 1/8” thick.
7. Grates: The grate shall be type 478Q ADA. The covers shall be manufactured from ductile iron and have minimum properties as follows:
    a. Independently certified to meet Load Class E to DIN 19580-135,000 lbs. – 2,788 psi
    b. Ductile iron to ASTM A 536-84 – Grade 65-45-12.
    c. Intake area of 22.5 sq. in. per half meter of grate.
    d. The overall width of 4.84” and overall length of 19.69”.
    e. Slots measure 0.27” by 1.77”
8. Installation: The trench drain system and grates shall be installed in accordance with the manufacturer’s installation instructions and recommendations

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Division 2 Section "Earthwork."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.

F. Install gravity-flow, nonpressure drainage piping according to the following:

1. Install piping pitched down in direction of flow, at profiles indicated on the drawings.
2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
3. Install PE corrugated sewer piping according to CPPA's "Recommended Installation Practices for Corrugated Polyethylene Pipe and Fittings."
4. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
5. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

3.3 PIPE JOINT CONSTRUCTION

A. Basic pipe joint construction is specified in Division 2 Section "Piped Utilities - Basic Materials and Methods." Where specific joint construction is not indicated, follow piping manufacturer's written instructions.

B. Join gravity-flow, nonpressure drainage piping according to the following:
1. Join corrugated PE piping according to CPPA 100 and the following:

a. Use watertight couplings for Type 2, watertight joints.
2. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric gasket joints.
3. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasket joints.
4. Join dissimilar pipe materials with nonpressure-type flexible or rigid couplings.

C. Join dissimilar pipe materials with pressure-type couplings.

3.4 CLEANOUT INSTALLATION

A. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
1. Use medium-duty, top-loading classification cleanouts unless otherwise indicated

B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding earth grade.

C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

3.5 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections according to ASTM C 891.

3.6 CATCH BASIN INSTALLATION

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.7 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318/318R.

3.8 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

1. Close open ends of piping with at least 8-inch- thick, brick masonry bulkheads.
2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

B. Abandoned Manholes and Structures: Excavate around manholes and structures as required and use one procedure below:

1. Remove manhole or structure and close open ends of remaining piping.
2. Remove top of manhole or structure down to at least 36 inches. Insert other below final grade. Fill to within 12 inches. Insert other of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.

C. Backfill to grade according to Division 2 Section "Earthwork."

3.9 IDENTIFICATION

A. Materials and their installation are specified in Division 2 Section "Earthwork." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
1. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.10 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:

a. Alignment: Less than full diameter of inside of pipe is visible between structures.
b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
c. Crushed, broken, cracked, or otherwise damaged piping.
d. Infiltration: Water leakage into piping.
e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

    a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
    b. Option: Test plastic piping according to ASTM F 1417.
    c. Option: Test concrete piping according to ASTM C 924 (ASTM C 924M).

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.11 CLEANING

A. Clean interior of piping of dirt and superfluous materials.

END OF SECTION 02630

SECTION 02741 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Hot-mix asphalt paving.

B. Related Sections:
1. Division 2 Section "Earthwork" for aggregate subbase and base courses and for aggregate pavement shoulders.
2. Division 7 Section "Joint Sealants" for joint sealants and fillers at paving terminations.

1.3 DEFINITION

A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

1.4 POSTED ASPHALT PRICE ADJUSTMENT

A. Payments to the Contractor shall be adjusted to reflect the increase or decrease in the Delaware Posted Asphalt Price when compared to the Project Asphalt Base Price as defined herein

B. The Delaware Posted Asphalt Price will be issued monthly by the Delaware Department of Transportation and will the industry price for Hot-Mix Asphalt , F.O.B Dover, Delaware.

C. All deviations of the Delaware Posted Asphalt Price are eligible for cost adjustment. No minimum increase or decreases for corresponding percentages are required to qualify for cost adjustment.

D. For Recycled Hot-Mix Asphalt the asphalt percentage eligible for adjustement shall be only the new asphalt added to the mix.

E. The Delaware Posted Asphalt Price shall be calculated on the Grade PG 64-22 asphalt regardless of the actual grade of asphalt used. The Project Asphalt Base Price for the project shall be $443.33 per English ton.

F. If the Contractor exceeds the authorized allotted completion time, the price of asphalt on the last authorized allotted work day shall be the price used for cost adjustment. The Contractor shall be entitled to cost increase if the Delaware Posted Asphalt Price is higher the Project Asphalt Base Price. The Project shall entitled to a cost reduction if the Delaware Posted Asphalt Price is lower the Project Asphalt Base Price.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

1. Job-Mix Designs: For each job mix proposed for the Work.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by Delaware Department of Transportation.

B. Installer Qualifications: Imprinted-asphalt manufacturer's authorized installer who is trained and approved for installation of imprinted asphalt required for this Project.

C. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.

D. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of Delaware Department of Transportation for asphalt paving work.

1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:

1. Prime Coat: Minimum surface temperature of 60 deg F.
2. Tack Coat: Minimum surface temperature of 60 deg F.
3. Slurry Coat: Comply with weather limitations in ASTM D 3910.
4. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
5. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.

C. Fine Aggregate: AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.

1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

2.2 ASPHALT MATERIALS

A. Asphalt Binder: AASHTO M 320 or AASHTO MP 1a, PG 64-22.

B. Water: Potable.

2.3 AUXILIARY MATERIALS

A. Sand: AASHTO M 29, Grade Nos. 2 or 3.

B. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with AASHTO M 248, Type N; colors complying with FS TT-P-1952.

1. Color: As indicated.

2.4 MIXES

1. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by the Delaware Department of Transportation and as indicated on the drawings by reference to DelDOT Standard Specifications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction. Limit vehicle speed to 3 mph.
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.

1. Mix herbicide with prime coat if formulated by manufacturer for that purpose.

C. Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd. Apply enough material to penetrate and seal but not flood surface. Allow prime coat to cure.

1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
2. Protect primed substrate from damage until ready to receive paving.

D. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd.

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.3 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
2. Place hot-mix asphalt surface course in single lift.
3. Spread mix at minimum temperature of 250 deg F.
4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.4 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
3. Offset transverse joints, in successive courses, a minimum of 24 inches.
4. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
5. Compact asphalt at joints to a density within 2 percent of specified course density.

3.5 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 96 percent of reference laboratory density according to AASHTO T 245, but not less than 94 percent nor greater than 100 percent.
2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.6 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch.
2. Surface Course: Plus 1/4 inch, no minus.

B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch.
2. Surface Course: 1/8 inch.
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.7 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Allow paving to age for 30 days before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

1. Broadcast glass beads uniformly into wet pavement markings at a rate of 6 lb/gal.

3.8 DISPOSAL

A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow milled materials to accumulate on-site.

END OF SECTION 02741

SECTION 02751 - CEMENT CONCRETE PAVEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes exterior cement concrete pavement for the following:
1. Curbs.
2. Walkways.

B. Related Sections include the following:

1. Division 2 Section "Earthwork" for subgrade preparation, grading, and subbase course.
2. Division 7 Section "Joint Sealants" for joint sealants of joints in concrete pavement and at isolation joints of concrete pavement with adjacent construction.
3. Division 3 Section "Cast-in-Place Concrete" for general building applications of concrete.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other Pozzolans, and ground granulated blast-furnace slag.

1.4 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:

D. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Admixtures.
4. Joint fillers.

E. LEED Submittals:

1. Credit MR C4: For products having recycled content, including postconsumer and pre-consumer recycled content. Provide the following information:
2. Product Data
3. Percent Content (post and pre-consumer)

4. Invoices indicating cost of material (no labor included.)

F. Credit MR C5: For products and materials that comply with requirements for regional materials based on location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Provide the following information:
   1. Product Data
   2. Fraction by weight of regional material
   3. Invoices indicating cost of material (no labor included.)
   4. Distance from Project

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.

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

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

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

C. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

D. Concrete Testing Service: Construction Manager will engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.6 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Products: Subject to compliance with requirements, provide one of the products specified.
   2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.

   1. Use flexible or curved forms for curves with a radius 100 feet (30.5 m) or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.

C. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs.

D. Epoxy-Coated Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60, plain steel bars.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use one of the following cementitious materials, of the same type, brand, and source throughout the Project:

1. Portland Cement: ASTM C 150, Type I, gray. Supplement with the following:

a. Fly Ash: ASTM C 618, Class F.

B. Normal-Weight Aggregates: ASTM C 33, Class 4S coarse aggregate, uniformly graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M.

D. Air-Entraining Admixture: ASTM C 260.

2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.

B. Water: Potable.

2.6 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

2.7 WHEEL STOPS

A. Wheel Stops: Precast, air-entrained concrete, 2500-psi, size and profile as indicated on the drawings.

2.8 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.

B. Proportion mixtures to provide normal-weight concrete with the following properties:

1. Compressive Strength: 3000 psi.
2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
3. Slump Limit: 5 inches, plus or minus 1 inch.

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:

1. Air Content: 5-1/2 percent plus or minus 1.5 percent for 1-1/2-inch nominal maximum aggregate size.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

E. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements for concrete exposed to deicing chemicals.

1. Fly Ash or Pozzolan: 25 percent.
2. Ground Granulated Blast-Furnace Slag: 50 percent.
3. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent, with fly ash or Pozzolan not exceeding 25 percent.

2.9 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94 and ASTM C 1116. Furnish batch certificates for each batch discharged and used in the Work.

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

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.

1. Completely proof-roll subbase in one direction. Limit vehicle speed to 3 mph.
2. Subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch require correction according to requirements in Division 2 Section "Earthwork."

C. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.5 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.

1. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
2. Provide tie bars at sides of pavement strips where indicated.
3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 50 feet, unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.

6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.

E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site.

F. Do not add water to fresh concrete after testing.

G. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

H. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

I. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.

1. Remove and replace concrete that has been placed for more than 15 minutes without being covered by top layer, or use bonding agent if approved by Architect.

J. Screed pavement surfaces with a straightedge and strike off.

K. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

L. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and

gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

M. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.

N. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.

O. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
1. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

3.8 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moist Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

a. Water.

b. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3.9 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-foot-long, unleveled straightedge not to exceed 1/4 inch.
4. Contraction Joint Depth: Plus 1/4 inch, no minus.
5. Joint Width: Plus 1/8 inch, no minus.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Construction Manager will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least 1 composite sample for each 5000 sq. ft. or fraction thereof of each concrete mix placed each day.

a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.

a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Construction Manager.

F. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.

G. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.11 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

B. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

C. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 02751

SECTION 02764 - PAVEMENT JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Expansion and contraction joints within cement concrete pavement.
2. Joints between cement concrete and asphalt pavement.

B. Related Sections include the following:
1. Division 1 Section 01505 – Construction Waste Management
2. List below only construction that the reader might expect to find in this Section but is specified elsewhere.
3. Division 2 Section "Hot-Mix Asphalt Paving" for constructing joints between concrete and asphalt pavement.
4. Division 2 Section "Cement Concrete Pavement" for constructing joints in concrete pavement.
5. Division 7 Section "Joint Sealants" for sealing nontraffic and traffic joints in locations not specified in this Section.

1.3 SUBMITTALS

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

B. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multi-component materials.

B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
2. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
3. When joint substrates are wet or covered with frost.
4. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.

5. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-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 HOT-APPLIED JOINT SEALANTS

A. Sealant for Concrete and Asphalt: Single-component formulation complying with ASTM D 3405.

2.3 JOINT-SEALANT BACKER MATERIALS

A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.

B. Backer Strips for Cold- and Hot-Applied Sealants: ASTM D 5249; Type 2; of thickness and width required to control sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.4 PRIMERS

A. Primers: Product 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

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

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.

B. Joint Priming: Prime joint substrates where indicated or 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.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

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. Install backer materials 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 backer materials.
2. Do not stretch, twist, puncture, or tear backer materials.
3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.

D. 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 provided for each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Provide joint configuration to comply with joint-sealant manufacturer's written instructions, unless otherwise indicated.

3.4 CLEANING

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

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations with repaired areas are indistinguishable from the original work.

END OF SECTION 02764

SECTION 02920 - LAWNS AND GRASSES

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
1. Seeding.
2. Hydroseeding.
3. Sodding.
4. Erosion-control material(s).

1.2 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful turf establishment.

1. Experience: Five years' experience in turf installation in addition to requirements in Division 01 Section "Quality Requirements."

2. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.

3. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

4. Pesticide Applicator: State licensed, commercial.

B. Soil-Testing Laboratory Qualifications: An independent laboratory or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

C. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of the soil.

D. Sod Producer: Shall be a company specializing in sod production and harvesting with a minimum of five (5) years of experience producing sod.

E. Sod: Shall be grown between 6 to 12 months with root development that will support its own weight without tearing when suspended laterally.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.

B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod in time for planting within 24 hours of harvesting. Protect sod from breakage and drying.

1.4 PROJECT CONDITIONS

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of substantial completion.

1. Regular Seeding Season
   a. Spring: March 1st - May 15th
   b. Fall: August 15th – October 15th
2. Regular Sodding Season
   a. Spring: March 1st - May 1st
   b. Fall: October 1st – November 15th

1.5 MAINTENANCE SERVICE

Initial Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable turf is established but for not less than the following periods:

1. Seeded Turf: Contractor to maintain seeded landscaping for (90) days maintenance period from the date of final acceptance of the project. Include all watering, mowing, trimming, reseeding, fertilizing, chemical and physical weed control and removal and other operations as necessary for a healthy lawn.

   a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.

2. Sodded Turf: Contractor to maintain sodded landscaping for a minimum 30-day maintenance period from the date of final acceptance of the project. Include all watering, mowing, trimming, reseeding, fertilizing, chemical and physical weed control and removal, and other operations as necessary for a healthy lawn.

1.6 LEED GENERAL REQUIREMENTS

A. The Owner requires the Contractor to Implement practices and procedures to meet the project's environmental performance goals, which include achieving LEED "Silver" Certifications. Specific project goals that may impact this area of work include: use of recycled-content materials; use of locally-manufactures materials; use of low-emitting materials; construction waste recycling; and the implementation of a construction indoor air quality management plan. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor of their Subcontractors, shall not be allowed if such changes compromise the stated LEED Performance Requirements.

1.7 LEED PERFORMANCE REQUIREMENTS

A. Per LEED Sustainable Sites - Protect of Restore Habitat: Vegetation added to the project site shall be native or adapted vegetation. Native/adaptive plants are plants indigenous to a locality or cultivars of native plants that are adapted to the local climate and are not considered invasive species or noxious weeds.

B. Vegetation shall be grown and harvested within 500 miles and will be documented in accordance with the procedures outlined in the SUBMITTAL section.

PART 2 - PRODUCTS

2.1.1 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species: State-certified seed of grass species as follows:

   As recommended by the University of Maryland Turf Grass Technical Update TT-77 and approved by the Architect.

   Lawn Seed: Fresh, clean and new crop seed mixture.

a. Mixed by an approved method.
b. composed of the following varieties, mixed to the specified proportions by weight and tested to minimum percentages of purity and germination. Poa Annua, Bent Grass and noxious weed seed free.

c. blends:	**parts**	**Purity**	**Minimum Germination**
Improved Kentucky Bluegrass	20%	97%	80%
Turf Type Tall Fescue	65%	97%	80%
Perennial Rye Grass	15%	97%	80%

Turf Type Tall Fescue shall be one of the following: Rebel IV, or Rebel Exedea or Falcon IV, Blue Grass shall be - Blue Note or Blue Tastic Blue Grass 2, Perennial Rye Grass shall be Integra II other Category #1 Turf Type Tall Fescue and Kentucky Bluegrass, as recommended by the University of Maryland Turf Grass Technical up-date TT-77 and approved by the Landscape Architect.

C. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:

1. Class: O, with a minimum of 95 percent passing through No. 8 sieve and a minimum of 55 percent passing through No. 60 sieve.

2. Provide lime in form of ground dolomitic limestone or calcitic limestone.

D. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

E. Aluminum Sulfate: Commercial grade, unadulterated.

F. Perlite: Horticultural perlite, soil amendment grade.

G. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 sieve.

H. Sand: Clean, washed, natural or manufactured, and free of toxic materials.

I. Diatomaceous Earth: Calcined, 90 percent silica, with approximately 140 percent water absorption capacity by weight.

J. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

2.1.2 LAWN SODDING

Sod: provide strongly rooted sod, at least 2 years old and free of weeds and undesirable native grasses, in strips not more than 18" wide and 4' long, composed principally of 5% Improved Kentucky Bluegrass and 95% Turf Type Tall Fescue or one of the following: SR 8200, SR8300, or Rebel 2.

Blends:	Parts	Purity	Minimum Germination
Improved Kentucky Bluegrass, Blue Note or Blue Tastic	5%	97%	80%
Turf Type Tall Fescue	95%	97%	80%
One of the following: Magellan, Tombstone or Rebel IV			

A. Source of Seed: Turf Type Tall Fescue Grass is to be grown from certified seed. The Contractor must supply the Landscape Architect, at delivery, with a seed certification from the Delaware Department of Agriculture. Evidence of certification may be in the form of a blue seed certification tag, an analysis tag and a bill of landing or invoice with certification label.
B. Seed Mix for Growing cultivated Grass: Under no circumstances shall hate seed percentage of Turf Type Tall Fescue Grass be less than 90% $\pm$ 1%. Kentucky blue Grass may be used as a binder in growing Turf Type Tall Fescue sod but must not exceed 10% (by seed count, not weight) of the mixture.

C. Final turf Sod Inspection: the final turf product shall not bee accepted unless the Landscape Architect receives a certificate or letter of certificate from the Delaware Department of Agriculture. It must state that the Turf Grass is free from all other crop plants, weedy plants, insects, diseases and nematodes, and shows good esthetic appearance. In addition, it must be stated that the final turf sod product has met the minimum standard of 90% ± 5% Turf Type Tall Fescue and 10% ± 5% Kentucky blue Grass by botanic composition. Contractors not meeting the botanic composition specification may submit a letter, before delivery, showing good cause for variance.
D. Turf sod shall be a uniform soil thickness of ½" + ¼". This thickness shall exclude top growth and thatch.
E. The Landscape Architect shall not accept turf sod:
F. if it contains a broken unit or a unit with torn or uneven ends.
G. Unless each standard size unit of sod is strong enough to support its own weight and retains its size and shape when suspended vertically from a firm hand grasp on the upper 10% of the unit.
H. If the sod has been harvested when the moisture content may adversely affect survival.
I. Sod has been harvested and delivered within a period of 36 hours. Sod not delivered within this period shall be inspected and approved by the Department of Agriculture before installation.
J. If it is harvested more than 36 months from the date of planting.
K. If certifications are provided after the turf grass has been delivered.

L. Fertilizer: The fertilizer analysis for use for sodding shall yield the values of plant food necessary to supply nutrients to bring the level satisfactory for sodding as per recommendations listed in Part 3.
   A. 10-20-10: Nitrogen source – 50% slow release.
      Phosphorous Source – monammonium phosphate
      Potassium Source – sulfate of potash

   B. High Calcium Ground Limestone:
   Containing 40% or higher calcium oxide and 55 or less magnesium oxide. Ground to such a fineness that 50% will pass through 100 mesh sieve and 90% will pass through a 20 mesh sieve.

   C. Water:
   Free of substances harmful to seed growth. Hoses or other methods of transportation shall be furnished by the Contractor.

M. Newly Sodded Areas:
   A. Sod all areas as noted as sod on the plan. Examine proposed sodding areas and conditions for installation. Do not start sodding work until unsatisfactory conditions are corrected.
   B. Remove existing vegetation by stripping or applying an approved systemic herbicide. Apply according to manufacturer's directions.
   C. Apply soil amendments at the following rates:
      . High calcium lime at rate determined by the soil test to adjust pH of topsoil to not less than 6.0 or more than 6/8.
      . Apply 10-20-10 type fertilizer at the rate determined by the soil test.
      . Distribute evenly by machine and incorporate thoroughly into the top 4" of the topsoil.

N. Cultivate area to be sodded by rototilling thoroughly or disking until soil is uniformly pulverized and in a favorable condition. Apply fertilizer at a rate determined by a soil test. Rake soil to remove stones 1" in diameter or larger, remove debris, rake mounds and/or depressions. Bring soil to an even finish, grade to provide positive drainage as indicated on grading and drainage plans. Moisten soil immediately prior to sodding.

INSTALLATION:
A. Sodded Lawn Areas:

1. Lay sod to form a solid mass with tightly fitting joints. But ends and sides of sod strips. Do not overlap edges. Stagger strips to off-set joints in adjacent courses. Remove excess sod to avoid smothering adjacent grass. Provide sod pad top 1 ½" below adjacent curbs, sidewalks, drains and mow strips.
2. Do not lay dormant sod or install sod on saturated or frozen soil.
3. Install initial row of sod in straight line, beginning at bottom of sloped areas.
4. Water sod thoroughly with a fine spray immediately after laying.
5. Roll with light roller to ensure contact with subsoil.

MAINTENANCE:
A. General

1. Maintain sodded areas from completion of installation to 30 days after substantial completion meeting. In no case shall the maintenance period exceed 1 year to conform with LEED WEC1.
2. If substantial completion meeting occurs between October 1, and April 1, than the maintenance period and guarantee period shall extend to May 15.
3. Lawn which does not live and must be replaced shall be guaranteed and maintained an additional 30 days from date of replacement.

B. Maintain sodded lawn areas, including watering, spot weeding, mowing, application of herbicides, fungicides, insecticides and re-sodding until a full uniform stand of grass, free of weeds, undesirable grass species, diseases and insects is achieved and accepted.

C. Sodded Areas:
1. Turf sod showing signs of heaving or desiccation that could influence sod appearance, growth or survival will not be accepted.
2. All lawn areas shall be kept uniformly wet, close to the saturation point, for 14 days following installation.
3. The Contractor shall be responsible for replacing any sodded areas that have died or are in any way impaired aesthetic appearance for a period of 30 days after installation. For late season installation, replacement may take place early the following season when weather permits.

D. Acceptance:
1. Sodded areas will be inspected at completion of installation and accepted subject to compliance with specified materials and installation requirements.
2. Sodded areas will be acceptable provided all requirements, including maintenance have been complied with, a healthy, even-colored, viable lawn is established , free of weeds, undesirable grass species, disease and insects.
3. No individual lawn areas shall have bare spots or unacceptable cover totaling more than 2% of the individual area in areas requested to be inspected.

Upon acceptance the Owner shall assume lawn maintenance.

2.2 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch sieve; soluble salt content of 5 or less decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings.

B. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.3 FERTILIZERS

A. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: 10 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.

2.4 PLANTING SOILS

A. Planting Soil: Imported topsoil or manufactured topsoil from off-site sources.Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs atleast 4 inches deep; do not obtain from agricultural land, bogs, or marshes.

1. Topsoil: Shall be loam. The soil shall consist of 45% sand, 40% silt, and 5% clay, based on the U.S. Department of Agriculture's Standards for Mechanical Analysis of Soils. It shall also contain 5% organic matter. It shall not have a mixture of subsoil and shall not contain any slag, cinders, stones, lumps of soil, sticks, roots, trash or other extraneous materials larger than one and one half inches in diameter. Topsoil must also be free of plants or plant parts of Bermuda Grass, Quack Grass, Johnson Grass, Nutsedge, Poison Ivy, Canada Thistle, or others as specified. All topsoil shall be tested by a state of Pennsylvania approved laboratory (Brookside Laboratories, Inc. or approved equal), for mechanical analysis, pH, soluble salts, fertilizer and micro nutrient

requirements. A pH of 5.5 to 6.0 is required. Soluble salts shall not be higher than 500 parts per million. No soil shall be used which has been treated with soil sterilants until sufficient time has elapsed to permit dissipation of toxic materials. The Contractor shall assume full responsibility for loss or damage to plantings arising from improper use of sterilants or due to his failure to allow sufficient time to permit dissipation of toxic materials.

B. SUBMITTALS

1. Submit minimum 10 oz sample of topsoil proposed. Forward sample to approved testing laboratory (Brookside Laboratories, Inc. or approved equal) in sealed containers to prevent contamination.

2. Test Reports: Indicate topsoil mechanical analysis nutrient and pH levels with recommended soil supplements and application rates and soluble salt levels. Soluble salts shall not be higher than 500 parts per million.

3. **Manufacturer's Certificate: Certify Products meet or exceed specified requirements**.

C. PREPARATION OF SOIL

1. Prepare sub-soil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.
2. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated sub-soil.
3. Scarify subsoil to a depth of 5 inches where topsoil is to be placed. Repeat cultivation in area where equipment, used for hauling and spreading topsoil, has compacted sub-soil.

D. PLACING TOPSOIL

1. Spread topsoil to a minimum depth of 4 inches over areas to be seeded or sodded. Rake until smooth.

2. Place topsoil during dry weather and on dry unfrozen subgrade.

3. Remove vegetable matter and foreign non-organic material from topsoil while spreading, remove stones over 1" in diameter.

4. **Grade topsoil to eliminate rough, low soft areas, and to ensure prop**er drainage according to grading plan.

2.5 PESTICIDES

A. General: Pesticide, registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

2.6 EROSION-CONTROL MATERIALS

A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber net less, erosion control blanket. Blanket shall be anchored with bio-degradable “Futura” stakes erosion control blanket and stakes shall be mfg. by Futura (www.futura.com) or approved equal.

Part 3 Execution

3.1 Inspections:

A. Examine finish surfaces, grades, topsoil quality and depth. Do not start seeding work until unsatisfactory conditions are corrected.

3.2 Preparation: for lawn seeding & sodding

A. Limit preparation to areas which will be immediately seeded.

B. Remove existing temporary lawn and other vegetation and dispose of such material outside of Owner’s property. Do not turn existing vegetation over into soil being prepared for permanent lawn. Option Method: use “round-Up” spray a minimum of two weeks prior to preparation to avoid removal of vegetation and topsoil loss. Incorporate organic residue into top 6” as before. Bring soil to finished grade to provide positive drainage as shown on the plan.

C. Loosen topsoil of lawn area to a minimum depth of 6” Remove stones over 1” in dimension and sticks, roots, rubbish and extraneous matter.
D. Grade lawn areas to a smooth, free draining even surface with a loose, moderate course texture. Roll, rake and remove ridges and fill depressions as required to drain.
E. Apply limestone at the rate determined by soils test to adjust pH of topsoil to not less than 6.0 or more than 6.8.
F. Apply fertilizer at a rate determined by soils test.
G. Thoroughly and evenly incorporated with soil to a depth of 6” by disking or other approved method. Fertilize areas inaccessible to power equipment with hand tools and incorporate into soil.
H. Restore prepared areas to specified condition if eroded settled or otherwise disturbed after fine grading and prior to seeding.

3.3 Installation:

Lawn Seeding:
A. Seed immediately after preparation of bed. Spring seeding between April 1 and May 1 and fall seeding between August 15 and October 15 or at such other times acceptable to the Landscape Architect.
B. Seed indicated areas within contract limits and areas adjoining contract limits disturbed as a result of construction operations.
C. Perform seeding operations when the soil is dry and when winds do not exceed 5 miles per hour.
D. Apply seed with approved hydroseeder, brillion drill, or hurricane seeder.
E. Sow grass seed at a rate of 8.0 lbs. per 1,000 sq. ft. (348 lbs. / acre).
F. Rake & rolling – after sowing seed, rake the area lightly and roll with a 200 lb. hand roller. The finished grade of the seeded area msut present an even, smooth and finished appearance.

Mulching:
a. Straw mulch: straw shall be spread over all seeded areas at the rate of 2/50 tons per acre. Mulch shall be applied to a uniform loose depth of not less than 1” no more no more than 2”. Mulch applied shall achieve a uniform distribution and depth so that no more than 10% of soil surface is exposed. Secure with a mulch anchoring tool. Punch, crimp and anchor mulch into the soil surface a minimum of 2”.

3.4 Sod Installation:
A. Sod all areas as noted as sod on the plan. Examine proposed sodding areas and conditions for installation. Do not start sodding work until unsatisfactory conditions are corrected.
B. Lay sod to form a solid mass with tightly fitting joints. But ends and sides of sod strips. Do not overlap edges. Stagger strips to off-set joints in adjacent courses. Remove excess sod to avoid smothering adjacent grass. Provide sod pad top 1 ½” below adjacent curbs, sidewalks, drains and mow strips.
C. Do not lay dormant sod or install sod on saturated or frozen soil.
D. Install initial row of sod in straight line, beginning at the bottom of sloped areas.
E. Water sod thoroughly with a fine spray immediately after laying.
F. Roll with a light roller to ensure contact with subsoil.

Acceptance:
A. Sodded and seeded areas will be inspected at completion of installation and accepted subject to compliance with specified materials and installation requirements.
B. Sodded and Seeded areas will be acceptable provided all requirements, including maintenance have been complied with, a healthy, , even-colored, viable lawn is established, free of weeds, undesirable grass species, disease and insects.
C. No individual lawn areas shall be bare spots or unacceptable cover totaling more than 25 of the individual area in areas requested to be inspected.
D. Upon acceptance the Owner shall assure lawn maintenance.

Cleaning:
A. Perform cleaning during installation of the work and upon completion of work. Remove from the site all excess materials, debris and equipment. Repair damage resulting from seeding, sodding and lawn renovation operations.

Clean Up & Inspection:
A. Upon completion of the work and maintenance, the grounds shall be cleared of all debris and equipment, which shall be entirely removed from the premises, to the satisfaction of the Owner and the landscape architect.

B. Final inspection shall be made at the conclusion of the maintenance period. Written notice to the Owner requesting inspection should be submitted at lease 10-days prior to anticipated inspection date.

LEED Submittal Requirements:

1. The Contractor and their sub-contractors shall submit the LEED Certification items listed herein. LEED submittals shall include the following:
   A. For all installed products and materials of this section, complete the ENVIROMENTAL MATERIALS REPORTING FORM (blank copy attached at the end of Section 01015). Information to be supplied for this form shall include:
      1. Cost breakdowns for the materials included in the Contractor or sub-contractor's work. Cost breakdowns shall include total installed cost and material-only cost.
      2. The percentages (by weight) of the post-consumer and/or pre-consumer recycled content in the supplied product(s).
      3. Indication of the exact distance (in miles as the crow flies) from the location of where the product(s) have been both extracted, harvested or recovered, and manufactured.
   B. For all field adhesives, sealants and coatings used in work of this section, complete the VOC REPORTING FORM (blank copy attached to the end of Section 01015). For each product listed, indicate the Volitile Organic Compound (VOC) content in grams/liter.
   C. Provide back-up documentation to validate all information provided on the ENVIROMENTAL MATERIALS and VOC REPORTING FORMS, except Cost data. For each material listed on the Forms, provided documentation to certify each of the material attributes (e.g., recycled content, VOC content), per the requirements of Section 01015.
   D. Provide product cut sheets with the Contractor's or sub-contractor's stamp, confirming that the submitted products are the products installed in the Project.
2. The LEED Submital Information outlined above shall be assembled into one (1) package per Specification section. Incomplete or inaccurate LEED submittals may be used as the basis for rejecting the submitted products or assemblies.

END OF SECTION 02920

SECTION 02930 - EXTERIOR PLANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plants.
2. Planting soils.
3. Tree stabilization.
4. Landscape edging

1.2 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful establishment of plants.

1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.

2. Experience: Three years' experience in landscape installation in addition to requirements in Division 01 Section "Quality Requirements."

3. Pesticide Applicator: State licensed, commercial.

B. Soil-Testing Laboratory Qualifications: An independent or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

C. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of the soil.

D. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

E. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.

1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches above the root flare for trees up to 4-inch caliper size, and 12 inches above the root flare for larger sizes.

2. Other Plants: Measure with stems, petioles, and foliage in their normal position.

3. Plants larger in size than specified in the Plant List may be used if approved. The use of larger plants shall not increase the contract price. If the use of larger plants is approved, the ball of earth or spread of roots shall be increased in proportion to the size of the plant. If plants required to be bare-root are furnished in sizes greater than specified, they shall be balled and burlapped. Provide plants indicated by two measurements sot that only a maximum of 25% of the minimum size are used and 75% of the maximum size indicated are used.

F. Plant Material Observation: Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Architect retains right to observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1. Notify Landscape Architect of sources of planting materials seven days in advance of delivery to site.

G. Preinstallation Conference: Conduct conference at Project site.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.

C. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.

D. Handle planting stock by root ball.

E. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

1.4 PROJECT CONDITIONS

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

1. Spring Planting: March 1st to May 31st.

2. Fall Planting: September 15th to November 30th.

1.5 WARRANTY

A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.

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

a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.

b. Structural failures including plantings falling or blowing over.

c. Faulty performance of tree stabilization and edgings.

d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Periods from Date of Substantial Completion:

a. Trees and Shrubs: 12 months. Replacement plants an additional 12-months.

3. Include the following remedial actions as a minimum:

a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.

b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.

c. Replace in accordance with the drawings and specifications, all plants that area dead or as determined by the Landscape Architect are in an unhealthy or unsightly condition and have lost their natural shape due to dead branches, or other causes due to the Contractor's negligence. The cost of such replacement is at the Contractors expense. Warrant all replacement plants for one year after installation.

1.6 MAINTENANCE SERVICE

A. Initial Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.

1. Maintenance Period: 6 months from date of Substantial Completion. In no case shall the maintenance period exceed 1-year to conform with LEED WEc1.

1.7 LEED GENERAL REQUIREMENTS

A. The Owner requires the Contractor to Implement practices and procedures to meet the project's environmental performance goals, which include achieving LEED "Silver" Certifications. Specific project goals that may impact this area of work include: use of recycled-content materials; use of locally-manufactures materials; use of low-emitting materials; construction waste recycling; and the implementation of a construction indoor air quality management plan. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor of their Subcontractors, shall not be allowed if such changes compromise the stated LEED Performance Requirements.

1.8 LEED PERFORMANCE REQUIREMENTS

A. Per LEED Sustainable Sites - Protect of Restore Habitat: Vegetation added to the project site shall be native or adapted vegetation. Native/adaptive plants are plants indigenous to a locality or cultivars of native plants that are adapted to the local climate and are not considered invasive species or noxious weeds.

B. Vegetation shall be grown and harvested within 500 miles and will be documented in accordance with the procedures outlined in the SUBMITTAL section.

C. LEED Submittal Requirements: The Contractor and their sub-contractors shall submit the LEED Certification items listed herein. LEED submittals shall include the following:

1. For all installed products and materials of this section, complete the ENVIRONMENTAL MATERIALS REPORTING FORM (blank copy attached at the end of Section 01015). Information to be supplied for this form shall include:

a. Cost breakdowns for the materials included in the Contractor or sub-contractor's work. Cost breakdowns shall include total installed cost and material-only cost.
b. The percentages (by weight) of the post-consumer and/or pre-consumer recycled content in the supplied product(s).
c. Indication of the exact distance (in miles as the crow flies) from the location of where the product(s) have been both extracted, harvested or recovered, and manufactured.

2. For all field adhesives, sealants and coatings used in work of this section, complete the VOC REPORTING FORM (blank copy attached to the end of Section 01015). For each product listed, indicate the Volitile Organic Compound (VOC) content in grams/liter.
3. Provide back-up documentation to validate all information provided on the ENVIRONMENTAL MATERIALS and VOC REPORTING FORMS, except Cost data. For each material listed on the Forms, provided documentation to certify each of the material attributes (e.g., recycled content, VOC content), per the requirements of Section 01015.
4. Provide product cut sheets with the Contractor's or sub-contractor's stamp, confirming that the submitted products are the products installed in the Project.
5. The LEED Submittal Information outlined above shall be assembled into one (1) package per Specification section. Incomplete or inaccurate LEED submittals may be used as the basis for rejecting the submitted products or assemblies.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Schedule or Plant Legend shown on Drawings and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

2.2 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:

1. Class: O, with a minimum of 95 percent passing through No. 8 sieve and a minimum of 55 percent passing through No. 60 sieve.

2. Provide lime in form of ground dolomitic limestone or calcitic limestone.

B. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

C. Aluminum Sulfate: Commercial grade, unadulterated.

D. Perlite: Horticultural perlite, soil amendment grade.

E. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 sieve.

F. Sand: Clean, washed, natural or manufactured, and free of toxic materials.

G. Diatomaceous Earth: Calcined, 90 percent silica, with approximately 140 percent water absorption capacity by weight.

H. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

2.3 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch sieve; soluble salt content of 5 or less decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

B. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, debris, and material harmful to plant growth.

2.4 FERTILIZERS

A. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: 10 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.

2.5 PLANTING SOILS

A. Planting Soil: Imported topsoil or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from agricultural land, bogs, or marshes.

1. Topsoil: Shall be loam. The soil shall consist of 45% sand, 40% silt, and 5% clay, based on the U.S. Department of Agriculture's Standards for Mechanical Analysis of Soils. It shall also contain 5% organic matter. It shall not have a mixture of subsoil and shall not contain any slag, cinders, stones, lumps of soil, sticks, roots, trash or other extraneous materials larger than one and one half inches in diameter. Topsoil must also be free of plants or plant parts of Bermuda Grass, Quack Grass, Johnson Grass, Nutsedge, Poison Ivy, Canada Thistle, or others as specified. All topsoil shall be tested by a state of Pennsylvania approved laboratory (Brookside Laboratories, Inc. or approved equal), for mechanical analysis, pH, soluble salts, fertilizer and micro nutrient requirements. A pH of 5.5 to 6.0 is required. Soluble salts shall not be higher than 500 parts per million. No soil shall be used which has been treated with soil sterilants until sufficient time has elapsed to permit dissipation of toxic materials. The Contractor shall assume full responsibility for loss or damage to plantings arising from improper use of sterilants or due to his failure to allow sufficient time to permit dissipation of toxic materials.

B. SUBMITTALS
1. Submit minimum 10 oz sample of topsoil proposed. Forward sample to approved testing laboratory (Brookside Laboratories, Inc. or approved equal) in sealed containers to prevent contamination.
2. Test Reports: Indicate topsoil mechanical analysis nutrient and pH levels with recommended soil supplements and application rates and soluble salt levels. Soluble salts shall not be higher than 500 parts per million.
3. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

C. PREPARATION OF SOIL
1. Prepare sub-soil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.
2. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated sub-soil.
3. Scarify subsoil to a depth of 5 inches where topsoil is to be placed. Repeat cultivation in area where equipment, used for hauling and spreading topsoil, has compacted sub-soil.

D. PLACING TOPSOIL
1. Spread topsoil to a minimum depth of 6 inches over planting areas. Rake until smooth.
2. Place topsoil during dry weather and on dry unfrozen subgrade.
3. Remove vegetable matter and foreign non-organic material from topsoil while spreading, remove stones over 1" in diameter.
4. Grade topsoil to eliminate rough, low soft areas, and to ensure proper drainage according to grading plan

2.6 MULCHES

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:

1. Type: Double Shredded hardwood. Free of foreign and toxic substances. 6-months old, well rotted shredded native hardwood bark mulch, free of woodchips and sawdust.

2. Size Range: 3 inches maximum, 1/2 inch minimum.

3. Color: Natural.

2.7 PESTICIDES

A. General: Pesticide registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

2.8 TREE STABILIZATION MATERIALS

A. Stakes and Guys:

1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated, pointed at one end.

2. Wood Deadmen: Timbers measuring 8 inches in diameter and 48 inches long, treated with specified wood pressure-preservative treatment.

3. “Tree Strap”, Arbor Tape or approved equal for guying trees, weather resistant webbing, 900 lb. tensile strength, Black or Green in Color.

4. Flags: Standard surveyor's plastic flagging tape, white, 6 inches long.

B. Root-Ball Stabilization Materials:

1. Upright Stakes and Horizontal Hold-Down: Rough-sawn, sound, new hardwood or softwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated; stakes pointed at one end.

2. Wood Screws: ASME B18.6.1.

2.9 LANDSCAPE EDGINGS

A. Aluminum Edging: Standard-profile extruded-aluminum edging, ASTM B 221 (ASTM B 221M), Alloy 6063-T6, fabricated in standard lengths with interlocking sections with loops stamped from face of sections to receive stakes.

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. Curv-Rite, Inc.

b. Permaloc Corporation.

c. Russell, J. D. Company (The).

d. Sure-Loc Edging Corporation.

2. Edging Size: 3/16 inch wide by 5-1/2 inches deep

3. Stakes: Aluminum, ASTM B 221, Alloy 6061-T6, approximately 1-1/2 inches wide by 12 inches long.

4. Finish: Black “Duraflex”.

2.10 MISCELLANEOUS PRODUCTS

A. Wood Pressure-Preservative Treatment: AWPA C2, with waterborne preservative for soil and freshwater use, acceptable to authorities having jurisdiction, and containing no arsenic; including ammoniacal copper arsenate, ammoniacal copper zinc arsenate, and chromated copper arsenate.

B. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.

C. Burlap: Non-synthetic, biodegradable.

Part 3 EXECUTION

TREES & SHRUBS

A. The Installing Contractor will Provide and pay for materials testing. Testing agency shall be acceptable to the Landscape Architect. Provide the following data:
   1. Test all areas shown on plan for planting to determine soil suitability for planting. Test soil for:
      a. pH factor
      b. mechanical analysis
      c. percentage of organic content.
      d. Provide recommendations on type and quantity of additives required to establish satisfactory pH factor, percentage of organic matter and supply of nutrients to bring up to satisfactory levels for planting and which are acceptable to the Landscape architect.
   2. Planting: location for all plants and outlines for planting areas shall be staked on the ground and must be approved before any excavation is made. Adjustments in location and outlines shall be as directed. The landscape contractor is responsible for locating and protecting underground utilities in the planting areas.
   3. All pits and pockets shall be circular in outline: all excavations shall have vertical sides unless otherwise shown on the drawing. The depts. Specified for excavation of planting areas shall be the depths below finished grade and shall be increased as much as may be necessary to accommodate beneath the ball or roots, a bead of topsoil not less than 4” in depth upon which the ball or roots shall rest when planted is set properly to finished grade.

   4. All topsoil used for planting shall be thoroughly and uniformly mixed with peat or composted humus in a portion by volume of one part peat or composted humus to 2 parts topsoil. All groundcover and perennial beds shall be spread with 1" thick layer of peat or humus prior to cultivation.

   5. Excess and unsatisfactory excavated soil shall be disposed of by the Contractor. Satisfactory subsoil must be granular in texture.

   6. All plants shall be planted in pits unless otherwise specified. Deep planting shall be avoided and , unless specified or directed otherwise, all plants shall be set at such a level that, after settlement, a normal or natural relationship of the crown of the plant with the ground surface will be established, Each plant to be planted in an individual pit or pocket shall be planted in the center thereof, unless directed otherwise.

   7. When balled and burlapped plants are set, the prepared topsoil shall be tamped carefully under and around the base of each ball to fill all voids. All burlap, ropes, wires, etc. shall be removed from the sides and tops of the balls but no burlap shall be pulled out from under the balls.

   8. Roots of bare rooted plants shall be spread out properly and the prepared top soils shall be worked in carefully among them. Broken or frayed roots shall be cut off properly.

   9. All plants shall be planted in the prepared topsoil which shall be settled thoroughly by tamping and watering. A shallow saucer shall be formed at finished grade about each plant by placing a mound of topsoil around the edge of each pit or pocket.

10. All trees shall be supported immediately after planting. All trees shall be guyed. wires shall be encased in hose wherever they came in contact with the trunk or branches, and shall be placed around the trunk in a single loop. Wires shall be tightened and kept taut with turnbuckles for guys and by twisting the strands together when staking.

11. Guying shall be done with three guys spaced equally about each tree. Each guy shall consist of two strands of wire attached to the tree trunk at about 2/5's the height of the tree, and anchored to the ground either to notched stakes which have been driven into the ground at an angle away from the tree so that the tops of the anchor stakes are below finished grade, or to deadmen, placed at least 3' below finished grade. Guys must be taut and be kept taut. Guys shall be made more visible by attaching small white wooden flags.

12. Stakes shall be equally spaced about each tree and shall be driven vertically into the ground to a depth of 2-1/2' - 3' in such a manner as to not injure the ball or roots. Trees shall be fastened to each stake at a height of about 5'. Stakes shall be uniform in height. Trees 3" in caliper and over shall have 3 stakes. Trees less than 3" in caliper shall have 2 stakes.

13. Where shrubs are arranged in a group, the areas between the pits shall be filled to finished grade with acceptable soil from the excavation of the plant pits or from other sources. After this filling has been completed, but prior to mulching, the soil between the plants shall be cultivate to a depth of 4" and raked smooth. The cultivated area shall then be marked off neatly.

14. Groundcover plantings shall be planted securely in pockets dug in the cultivated, mulched beds. Balls of potted plants shall be broken or sliced gently to provide better adhesion with the soil.

15. Pruning: all new plant materials shall be pruned at the site in accordance with standard modern practice. Pruning shall remove all dead or damaged branches, twigs and roots; the plants shall be shaped as directed or to preserve the natural character.

16. Mulching: after the work of setting plants and cultivating within groups of plants has been completed and approved, the area within the outline of each plant pit as specified and the entire area of all planting spaces within beds shall be mulched with a 3" layer of mulch of approved material.

17. Groundcover beds shall be mulched with a 2" layer of approved mulch material prior to planting.

A. Install aluminum edging in areas shown on the plan. Install according to mfgs. Direction. Finished grade of the edging shall be ½” higher than the grade of the planting.

3.1 MAINTENANCE & ACCEPTANCE

A. Trees, shrubs and plantings.

1. Maintain plantings until completion and acceptance of the entire project.

2. Maintenance shall include pruning, cultivating, weeding, watering and application of appropriate insecticides and fungicides necessary to maintain plants free from insects and disease.

3. Re-set settled plants to proper grade and position. Restore planting saucer and adjacent material and remove dead material.

4. Tighten and repair guy wires and stakes as required. Correct defective work as soon as possible after deficiencies become apparent and weather and season permit.

5. Water trees, plants and groundcover beds within the first 24 hours after planting, and not less than twice per week until final acceptance. The Owner shall take over watering upon the final acceptance and will water once weekly from April 1st to December 1st when natural rainfall is less than 1” per week.

6. Warrant plant material to remain alive and be in a healthy, vigorous condition for a period of one year after completion and acceptance of the entire project. Replacement plants shall be warranted for an additional year.

7. Inspection of plants will be made by the Landscape Architect at the completion of planting.

8. Remove and immediately replace all plants as determined by the Landscape Architect to be unsatisfactory during the initial planting installation.

9. Remove all tree stakes and guy wires from trees and site at the end of the one year warranty period.

3.2 CLEAN – UP AND INSPECTION

A. Clearing and clean up - Upon completion of the work, the grounds shall be cleared of all debris, of superfluous materials, and all equipment, which shall be entirely removed from the premises, to the satisfaction of the Owner.

B. Final Inspection - final inspection of plantings shall be made at the conclusion of the maintenance period. Written notice to the Landscape Architect requesting inspection should be submitted at least 10 days prior to the anticipated date.

END OF SECTION 02930

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SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the complete construction of plain and reinforced concrete work, as indicated on the contract documents, including schedules, notes, and details for pile caps, foundation walls and grade beams, slabs-on-grade, elevated slabs, and miscellaneous curbs, and pads. Provide fabrication and complete installation of materials including concrete and reinforcement, as well as anchor rods and other embedded items provided by other trades.

1.02 QUALITY ASSURANCE

A. Codes and Standards:

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

a. IBC 2009 and ASCE 7-05 for Seismic Design Category B detailing requirements.
b. Concrete Reinforcing Steel Institute, "Manual of Standard Practice."
c. ACI 201.1 "Guide for Making a Condition Survey of Concrete in Service."
d. ACI 201.2 "Guide to Durable Concrete."
e. ACI 211.1 "Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete."
f. ACI 211.2 "Standard Practice for Selecting Proportions for Structural Lightweight."
g. ACI 211.5 "Guide for Submittal of Concrete Proportions."
h. ACI 212.3 "Chemical Admixtures for Concrete."
i. ACI 212.4 "Guide for the Use of High-Range Water-Reducing Admixtures (Superplasticizers) in Concrete."
j. ACI 224.1 "Causes, Evaluation, and Repair of Cracks in Concrete Structures."
k. ACI 224.3 "Joints in Concrete Construction."
l. ACI 230.1 - "Report on Solid Cement."
m. ACI 232.2 "Use of Fly Ash in Concrete."
n. ACI 301 "Specifications for Structural Concrete for Buildings."
o. ACI 302 "Guide for Concrete Floor and Slab Construction."
p. Where specified as "Architectural Concrete," ACI 303, "Guide to Cast-in-Place Architectural Concrete Practice."
q. ACI 304 "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete."
r. ACI 305 "Hot Weather Concreting."
s. ACI 306 "Cold Weather Concreting."
t. ACI 308 "Standard Practice for Curing Concrete."
u. ACI 309 "Guide for Consolidation of Concrete."
v. ACI 311 "Recommended Practice for Concrete Inspection."
w. ACI 315 "Details and Detailing of Concrete Reinforcement."
x. ACI 318 "Building Code Requirements for Reinforced Concrete."
y. ACI 347 "Recommended Practice for Concrete Formwork."
z. ACI 504 "Guide to Sealing Joints in Concrete Structures."

B. Workmanship:

1. Qualifications of Workmen: Provide at least one person who shall be present at all times during execution of this work and who shall be thoroughly trained and experienced in placing the types of concrete specified and who shall direct all work performed under this specification.

a. For the finishing of exposed concrete surfaces, use only thoroughly trained and experienced concrete finishers.

2. Workmanship: All workmanship shall be first-class and reflect the latest and best practice

in modern construction. Extreme care shall be exercised to make all concrete work uniform and dense, of the required strength, and true to elevations and lines required by the contract documents.

3. Tests for Concrete Materials:

   a. Test aggregates by the methods of sampling and testing of the following standard specifications:

      1) ASTM C 33 for normal weight aggregates.
      2) ASTM C 330 for light weight aggregates.

   b. For Portland Cement, sample the cement and determine the properties by the methods of test of ASTM C 150.
   c. Submit written reports to the Architect, for each material sampled and tested, prior to the start of work. Provide the project identification name and number, date of report, name of contractor, name of concrete testing service, source of concrete aggregates, material manufacturer and brand name for manufactured materials, values specified in the referenced specification for each material, and test results. Indicate whether or not material is acceptable for intended use.
   d. For Fly Ash, test samples by the methods of ASTM C618 and the fineness test of ASTM C430. Fly ash shall not have more than 34% of the particles retained on the No. 325 sieve.

1.03 SUBMITTALS

A. Manufacturer's Product Data: Concrete Work - submit manufacturer's data with application and installation instructions for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, joint systems, curing compounds, and others as requested by the Owner.

B. Shop Drawings: Concrete Reinforcement: Submit shop drawings for fabrication, bending and placement of concrete reinforcement. Comply with the ACI 315 "Details and Detailing of Concrete Reinforcement" requirements showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangements of concrete reinforcement. Include special reinforcement required and openings through concrete structures.

C. Laboratory Test Reports: Concrete Work: Submit 2 copies of laboratory test reports for concrete materials and for mix design test as specified herein.

D. Material Certificates: Certificates of material properties and compliance with specified requirements may be submitted in lieu of testing. Certificates of compliance must be signed by the materials producer and the Contractor. Submit signed certificates from manufacturer for each of the following:

   1. Cementitious materials
   2. Admixtures
   3. Form materials and release agents
   4. Steel reinforcement and accessories
   5. Waterstops
   6. Curing compounds
   7. Floor and slab treatments
   8. Bonding agents
   9. Adhesives
   10. Vapor retarder
   11. Semi-rigid joint filler
   12. Joint filler strips
   13. Repair materials

E. Design Mixtures: Submit mix design for each concrete mixture with supporting test data as required, and specific use identified.

F. Submit sample waterstops and vapor retarder membrane.

G. Floor flatness and levelness: Measurements to determine compliance with specified tolerances.

H. Field Quality Control: Test and inspection reports.

I. Pre-installation Conference: Meeting Minutes.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

A. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.

B. Forms for Exposed Finish Concrete: Form concrete surfaces which will be exposed in finished structure with plywood, metal, or other approved panel materials. Form facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize joints.

C. Form Coatings: Provide commercial formulation form- coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces requiring bond or adhesion, nor impede wetting of surfaces to be cured with water or curing compound.

2.02 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Welded Wire Fabric: ASTM A 185, welded steel wire fabric.

C. Supports for Reinforcement: Bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire-bar-type supports complying with CRSI specifications. Do not use bricks, blocks, or other non-wire type materials for reinforcement support.

2.03 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I, unless otherwise acceptable to the Owner.

B. Use only one brand of cement throughout the project, unless otherwise acceptable to the Owner.

C. Normal Weight Aggregates: ASTM C 33 and as herein specified.

1. Fine Aggregate: Clean, sharp sand free from loam, clay, lumps or other deleterious substances.

2. Coarse Aggregate: Clean, uncoated, processed aggregate containing no clay, mud, loam or foreign matter as follows:

a. Crushed stone, processed from natural rock or stone.
b. Washed gravel, either natural or crushed. Use of pit or bankrun gravel is not permitted.
c. Maximum Aggregate Size: Not larger than one- fifth of the narrowest dimension between sides of forms, one-third of the depth of slabs, nor three-fourths of the minimum clear spacing between individual reinforcing bars or bundles of bars.

D. Lightweight Aggregates: ASTM C 330.

E. Water: Clean, fresh, drinkable.

F. Admixtures:

1. Water Reducing Admixture: "Eucon WR-75" by the Euclid Chemical Company, "WRDA" by W. R. Grace & Co., "Pozzolith 200N" by BASF or "Plastocrete 161" by Sika Chemical Corporation. The admixture shall conform to ASTM C 494, Type A and not contain more chloride ions than are present in municipal drinking water.

2. Water Reducing, Retarding Admixture: "Eucon Retarder-75" by The Euclid Chemical Company, "Daratard 17" by W. R. Grace & Co., "Pozzolith 200N" by BASF or "Plastiment" by Sika Chemical Corporation. Shall meet ASTM C 494 Types B and D.

3. High Range Water Reducing Admixture (Super Plasticizer): ADVA 100 by W. R. Grace and Co., Glenium 3400 NV by BASF; VIstoCrete (or Sikament) by Sika; Plastol by Euclid Chemical. The admixture shall conform to ASTM C 494, Type D and not contain more chloride ions than are present in municipal drinking water.

4. Air Entraining Admixture: Sika Air by Sika; Eucon Air by Euclid; Daravair by Grace, MB-AE 90 by BASF/Master Builders. Shall conform to ASTM C 260.

5. Calcium Chloride: Calcium chloride or admixtures containing more than 0.05% chloride ions are not permitted.

6. In order for fly ash to be utilized, a mix design must be submitted in which the exact type of fly ash was successfully used on a previous project. Representative test results shall be submitted with the mix design in conformance with ACI requirements as specified. ASTM conformance must also be provided. The locations where the mix will be used must be clearly defined.

   a. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

      1) Fly Ash: 25 percent.
      2) Combined Fly Ash and Pozzolan: 25 percent.
      3) Ground Granulated Blast-Furnace Slag: 50 percent.
      4) Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or possolan not exceeding 25 percent.
      5) Silica Fume: 10 percent.
      6) Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
      7) Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

7. Certification: Written conformance to the above mentioned requirements and the chloride ion content of the admixture will be required from the admixture manufacturer prior to mix design review by the Owner.

2.04 RELATED MATERIALS

A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

1. Products:

   a. Colloid Environmental Technologies Company; Volclay Waterstop-RX.
   b. Concrete Sealants Inc.; Conseal CS-231.
   c. Greenstreak; Swellstop.
   d. Henry Company, Sealants Division; Hydro-Flex.

e. JP Specialties, Inc.; Earthshield Type 20.
f. Progress Unlimited, Inc.; Superstop.
g. TCMiraDRI; Mirastop.

B. Plastic Vapor Retarder: Provide vapor retarder system over prepared base material below slabs-on-grade. Use only materials which are resistant to decay when tested in accordance with ASTM E154 as follows:

1. Products:

a. Stego Industries, LLC; Stego Wrap, 15 mils.
b. Layfield Group, Vaporflex 15
c. Fortifiber Building Systems; Moistop Ultra 15.
d. Raven Industries Inc.; VaporBlock 15.
e. Reef Industries, Inc.; Griffolyn 15 mil.

2. Provide manufacturer's recommended tape at joints and seams. Provide manufacturer's recommended mastic and accessories at all penetrations and perimeter conditions.

C. Non-Shrink Grout: The grout shall conform to CRD C 621 92, "Corps of Engineers Specification for Non- Shrink Grout": "NS Metallic Grout" by the Euclid Chemical Company, or "Duragrout" by L&M Construction Chemicals, or “Sika Grout-300” by Sika.

D. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., when dry complying with AASHTO M 182, Class 2.

E. Moisture-Retaining Cover: One of the following complying with ASTM C 171.

1. Polyethylene Film.
2. White Polyethylene-coated burlap.

F. Clean, Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering:

1. Applied at a coverage rate of 300 sq. ft. per gallon. The compound shall be "Super Diamond Clear VOX" by The Euclid Chemical Company, or "Dress/Seal WB30" by L&M Construction Chemicals.

a. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
b. Euclid Chemical Company (The); Kurez DR VOX.
c. L&M Construction Chemicals, Inc.; L&M Cure R.

G. Bonding Agent: The compound shall be a polyvinyl acetate, rewettable type. "Euco Weld" by The Euclid Chemical Company or "Weld-Crete" by The Larsen Company, or "Everweld" by L&M Construction Chemicals.

H. Epoxy Adhesive: The compound shall be a two (2) component, 100% reactive compound suitable for use on dry or damp surfaces, "Euco #452 Epoxy System" by The Euclid Chemical Company or "Sikadur Rapid" by Sika Chemical Corporation, or "Epobond" by L&M Construction Chemicals.

I. See Architectural specifications for applied waterproofing membrane requirements.

2.05 PROPORTIONING AND DESIGN OF MIXES:

A. All mix designs shall be proportioned in accordance with Section 5.3 (field experience or trial batches) of ACI 318. Submit mix designs on each class of concrete for review. If trial batches are used, mix design shall be prepared by an independent testing laboratory.

B. Submit written reports to the Architect, accompanied by complete standard deviation analysis or trial batch data, of each proposed mix for each class of concrete at least 15 days prior to start of

work. Do not begin concrete production until mixes have been reviewed.

C. Design mixes to provide normal weight and lightweight with strengths as indicated on drawings.

D. Air Content: All concrete exposed to freezing and thawing shall have an air content of 4.5% to 7.5%.

E. Water-Cement Ratio: All concrete required to be watertight shall have a maximum water-cement ratio of 0.45. All slabs on metal deck and slabs on grade shall have a maximum water-cement ratio of 0.45. All reinforced concrete subjected to brackish water, salt spray or deicers shall have a maximum water-cement ratio of 0.40. All other concrete shall have a maximum water-cement ratio of 0.50.

F. Admixture Usage: All concrete subject to freeze/thaw shall have the air entrainment admixture. All concrete shall contain the specified water reducing or water reducing retarding admixture. Concrete slabs on deck and slabs on grade may contain a high range water reducer (super plasticizer).

G. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows: All concrete shall have a slump of not less than 3" and not more than 5", exclusive of any high range water reducing admixture.

H. Ready-Mix Concrete: Comply with the requirements of ASTM C 94 and as herein specified.

1. Delete the references for allowing additional water to be added to the batch for material with insufficient slump. Addition of water to the batch resulting in higher water-cement ratio than what is specified above, will not be permitted.

PART 3 - EXECUTION

3.01 FORMS

A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by the concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.

B. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.

C. Construct forms complying with ACI 347, to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.

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

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

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

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

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

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

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

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

3.02 VAPOR RETARDER INSTALLATION

A. Following leveling and compacting of granular base for slabs on grade, place vapor barrier sheeting with longest dimension parallel with direction of concrete placement.

B. Install complete vapor barrier system in accordance to manufacturer's instructions and ASTM E 1643.

C. Overlap joints 6" and seal with manufacturer's tape.

D. Protect vapor barrier from damage during installation of reinforcing steel and utilities and during placement of concrete slab or granular materials.

E. Immediately repair holes in vapor barrier with self-adhesive repair tape in accordance with manufacturer's instructions.

3.03 PLACING REINFORCEMENT

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

1. Avoid cutting or puncturing waterproofing during reinforcement placement and concreting operations. See waterproofing specs for waterproofing membrane patching and flashing requirements.

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

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

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

1. Minimum concrete protective cover for reinforcement (excluding requirements for fire protective cover) shall be as follows:

a. Concrete deposited against ground: 3 inches.
b. Formed surfaces exposed to weather or in contact with the ground: 2 inches for #6 bars or larger; 1-1/2 inches for bars less than 6".
c. Interior surfaces: 1-1/2 inches for beams, girders and columns; 3/4 inch for slabs, structural slab-on-grade above waterproofing membrane, walls and joists with #11 bars or smaller; and 1-1/2 inches with #14 and #18 bars.

E. Do not place reinforcing bars more than 2" beyond the last leg of continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.

F. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.04 JOINTS

A. Construction Joints: Submit proposed construction joint locations to Engineer for review. Locate and install construction joints as indicated or, if not indicated, so as not to impair strength and appearance of the structure and to ensure compliance with ACI 224.3 recommendations, as acceptable to the Architect and Owner.

B. Provide keyways at least 1-1/2" deep in construction joints in walls and slabs and between walls and footings.

C. Place construction joints perpendicular to the main reinforcement. Continue reinforcement across construction joints except as otherwise indicated.

D. Contraction (Control) Joints in Slabs-on-Ground: Unless otherwise indicated on the drawings, construct contraction joints in slab-on-ground as follows:

1. Provide joints in each direction located typically to conform to bay spacing (at column centerlines) and not more than 30 feet on center. Provide additional joints at all re-entrant corners.

3.05 INSTALLATION OF EMBEDDED ITEMS

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

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

3.06 PREPARATION OF FORM SURFACES

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

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

C. Coat steel forms with a non-staining, rust- preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

3.07 CONCRETE PLACEMENT

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

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

C. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. Deposit concrete as near to its final location as practicable, to avoid segregation due to rehandling or flowing.

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

E. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping, except where otherwise indicated. Use equipment and procedures for consolidation of concrete in accordance with the recommended practices of ACI 309, to suit the type of concrete and project conditions.

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

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

H. Bring slab surfaces to the correct level with a straightedge and strikeoff. Use bull floats or darbies to smooth the surface, leaving it free of humps or hollows. Do not sprinkle water on the plastic surface. Do not disturb the slab surfaces prior to beginning finishing operations.

I. Maintain reinforcing in the proper position during concrete placement operations.

3.08 FINISH OF FORMED SURFACES

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

B. Related Unformed Surfaces: At tops of walls, horizontal offsets and similar unformed surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise shown.

3.09 MONOLITHIC SLAB FINISHES

A. Float Finish: Apply float finish to monolithic slab surfaces that are to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo, and as otherwise shown on drawings or in schedules.

1. After screeding and consolidating concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to a tolerance so that the gap between floor surface and straightedge does not exceed 1/4" under a 10' straightedge. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

B. Trowel Finish: Apply trowel finish to monolithic slab surfaces that are to be exposed-to-view, unless otherwise shown, and slab surfaces that are to be covered with resilient flooring, paint, epoxy terrazzo or other thinfilm finish coating system, and as otherwise shown on drawings or in schedules.

C. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.

D. Flatness and Levelness: The following composite floor flatness (F_f) and floor levelness (F_l) criteria shall be met for concrete slabs as measured in accordance with ASTM E 1155. The Subcontractor shall use whatever means and methods are necessary to achieve the specified F_f and F_l criteria

1. Slab-On-Ground Level

Flatness (F_f)	25
Levelness (F_l)	20

2. Elevated Slabs

Flatness (F_f)	25

3.10 CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperature, and maintain without drying at a relatively constant temperature for a period of time necessary for hydration of cement and proper hardening.

B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 72 hours.

C. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least seven (7) days after initial curing and in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

D. Curing Methods: Perform curing of concrete by moisture curing, by moisture-cover curing, by curing compounds, and by combinations thereof, as herein specified.

E. Provide curing compounds as follows:

1. All interior slabs to receive resilient tile, broadloom carpet or to be left exposed, and all exterior slabs, steps, etc. shall be cured with the specified clear curing and sealing compound (VOC compliant).

2. All other interior slabs shall be moisture or moisture-cover cured. (Note: Do not apply curing compound to slabs which are to receive resinous flooring, terrazzo, ceramic tile or quarry tile.)

3. The curing compounds shall be applied immediately after final finishing.

F. Provide moisture curing by following method:

1. Covering concrete surface with specified cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.

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

G. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moisture curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

3.11 REMOVAL OF FORMS

A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F. for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

B. Formwork supporting weight of concrete, such as beam soffits, joints, slabs and other structural elements, may not be removed in less than 14 days. Determine potential compressive strength of inplace concrete by testing field-cured specimens representative of concrete location or members.

C. Form facing material may be removed four (4) days after placement, only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

3.12 RE-USE OF FORMS

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

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

3.13 MISCELLANEOUS CONCRETE ITEMS

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

3.14 CONCRETE REPAIRS

A. Patching Defective Areas: Repair and patch defective areas with structural grout patching material suitable for this application and approved by the Architect immediately after removal of forms, but only when acceptable to the Architect.

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

C. Repair all random floor cracks in mechanical rooms, or on floors required to be watertight, by grinding cracks 1/8" to 1/4" wide by 1/2" depth and filling with flexible watertight sealant material such as Sika Injection 203, or equal. Repair other random floor cracks greater than 1/16" in. filling with epoxy sealer such as Sikadur-52 Injection, or equal.

D. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.

E. Correct low areas in unformed surfaces during, or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete.

F. If defects cannot be repaired, remove and replace with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete, and brush coat the areas to be patched with the specified bonding compound. New concrete shall be placed after the bonding compound has dried. Mix patching concrete of same materials to provide concrete of the same type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.

G. All structural repairs and replacements shall be made with prior approval of the Architect.

3.15 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: The Owner will engage an independent testing and inspection agency to perform all concrete tests.

B. Testing Agency concerned shall perform the following services in connection with concrete and reinforcing steel:

1. Preliminary tests of concrete ingredients, including sieve analysis of aggregates.

2. Review concrete design mixes.

3. Mold cylinders and conduct compressive strength tests as follows:

a. One strength test shall consist of 5 standard cylinders made and cured in accordance with ASTM C31.

b. On each day of concreting operations, make one test for first 50 c.y. or any fraction thereof of concrete placed. Make one additional test for each additional 50 c.y. or fraction thereof of concrete placed. Make cylinders for each test from the same sample of concrete.

c. For each strength test, 2 cylinders shall be tested at 7 days and 2 cylinders tested at 28 days, in accordance with ASTM C 39. One cylinder shall be held for 56 days in the event it is needed for additional evaluation.

d. Concrete strength test reports shall include the following:

1) Sample number.
2) Age of specimen.
3) Date cast.
4) Date tested.
5) Location of concrete placed.
6) Required strength.
7) Weight of cement/c.y.
8) Weight of aggregates/c.y. and maximum size.
9) Gallons of water/c.y.
10) Water-cement ratio.
11) Admixtures - amount/c.y. and manufacturers.
12) Air content.
13) Slump.
14) Total load.
15) Unit load (psi).
16) Size and area of specimen.
17) Type of break.
18) Remarks concerning abnormal conditions.
19) Name of concrete supplier.

5. Periodically inspect placement of concrete for compliance with ACI Manual of Practice (Part 2).

6. If the average strength of cylinders tested for any portion of the structure falls below minimum ultimate strength requirements of the Specifications, perform additional testing as required by the Owner: Costs of these additional services, if required, shall be borne by the Contractor.

7. Perform inspection of placement of reinforcing steel.

8. Inspect formwork for stability, cleanliness and conformity with the requirements of the Contract Documents.

9. Perform inspection of floors to confirm compliance with flatness and levelness criteria set forth in these Specifications.

10. Perform inspection of specified curing temperature and techniques to conform with criteria set forth in these specifications.

+ + END OF SECTION + +

SECTION 04200 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Concrete unit masonry.
2. Reinforced unit masonry.
3. Masonry waste disposal.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 3 Section "Cast in Place Concrete" for footings and slabs.
2. Division 9 Section "Painting" for CMU finishes.

C. Products installed but not furnished under this Section include the following:

1. Steel lintels for unit masonry specified in Division 5 Section "Metal Fabrications."
2. Hollow metal frames in unit masonry openings specified in Division 8 Section "Standard Steel Doors and Frames."

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each different masonry unit, accessory, and other manufactured product specified.

C. Shop drawings for reinforcing detailing fabrication, bending, and placement of unit masonry reinforcing bars. Comply with ACI 315 "Details and Detailing of Concrete Reinforcement" showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of masonry reinforcement.

E. Setting drawings for glazed structural facing tile showing coursing and location of special shapes.

F. Material certificates for the following, signed by manufacturer and Contractor, certifying that each material complies with requirements.

1. Each different cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.
2. Each material and grade indicated for reinforcing bars.
3. Each type and size of joint reinforcement.
4. Each type and size of anchors, ties, and metal accessories.

G. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

H. LEED Submittals:

1. Credit MR C4: For products having recycled content, including postconsumer and pre-consumer recycled content. Provide the following information:

a. Product Data
b. Percent Content (post and pre-consumer)
c.Invoices indicating cost of material (no labor included.)

2. Credit MR C5: For products and materials that comply with requirements for regional materials based on location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Provide the following information:
   a. Product Data
   b. Fraction by weight of regional material
   c. Invoices indicating cost of material (no labor included.)
   d. Distance from Project

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: To qualify for acceptance, an independent testing agency must demonstrate to Architect's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM C 1093, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.

B. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one source and by a single manufacturer for each different product required.

C. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not install until they are in an air-dried condition.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 PROJECT CONDITIONS

A. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches (600 mm) down both sides and hold cover securely in place.

B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt on completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit masonry damaged by frost or freezing conditions. Comply with the following requirements:

1. Cold-Weather Construction: When the ambient temperature is within the limits indicated, use the following procedures:

    a. 40 to 32 deg F (4 to 0 deg C): Heat mixing water or sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C).
    b. 32 to 25 deg F (0 to -4 deg C): Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C). Heat grout materials to produce grout temperatures between 40 and 120 deg F (4 and 49 deg C). Maintain mortar and grout above freezing until used in masonry.
    c. 25 to 20 deg F (-4 to -7 deg C): Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C). Heat grout materials to produce grout temperatures between 40 and 120 deg F (4 and 49 deg C). Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40 deg F (4 deg C) if grouting. Use heat on both sides of walls under construction.
    d. 20 deg F (-7 deg C) and Below: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C). Heat grout materials to produce grout temperatures between 40 and 120 deg F (4 and 49 deg C). Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40 deg F (4 deg C). Provide enclosures and use heat on both sides of walls under construction to maintain temperatures above 32 deg F (0 deg C) within the enclosures.

2. Cold-Weather Protection: When the mean daily temperature is within the limits indicated, provide the following protection:

    a. 40 to 25 deg F (4 to -4 deg C): Cover masonry with a weather-resistant membrane for 48 hours after construction.
    b. 25 to 20 deg F (-4 to -7 deg C): Cover masonry with insulating blankets or provide enclosure and heat for 48 hours after construction to prevent freezing. Install wind breaks when wind velocity exceeds 15 mi./h (25 km/h).
    c. 20 deg F (-7 deg C) and Below: Provide enclosure and heat to maintain temperatures above 32 deg F (0 deg C) within the enclosure for 48 hours after construction.

3. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried out, but not less than 7 days after completion of cleaning.

E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F (38 deg C) and above.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

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

1. Concrete Masonry Units:
    a. Binkley and Ober Inc.
    b. Maisel Brothers Inc.
    c. New Holland Concrete
    d. Nitterhouse Masonry Products, LLC

2. Portland Cement, Mortar Cement, Masonry Cement, and Lime:

    a. Essroc Materials, Inc.

b. Glen-Gery Corporation.
c. Keystone Cement Co.
d. Lehigh Portland Cement Co.

3. Joint Reinforcement, Ties, and Anchors:

a. Dur-O-Wal, Inc.
b. Heckman Building Products, Inc.
c. Hohmann & Barnard, Inc.
d. Masonry Reinforcing Corp. of America.
e. National Wire Products Industries.
f. Southern Construction Products.

2.2 CONCRETE MASONRY UNITS

A. General: Provide shapes indicated and as follows for each form of concrete masonry unit required.

1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
2. Provide square-edged units for outside corners.

B. Concrete Masonry Units: ASTM C 90 and as follows:

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength indicated below:

a. 1900 psi (13.1 MPa).

2. Weight Classification: Normal weight.
3. Aggregates: Do not use aggregates made from pumice, scoria, or tuff.
4. Provide Type I, moisture-controlled units.
5. Size: Manufactured to the actual dimensions indicated on Drawings within tolerances specified in the applicable referenced ASTM specification.
6. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.

2.3 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color cement as required .
B. Masonry Cement: ASTM C 91.

C. Hydrated Lime: ASTM C 207, Type S.

D. Aggregate for Grout: ASTM C 404.

E. Ready-Mixed Mortar: Cementitious materials, water, and aggregate complying with requirements specified in this Article; combined with set-controlling admixtures to produce a ready-mixed mortar complying with ASTM C 1142.

F. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494, Type C, and recommended by the manufacturer for use in masonry mortar of composition indicated.

G. Water: Potable.

N. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

2.4 REINFORCING STEEL

A. Steel Reinforcing Bars: Material and grade as follows:

1. Billet steel complying with ASTM A 615 (ASTM A 615M).

B. Deformed Reinforcing Wire: ASTM A 496, with ASTM A 153, Class B-2 zinc coating.

C. Welded-Wire Fabric: ASTM A 185.

2.5 JOINT REINFORCEMENT

A. General: Provide joint reinforcement formed from the following:

1. Galvanized carbon-steel wire, coating class as follows:

a. ASTM A 153, Class B-2, for exterior walls.

B. Description: Welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10 feet (3 m), with prefabricated corner and tee units, and complying with requirements indicated below:

1. Wire Diameter for Side Rods: 0.1875 inch (4.8 mm).
2. Wire Diameter for Cross Rods: 0.1875 inch (4.8 mm).

C. For single-wythe masonry, provide type as follows with single pair of side rods:

1. Ladder design with perpendicular cross rods spaced not more than 16 inches (407 mm) o.c.

2.6 MISCELLANEOUS MASONRY ACCESSORIES

A. Weep Holes: Provide the following:

1. Round Plastic Tubing: Medium-density polyethylene, 3/8-inch (9-mm) outside diameter by 8 inches long

2.7 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Add cold-weather admixture (if used) at the same rate for all mortar, regardless of weather conditions, in order to ensure that mortar color is consistent.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification, for job-mixed mortar; and ASTM C 1142 for ready-mixed mortar, of types indicated below:

1. Limit cementitious materials in mortar to portland cement and lime.
2. For reinforced masonry and where indicated, use type indicated below:

a. Type: S.

C. Grout for Unit Masonry: Comply with ASTM C 476. Use grout of consistency indicated or, if not otherwise indicated, of consistency (fine or coarse) at time of placement that will completely fill spaces intended to receive grout.

2.8 SOURCE QUALITY CONTROL

A. The Owner will engage and pay for the services of an independent testing agency to perform the following testing for source quality control. Payment for these services will be made from the Inspection and Testing Allowance, as authorized by Change Orders. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.

C. Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units will be tested for strength, absorption, and moisture content per ASTM C 140.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of unit masonry. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Examine rough-in and built-in construction to verify actual locations of piping connections prior to installation.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual thickness of the masonry units, using units of thickness indicated.

B. Leave openings for equipment to be installed before completion of masonry. After installing equipment, complete masonry to match construction immediately adjacent to the opening.

C. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting, where possible. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces of columns, walls, and arrises, do not exceed 1/4 inch in 10 feet (6 mm in 3 m), nor 3/8 inch in 20 feet (10 mm in 6 m), nor 1/2 inch in 40 feet (12 mm in 12 m) or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m), nor 1/2 inch in 40 feet (12 mm in 12 m) or more. For vertical alignment of head joints, do not exceed plus or minus 1/4 inch in 10 feet (6 mm in 3 m), nor 1/2 inch (12 mm) maximum.

B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m), nor 1/2 inch in 40 feet (12 mm in 12 m) or more. For top surface of bearing walls, do not exceed 1/8 inch (3 mm) in 10 feet (3 m), nor 1/16 inch (1.5 mm) within width of a single unit.

C. Variation in Mortar-Joint Thickness: Do not vary from bed-joint thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm). Do not vary bed-joint thickness from bed-joint thickness of adjacent course by more than 1/8 inch (3 mm). Do not vary from head-joint thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary head-joint thickness from adjacent head-joint thickness by more than 1/8 inch (3 mm). Do not vary from collar-joint thickness indicated by more than minus 1/4 inch (6 mm) or plus 3/8 inch (10 mm).

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets. Avoid the use of less-than-half-size units at corners, jambs, and where possible at other locations.

B. Lay walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.

C. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

1. One-half running bond with vertical joint in each course centered on units in courses above and below.

D. Stopping and Resuming Work: In each course, rack back 1/2-unit length for one-half running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar prior to laying fresh masonry.

F. Built-in Work: As construction progresses, build-in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

G. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.

H. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.

I. Fill cores in hollow concrete masonry units with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow concrete masonry units as follows:

1. With full mortar coverage on horizontal and vertical face shells.
2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
3. Maintain joint widths indicated, except for minor variations required to maintain bond alignment. If not indicated, lay walls with 3/8-inch (10-mm) joints.

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

3.6 CAVITIES

A. Keep cavities clean of mortar droppings and other materials during construction. Strike joints facing cavities flush.

3.8 HORIZONTAL-JOINT REINFORCEMENT

A. General: Provide continuous horizontal-joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcing a minimum of 6 inches (150 mm).

1. Space reinforcement not more than 16 inches (406 mm) o.c.

B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.9 LINTELS

A. Install steel lintels where indicated.

B. Provide minimum bearing of 8 inches (200 mm) at each jamb, unless otherwise indicated.

3.10 WEEP HOLES

A. General: Install through wall weep holes in masonry at floor slab, shelf angles, lintels, ledges, other obstructions to the downward flow of water in the wall, and where indicated.

1. Form weep holes with product specified in Part 2 of this Section.
2. Space weep holes 24 inches (600 mm) o.c.

3.11 INSTALLATION OF REINFORCED UNIT MASONRY

A. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.

1. Do not exceed the following pour heights for grout: 48”

3.12 FIELD QUALITY CONTROL

A. The Owner will engage and pay for the services of an independent testing agency to perform the following testing for field quality control. Payment for these services will be made from the Inspection and Testing Allowance, as authorized by Change Orders. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.

B. Testing Frequency: Tests and Evaluations listed in this Article will be performed during construction for each 5000 sq. ft. (460 sq. m) of wall area or portion thereof.

C. Mortar properties will be tested per property specification of ASTM C 270.

D. Grout will be sampled and tested for compressive strength per ASTM C 1019.

3.13 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units; install in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point-up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for application of sealants.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears prior to tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
5. Clean brick by bucket and brush hand-cleaning method described in BIA Technical Note No. 20 Revised, using the following masonry cleaner:

    a. Job-mixed detergent solution.
    b. Proprietary acidic cleaner, applied in compliance with directions of acidic cleaner manufacturer.

6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain present on exposed surfaces.
7. Clean limestone units to comply with recommendations in the "Indiana Limestone Handbook" of the Indiana Limestone Institute of America.

E. Protection: Provide final protection and maintain conditions that ensure unit masonry is without damage and deterioration at time of Substantial Completion.

3.19 MASONRY WASTE DISPOSAL

A. Recycling: Undamaged, excess masonry materials are Contractor's property and shall be removed from the Project site for his use.

B. Excess Masonry Waste: Remove excess masonry waste in accordance with Division 1 requirements.

END OF SECTION 04200

SECTION 05120 - STRUCTURAL STEEL

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes fabrication and erection of structural steel work, as indicated on the contract documents including schedules, notes, and details of members, connections, and types of steel required.

1. Structural steel is that work defined in American Institute of Steel Construction (AISC) "Code of Standard Practice" and as otherwise shown on drawings.

1.02 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).

1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.

2. High-strength bolts including nuts and washers.

3. Structural steel primer paint.

4. Shrinkage-resistant grout.

C. Shop Drawings prepared under supervision of a licensed Professional Structural Engineer, including complete details and schedules for fabrication and assembly of structural steel members, procedures, and diagrams showing the sequence of erection. Architect's review of shop drawings will be for general consideration only. Compliance with requirements for materials, fabrication, and erection of structural steel is the Contractor's responsibility.

1. Sequencing of Shop Drawing Submittals: Fabricator is to submit erection drawings prior to submitting any piece drawings, for review and approval by the Architect and Engineer of Record. The Owner shall not be responsible for re-detailing of pieces due to detailing prior to receipt of approved erection drawings.

2. Calculations shall be submitted prior to, or along with, the piece drawings with which they are associated. Piece drawings will not be reviewed without signed and sealed calculations.

3. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols and show size, length, and type of each weld.

4. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed as work of other sections.

D. Certified copies of each survey conducted by a Professional Surveyor, licensed in the State of Delaware showing elevations and locations of base plates and anchor bolts to receive structural steel and final elevations and locations for major members. Indicate discrepancies between actual installation and contract documents.

E. Calculations, prepared and signed and sealed by a professional engineer licensed in the State of Delaware, for all braced frame connections, indicating that connections are capable of resisting the design forces shown on the drawings. Provide shear connection capacity tables for proposed shear connections, for use in the review of shop drawings.

1.03 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of following, except as otherwise indicated:

1. American Institute of Steel Construction (AISC) 303-05, "Code of Standard Practice for Steel Buildings and Bridges."

Paragraph 4.4.1.b of the above code is hereby modified by deletion of the following sentence:

"Confirmation that the Owner's Designated Representative for Design has reviewed and approved the connection details shown on the Shop and Erection Drawings and submitted in accordance with Section 3.1.2, if applicable."

2. AISC "Specifications for Structural Steel Buildings," including "Commentary."

3. "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" approved by the Research Council on Structural Connections.

4. American Welding Society (AWS) D1.1 "Structural Welding Code - Steel."

5. ASTM A 6 "General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use."

6. Steel Structures Painting Council (SSPC) "Steel Structures Painting Manual", Volume 2.

7. ANSI/AISC 341-02 "Seismic Provisions for Structural Steel Buildings."

8. Any material or workmanship which is observed to be defective or inconsistent with the Contract Documents shall be corrected, modified, or replaced at the Contractor's expense.

B. Fabricator's Qualifications:

1. Minimum of five (5) years' continuous experience in the fabrication of steel for projects of similar quantity and scope.

2. **Preferential consideration for bid award shall be given to those fabricators that are certified** ~~Certification~~ for Conventional Steel Building Structures (Category Sbd) in accordance with the American Institute of Steel Construction's Quality Certification Program.

3. Submit a written description of fabricator's capabilities, including plant facilities, personnel and a list of at least three projects of comparable size that have been completed within the last five years.

C. Erector's Qualifications:

1. Minimum of five (5) years' continuous experience in the erection of similar steel structures.

2. Submit a written description of at least one project of equal or greater height to this project which the erector has completed.

3. Submit a complete list of equipment and personnel with experience records of all supervisory personnel to be used on this project.

D. Qualifications for Welding Work: Qualify welding procedures and welding operators in accordance with AWS "Qualification" requirements.

1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests within the previous 12 months.

2. If recertification of welders is required, retesting will be Contractor's responsibility.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site at such intervals to ensure uninterrupted progress of work.

B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time not to delay work.

C. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration. If bolts and nuts become dry or rusty, clean and relubricate before use.

1. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Metal Surfaces, General: For fabrication of work that will be exposed to view in the finished Work, use only materials that are smooth and free of surface blemishes including pitting, rust and scale, seam marks, roller marks, rolled trade names, and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating, and applying surface finishes.

B. Structural Steel Shapes, Plates, and Bars: ASTM A 992, Grade 50, or as indicated on the drawings.

C. Cold-Formed Steel Tubing: ASTM A 500, Grade B.

D. Steel Pipe: ASTM A 501.

1. Finish: Black, except where indicated to be galvanized.

E. Headed Stud-Type Shear Connectors: ASTM A 108, Grade 1015 or 1020, cold-finished carbon steel with dimensions complying with AISC Specifications.

F. Anchor Rods: ASTM F 1554 Grades 36 and 105, nonheaded type unless otherwise indicated.

G. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:

1. Quenched and tempered medium-carbon steel bolts, nuts, and washers, complying with ASTM A 325.

a. Where indicated as galvanized, provide units that are zinc coated, either mechanically deposited complying with ASTM B 695, Class 50, or hot-dip galvanized complying with ASTM A 153.

H. Electrodes for Welding: Comply with AWS Code.

I. Structural Steel Primer Paint:

1. Except where indicated otherwise, provide TNEMEC P10-1009 Gray, 2.0 - 3.5 mils dry film thickness.

2. For structural steel exposed to exterior in the finished Work, and exposed to public view, provide TNEMEC 90-97 TNEME-ZINC, 2.5 - 3.5 mils dry film thickness, in addition to galvanizing required by sub-paragraph 2.04.F.

a. Structural steel exposed to exterior, but not exposed to public view, shall be galvanized, with no primer. Refer to Article 2.04, "Finishing."

J. Galvanizing Repair Paint: High zinc dust content paint for touching up of welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint-20.

K. Nonmetallic Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining product containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with CE-CRD-C621.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Euco N.S.; Euclid Chemical Co.
b. Masterflow 713; Master Builders.
c. Five Star Grout; U.S. Grout Corp.
d. Duragrout; L&M Construction Chemicals

2.02 FABRICATION

A. Detailing:

1. Pre-Detailing Conference: Prior to commencement of piece detailing, hold pre-detailing conference with engineer of record. Agenda to include discussion of shop standard details, requests for changing details shown on contract documents, submittal schedule and procedures, and timeline for submittal review (drawings per week, turnaround time, etc.)

2. Connection Detailing: Any fabricator-desired variation to the typical connection details shown on the contract documents must be approved by the engineer of record prior to detailing. The Owner shall not be responsible for the cost of detailing that is rejected on the grounds of not receiving prior approval from the engineer of record.

B. Shop Fabrication and Assembly:

1. Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications except as more restrictive tolerances are indicated. Provide camber in structural members where indicated.

2. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.

3. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.

B. Connections: Provide signed and sealed calculations as required in Section 1.02.E.

1. Weld or bolt shop connections, as indicated.

2. Bolt field connections, except where welded connections or other connections are indicated.

a. Provide high-strength threaded fasteners for all bolted connections.

C. High-Strength Bolted Construction: Install high-strength bearing type threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts."

D. Welded Construction:

1. Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.

    a. For galvanized items, burn off zinc coating at areas to be welded.

2. Assemble and weld built-up sections by methods that will produce true alignment of axes without warp.

E. Shear Connectors: Prepare steel surface as recommended by manufacturer of shear connectors. Weld shear connectors in field, spaced as shown, to beams and girders where indicated. Use automatic end welding of headed stud shear connectors in accordance with manufacturer's printed instructions.

F. Preparation for Other Work:

1. Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on final shop drawings.

2. Provide threaded nuts welded to framing and other specialty items as indicated to receive other work.

3. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.

2.03 SURFACE PREPARATION

A. Clean steelwork after inspection and before shipping. Remove loose rust, loose mill scale, and spatter, slag, and flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows:

1. SSPC SP-2 "Hand Tool Cleaning" for all steelwork.

2.04 FINISHING

A. Galvanizing: For those items indicated for galvanizing, apply zinc coating by the hot-dip process in compliance with ASTM A 123, G60.

1. Galvanize all structural steel members exposed to the weather and as indicated on the drawings, and all related bolts, washers, and other accessories.

2. Galvanize all structural steel members, including accessories, bolts, washers, etc., specifically noted to be galvanized on the Contract Drawings.

3. Properly prepare items for galvanizing.

4. Drill or punch weep and drainage holes before galvanizing.

B. Painting:

1. Shop-paint all structural steel which is not galvanized, except as follows:

    a. Do not paint those members or portions of members to be embedded in concrete or mortar. (Paint embedded steel that is partially exposed, on exposed portion and the first 2 inches only of embedded portion).
    b. Do not paint surfaces to be welded.
    c. Do not paint surfaces to be fireproofed.

2. Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide dry film thickness indicated. Use painting methods that result in full coverage of joints, corners, edges, and exposed surfaces.

a. Apply 2 coats of paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

3. Paint all galvanized steel exposed to view below the second floor level.

2.05 SOURCE QUALITY CONTROL

A. General: Materials and fabrication procedures are subject to inspection and tests in mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.

1. Promptly remove and replace materials or fabricated components that do not comply.

B. Design of Members and Connections: Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the work.

1. Promptly notify Architect whenever design of members and connections for any portion of structure are not clearly indicated.

PART 3 - EXECUTION

3.01 ERECTION

A. Surveys: Check elevations of concrete and masonry bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Architect. Do not proceed with erection until corrections have been made or until compensating adjustments to structural steel work have been agreed upon with Architect.

B. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.

C. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete work.

D. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.

1. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.

2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.

3. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.

4. For proprietary grout materials, comply with manufacturer's instructions.

E. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure within specified AISC tolerances except as more restrictive tolerances are indicated.

2. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.

3. Splice members only where indicated and accepted on shop drawings.

F. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds, and grind smooth at exposed surfaces.

1. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

2. Do not enlarge unfair holes in members by burning or by using drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.

G. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members that are not under stress, as acceptable to Architect. Finish gas-cut sections equal to a sheared appearance when permitted.

H. Touch-Up Painting: Immediately after erection and inspection, clean field welds, bolted connections, and abraded areas of shop paint.

1. Apply paint to exposed areas using same material as used for shop painting. Apply by brush or spray to provide minimum dry film thickness of 2.0 mils.

2. Apply galvanizing repair paint to comply with ASTM A 780.

3.02 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: The Owner will engage an independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports.

1. Testing agency will conduct and interpret tests, state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.

2. Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.

3. Testing agency may inspect structural steel at plant before shipment.

B. Testing agency concerned shall perform the following services in connection with structural steel:

1. Inspect bearing plates for level and total bearing.

2. Inspect all columns for plumb and alignment.

3. Inspect all members for proper position.

4. Inspect guying and bracing during construction period.

5. Verify calibration of torque wrenches and inspect all bolts for proper type and size and for proper torque. See IBC 2009 Section 1700 for requirements of special inspections.

6. Perform the following services in connection with both shop and field welding. See IBC 2009 Section 1700 for additional requirements of special inspections.

a. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
b. Perform visual inspection of all welds.

c. Perform tests of welds as follows.

1) Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration not acceptable.

a) Inspect 15% of all fillet welds, randomly selected.
b) Inspect all full penetration welds.

7. Inspect all steel frame joint details for compliance with approved construction documents.

8. Upon completion, certify that all structural steel on the project, including welding and bolting of members, was done under inspection of the testing agency concerned and is in accordance with the requirements of pertinent codes, and the requirements of the Contract Documents.

9. Inspect the following materials for identification markings to conform to ASTM or AWS standards specified in the approved construction documents. (Verify manufacturer's certificate of compliance for each material):

a. high strength bolts, nuts and washers
b. structural steel
c. weld filler material

C. Correct deficiencies in structural steel work that inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as necessary to reconfirm any noncompliance of original work and to show compliance of corrected work.

+ + END OF SECTION + +

SECTION 05300 - STEEL FLOOR DECKING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the fabrication and erection of steel floor decking as indicated on the contract documents including basic layout and type of units required. All accessories to be provided as specified herein.

1.02 QUALITY ASSURANCE

A. Codes and Standards

1. Comply with the provisions of the following codes and standards, except as otherwise shown or specified.

a. AISI "Specification for the Design of Cold- Formed Steel Structural Members."
b. AWS "Structural Welding Code."
c. "Design Manual for Composite Decks, Form Decks, and Roof Decks", by the Steel Deck Institute.

B. Qualification of Welding Work

1. Qualify welding processes and welding operators in accordance with the AWS "Standard Qualification Procedure."

2. Welded decking in place is subject to inspection and testing. Expense of removing and replacing any portion of composite decking for testing purposes will be borne by the Owner if welds are found to be satisfactory. Remove work found to be defective and replace with new acceptable work.

C. Manufacturers Qualifications: Steel Deck manufacturer shall have not less than three (3) year experience in fabrication of Steel Deck.

D. Erector's Qualifications: Erector shall have not less than five (5) years experience in installation of steel decking.

1.03 PERFORMANCE REQUIREMENTS

A. Provide floor decking in accordance with SDI Manual, with depth and gage as noted on the drawings.

B. Underwriters' Label: Provide deck units listed in Underwriters' Laboratories "Fire Resistance Index", with each deck unit bearing the UL labels and marking.

1.04 SUBMITTALS

A. For information only, submit manufacturer's specifications and installation instructions for each product specified. Include manufacturer's certification as may be required to show compliance with these specifications. Indicate by transmittal form that a copy of each instruction has been distributed to the Installer.

B. Submit detailed drawings showing layout and types of deck units, shear connectors, anchorage details, edge of slab details, and conditions requiring closure panels, cut openings, special jointing or other accessories.

C. Submit evidence that welders employed in the work are currently certified under AWS qualification procedures.

1.05 STORAGE AND HANDLING

A. Storage: Separate sheets and store units on dry wood sleepers, sloped to promote drainage. Cover with waterproof material ventilated to avoid condensation.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Vulcraft Composite Floor Deck by Nucor, or Composite Steel Deck by CANAM. Depth and gage as noted on the drawings.

B. Steel for Composite Floor Decking, Galvanized Finish: ASTM A 653, Type VLI or equivalent with minimum yield strength of 33 ksi.

C. Galvanizing: ASTM A 653, G90.

D. Sheet Metal Accessories: ASTM A 653, commercial quality, galvanized.

E. Galvanizing Repair Paint: High zinc-dust content paint for repair of damaged galvanized surfaces complying with Military Specifications MIL-P-21035.

2.02 FABRICATION

A. General: Fabricate deck units of galvanized steel, in lengths to span 4 or more supports with flush ends and nesting side laps.

B. Composite Deck Units

1. Fabricate deck units with integral embossing or raised patterns to provide mechanical bond with concrete slabs.

2. Fabricate deck units with a fluted section having interlocking side laps; of the depth and width as shown.

3. Fabricate metal cover plates for end-abutting deck units of not less than 18 gage galvanized sheet steel of the same quality as the deck units. Form to the configuration to match deck units, approximately 6" wide.

C. Metal Closure Strips and Screed Strips

1. Fabricate metal closure strips, for openings between decking and other construction, of not less than 14 gage galvanized sheet steel of the same quality as the deck units. Form to the configuration required to provide tight-fitting closures at flutes and sides of decking.

2. Fabricate screed strips of 14 ga. galvanized sheet steel as shown.

PART 3 - EXECUTION

3.01 INSPECTION

A. Installer must examine the areas and conditions under which deck units are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Install deck units and accessories in accordance with SDI specifications, with manufacturer's recommendations, and as specified herein. Fasten deck units to supports promptly after placement and alignment. Do not leave placed sheets unattached at end of working day.

1. Shop Drawings: Comply with final shop drawings.

2. Steel bearing: Provide at least the minimum bearing of 1-1/2 inches at steel supports;

align and level deck units.

3. Placement: Place deck units flat and square, without excessive warp or deflection.

   a. Do not stretch or contract side lap interlocks.

4. End laps: Lap ends of deck units over supports and make laps not less than 2 inches.

5. Precautions: Coordinate location of decking bundles to prevent overloading of structure. Beams are designed to take only minimal loading prior to welding of deck to beams.

6. Provide shoring and/or bracing as required for support of wet concrete during construction.

B. Fastening Deck Units

1. Permanently fasten deck units to all steel supporting members (both perpendicular and parallel to deck spans) by not less than 3/4" diameter fusion welds or elongated welds of equal strength, spaced at not more than 12" o.c. with a minimum of 2 welds per unit at each support.

   a. Use welding washers for form decking, and where recommended by deck manufacturer.
   b. Substitution of mechanical fasteners for fusion welds must be formally submitted. Fastner manufacturer must submit calculations proving diaphragm shear and wind uplit capacity of proposed mechanical fastener is equal to or greater than specified fusion welds.

2. Tack weld at 2'-0" o.c. for fastening end closures and side closures, typical unless otherwise indicated.

3. Comply with AWS requirements and procedures for manual shielded metal-arc welding, the appearance and quality of welds, and the methods used in correcting welding work.

4. Fasten side laps of adjacent deck units between supports, at intervals not exceeding 36" o.c., by welding, or mechanical fasteners.

D. Cutting and Fitting: Cut and neatly fit deck units and accessories around other work projecting through or adjacent to the decking.

E. Reinforcement at Openings: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking, and support of other work required by the contract documents.

F. Metal Closures: Provide galvanized metal closures for open ends of fluted sections at openings, columns, walls, changes in direction, and other building construction, and to close openings between decking and other construction. Tack weld into position to provide a complete decking installation.

G. Touch-Up Painting:

1. After decking installation, wire brush, clean and paint scarred areas, welds and rust spots on the top and bottom surfaces of decking units and supporting steel members.

   a. Touch-up galvanized surfaces with galvanizing repair paint applied in accordance with the manufacturer's instructions.

3.03 INSPECTION

A. Quality Control Testing During Construction: The Owner will engage an independent testing and inspection agency to inspect deck installation and field welds. If inspections indicate that work does not comply with requirements, repair defective work, or remove and replace at no additional

expense to the Owner.

3.04 CLEANING

A. Upon completion of work, remove all rubbish, debris, and excess materials from project site.

+ + END OF SECTION + +

SECTION 05313 - STEEL ROOF DECKING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the fabrication and erection of steel roof decking as indicated on the contract documents including basic layout and type of units required. All accessories to be provided as specified herein.

1.02 QUALITY ASSURANCE

A. Codes and Standards

1. Comply with the provisions of the following codes and standards, except as otherwise shown or specified.

a. AISI "Specification for the Design of Cold- Formed Steel Structural Members."
b. AWS "Structural Welding Code."
c. "Design Manual for Composite Decks, Form Decks, and Roof Decks", by the Steel Deck Institute.

B. Qualification of Welding Work

1. Qualify welding processes and welding operators in accordance with the AWS "Standard Qualification Procedure."

2. Welded decking in place is subject to inspection and testing. Expense of removing and replacing any portion of composite decking for testing purposes will be borne by the Owner if welds are found to be satisfactory. Remove work found to be defective and replace with new acceptable work.

C. Manufacturers Qualifications: Steel Deck manufacturer shall have not less than three (3) year experience in fabrication of Steel Deck.

D. Erector's Qualifications: Erector shall have not less than five (5) years experience in installation of steel decking.

1.03 PERFORMANCE REQUIREMENTS

A. Provide roof decking in accordance with SDI Manual, with depth and gage as noted on the drawings.

B. Underwriters' Label: Provide deck units listed in Underwriters' Laboratories "Fire Resistance Index", with each deck unit bearing the UL labels and marking.

C. FM Listing: Provide roof deck units listed in Factory Mutual's "Approval Guide" for Class I Fire-Rated and I-90 windstorm construction.

1.04 SUBMITTALS

A. For information only, submit manufacturer's specifications and installation instructions for each product specified. Include manufacturer's certification as may be required to show compliance with these specifications. Indicate by transmittal form that a copy of each instruction has been distributed to the Installer.

B. Submit detailed drawings showing layout and types of deck units, shear connectors, anchorage details, edge of roof details, and conditions requiring closure panels, cut openings, special jointing or other accessories.

C. Submit evidence that welders employed in the work are currently certified under AWS qualification

procedures.

1.05 STORAGE AND HANDLING

A. Storage: Separate sheets and store units on dry wood sleepers, sloped to promote drainage. Cover with waterproof material ventilated to avoid condensation.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Type N Wide Rib Roofdeck by Vulcraft, or Wide Rib Roof Deck by CANAM. Depth and gage as noted on the drawings.

B. Steel for Composite Roof Decking, Galvanized Finish: ASTM A 446, Grade A with minimum yield strength of 33 ksi.

C. Galvanizing: ASTM A 525, G60.

D. Sheet Metal Accessories: ASTM A 526, commercial quality, galvanized.

E. Galvanizing Repair Paint: High zinc-dust content paint for repair of damaged galvanized surfaces complying with Military Specifications MIL-P-21035.

2.02 FABRICATION

A. Fabricate deck units of galvanized steel, in lengths to span 4 or more supports with flush ends and nesting side laps.

B. Cant Strips: Fabricate of same material and gage as deck units, with flange for attachment, and with slope, width, and height as indicated on drawings.

C. Roof Sump Pans: Fabricate of not less than 0.071-inch-thick galvanized steel, with flat bottom and sloped sides, recessed 1-1/2 inches below deck surface, with bearing flange not less than 3 inches wide, and with all joints sealed watertight.

D. Weld Washers: Uncoated mild steel, sized as recommended by manufacturer of steel deck units.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Installer must examine the areas and conditions under which deck units are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Install deck units and accessories in accordance with SDI specifications, with manufacturer's recommendations, and as specified herein. Fasten deck units to supports promptly after placement and alignment. Do not leave placed sheets unattached at end of working day.

1. Shop Drawings: Comply with final shop drawings.

2. Steel bearing: Provide at least the minimum bearing of 1-1/2-inches at steel supports; align and level deck units.

3. Placement: Place deck units flat and square, without excessive warp or deflection.

a. Do not stretch or contract side lap interlocks.

4. End laps: Lap ends of deck units over supports and make laps not less than 2 inches.

5. Uplift anchorage: Install and attach roof deck units to resist uplift loading per all applicable Building Code requirements.

6. Precautions: Coordinate location of decking bundles to prevent overloading of structure. Beams are designed to take only minimal loading prior to welding of deck to beams.

B. Fastening Deck Units

1. Permanently fasten deck units to all steel supporting members (both perpendicular and parallel to deck spans) by not less than 3/4" diameter fusion welds or elongated welds of equal strength, with 36/7 pattern. At all roof perimeter zones fasten roof deck with welds spaced at not more than 6-inches o.c.

   a. Use welding washers for form decking, and where recommended by deck manufacturer.
   b. Space fastening welds closer together where required for uplift force resistance, and where indicated on drawings.
   c. Requests for substitution of mechanical fastening must be formally submitted to the engineer for approval, and must be accompanied by manufacturer testing data indicating load capacity of proposed fasteners equal to or greater than the diaphragm shear and uplift valves provided by the specified welds.

2. Tack weld at 2'-0" o.c. for fastening end closures and side closures, typical unless otherwise indicated.

3. Comply with AWS requirements and procedures for manual shielded metal-arc welding, the appearance and quality of welds, and the methods used in correcting welding work.

4. Fasten side laps of adjacent deck units between supports, at intervals not exceeding 36" o.c., by welding.

C. Openings:

1. Cut and neatly fit deck units and accessories around other work adjacent to or projecting through the decking.

2. Provide additional metal reinforcement and closure pieces as shown or as required for strength, continuity of decking, and support of other work required by the contract documents.

D. Metal Accessories: Fasten metal accessories securely to deck units, using welding or mechanical fasteners as appropriate to conditions.

1. Install metal cant strips at roof edges and as otherwise detailed.

2. Install metal sump pans at openings provided in metal decking and fasten or weld to top deck surface, spacing fasteners or welds at not more than 12 inches on center and with at least one fastener or weld in each corner. Cut opening to accommodate drain size indicated.

3. Install other metal accessories as indicated.

E. Touch-Up Painting:

1. After decking installation, wire brush, clean and paint scarred areas, welds and rust spots on the top and bottom surfaces of decking units and supporting steel members.

   a. Touch-up galvanized surfaces with galvanizing repair paint applied in accordance with the manufacturer's instructions.

3.03 INSPECTION

A. Quality Control Testing During Construction: The Owner will engage an independent testing and inspection agency to inspect field welds. If inspections indicate that work does not comply with requirements, repair defective work, or remove and replace at no additional expense to the Owner.

3.04 CLEANING

A. Upon completion of work, remove all rubbish, debris, and excess materials from project site.

+ + END OF SECTION + +

SECTION 05400 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Exterior non-load-bearing wall framing.

2. Interior non-load-bearing wall framing where cold formed framing is indicated on drawings.

3. Other locations where cold formed framing is indicated on drawings.

1.02 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads in accordance with applicable code and ASCE 7 within limits and under conditions indicated.

1. Exterior Design Loads: Calculate for each specific condition using the structural design criteria on Structural Drawing S001.

2. Interior Design Loads: Calculate for each specific condition using the structural design criteria on Structural Drawing S001.

3. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:

a. Exterior Non-Load-Bearing Framing:

1) Supporting Metal Panels: Horizontal deflection of 1/600 of the wall height.

b. Interior Non-Load-Bearing Framing:

1) Supporting walls where indicated: Horizontal deflection of 1/360 of wall height.

4. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.

5. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

a. Upward and downward movement of one inch.

B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."

1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."

2. Design exterior non-load-bearing and interior non-load-bearing wall framing to

accommodate horizontal deflection without regard for contribution of sheathing materials.

1.03 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Shop Drawings-(All applications): Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding certificates.

D. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:

1. Steel sheet.

2. Expansion anchors.

3. Power-actuated anchors.

4. Mechanical fasteners.

5. Vertical deflection clips.

6. Horizontal drift deflection clips.

7. Miscellaneous structural clips and accessories.

1.04 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

C. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and metallic-coating thickness.

D. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

E. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

F. AISI Specifications and Standards: Comply with AISI's "North American Specification for the

Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Current producer member of Steel Stud Manufacturer's Association.

2.02 MATERIALS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: ST50H.

2. Coating: G90 or equivalent.

C. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: 50, Class 1 or 2.

2. Coating: G90.

2.03 NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0538 inch.

2. Flange Width: 1-5/8 inches, minimum.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: Matching steel studs.

2. Flange Width: 1-1/4 inches.

C. Vertical Deflection Clips: Manufacturer's standard bypass clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. The Steel Network, Inc.; Stiff Clip.
b. Dietrich Metal Framing; a Worthington Industries Company.
c. MarinoWare, a division of Ware Industries.
d. SCAFCO Corporation.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:

1. Minimum Base-Metal Thickness: Matching stud framing.

2. Flange Width: 1 inch plus twice the design gap for other applications.

E. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure.

F. Ceiling Joists: Manufacturer's standard C-shaped steel studs, of web depths indicated, unpunched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0538 inch.

2. Flange Width: 1-5/8 inches, minimum.

2.04 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.

2. Bracing, bridging, and solid blocking.

3. Web stiffeners.

4. Anchor clips.

5. End clips.

6. Gusset plates.

7. Stud kickers, knee braces, and girts.

8. Hole reinforcing plates.

9. Backer plates.

10. Kneewall Framing/Moment Resisting Connection Clips: Sheet steel, minimum 0.0713 inch thick, multi-purpose rigid connection fabrication.

    a. The Steel Network; StiffClip CL series connector with H plate reinforcing or alternate stiffclip model as required to comply with moment resisting requirements of structural analysis.

2.05 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

    1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.06 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780.

B. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

2.07 FABRICATION

A. Contractor's Option: Shop or field fabricate wall framing.

B. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

    1. Fabricate framing assemblies using jigs or templates.

    2. Cut framing members by sawing or shearing; do not torch cut.

    3. Fasten cold-formed metal framing members by welding or screw fastening as standard with fabricator.

        a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
        b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

C. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

D. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

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

3.02 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.03 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.

2. Fasten cold-formed metal framing members by welding or screw fastening.

a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

I. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.04 NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Do not fasten studs to deflection tracks. Space studs as follows:

1. Stud Spacing: 16 inches, maximum.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single-leg deflection tracks and anchor to building structure.

2. Connect vertical deflection clips to bypassing studs and anchor to building structure.

3. Connect drift clips to cold formed metal framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track.

2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.

3. Bridging: Proprietary bridging bars installed according to manufacturer's written

instructions.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.05 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.06 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

+ + END OF SECTION + +

SECTION 05500 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following metal fabrications:

1. Steel ladders.
2. Loose bearing and leveling plates.
3. Suspended storage frame and grid deck.
3. Miscellaneous framing and supports for the following:

a. Applications where framing and supports are not specified in other sections.

4. Miscellaneous metal trim, including the following:

a. Facia and trim.
b. Fencing and Gates
c. Plate signs.
d. Stair riser plate
e. Aluminum wall base
f. Perforated panels for walls and ceilings
g. Handrails
h. Guardrail Support

5. Floor plate and supports.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 5 Section "Structural Steel" for structural steel framing system components.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for manufactured metal items, paint products, and grout.

C. Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.

D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include a list of completed projects with project name, addresses, names of architects and owners, and other information specified.

F. LEED Submittals:

1. Credit MR C4: For products having recycled content, including postconsumer and pre-consumer recycled content. Provide the following information:
a. Product Data
b. Percent Content (post and pre-consumer)

c. Invoices indicating cost of material (no labor included.)

2. Credit IEQ 4.2: For paints and coatings, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
   a. Product Data
   b. Laboratory Test Reports

3. Credit IEQ 4.1: For adhesives and sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
   a. Product Data
   b. Laboratory Test Reports

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this Project with a record of successful in-service performance, and with sufficient production capacity to produce required units without delaying the Work.

B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel," AWS D1.2 "Structural Welding Code--Aluminum," and AWS D1.3 "Structural Welding Code--Sheet Steel."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

C. Mockups:
1. Before installing Guardrails construct mockups required to verify detail attachments made under Shop Drawing submittals and to demonstrate aesthetic effects and qualities of materials and execution. Coordinate this mock-up with installer of infill guard rail panels. Build mockups to comply with the following requirements, using materials indicated for completed Work.

   a. Locate mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
   b. Notify Architect 7 days in advance of the dates and times when mockups will be constructed.
   c. Demonstrate the proposed range of aesthetic effects and workmanship.
   d. Obtain Architect's approval of mockups before proceeding with final unit of Work.
   e. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
      1) Approved mockups in an undisturbed condition at time of Substantial Completion may become part of the completed work.

1.5 PROJECT CONDITIONS

A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating products without field measurements. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

PART 2 - PRODUCTS

2.1 METALS

A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

B. Aluminum: Alloy and temper recommended by aluminum producer and finisher for use and finish indicated, and with not less than the strength and durability of alloy and temper designated below:

1. Extruded Bars and Shapes: ASTM B 221, alloy 6063-T6.
2. Plate and Sheet: ASTM B 209, alloy 6061-T6.

C. Stainless Steel:

1. Stainless Steel Tube, Plate, Shapes, and Bars Type 304.
2. Stainless Steel Sheet Type 304.

D. Steel Plates, Shapes, and Bars: ASTM A 36.

E. Galvalume coated steel sheet.

F. Steel Tubing: Product type (manufacturing method) and as follows:

1. Cold-Formed Steel Tubing: ASTM A 500.

G. Steel Pipe: ASTM A 53, standard weight (schedule 40), unless otherwise indicated, or another weight required by structural loads.

1. Black finish, unless otherwise indicated.
2. Galvanized finish for exterior installations and where indicated.

H. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 malleable iron or ASTM A 27 cast steel. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153.

I. Welding Rods and Bare Electrodes: Select according to AWS specifications for the metal alloy to be welded.

2.2 PAINT

A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements of FS TT-P-664, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.

2.3 FASTENERS

A. General: Provide plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating, for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A, with hex nuts, ASTM A 563, and, where indicated, flat washers.

C. Machine Screws: ANSI B18.6.3.

D. Lag Bolts: ANSI B18.2.1.

E. Wood Screws: Flat head, carbon steel, ANSI B18.6.1.

F. Plain Washers: Round, carbon steel, ANSI B18.22.1.

G. Lock Washers: Helical, spring type, carbon steel, ANSI B18.21.1.

H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Material: Carbon steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Group 1 alloy 304 or 316 stainless-steel bolts and nuts complying with ASTM F 593 and ASTM F 594.

. Double sided tape: 3M structural glazing tape in width 1” less than material or substrate dimension.

2.4 FABRICATION, GENERAL

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

C. Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.

1. Temperature Change (Range): 100 deg F.

D. Shear and punch metals cleanly and accurately. Remove burrs.

E. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

F. Remove sharp or rough areas on exposed traffic surfaces.

G. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.

H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

K. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

L. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.5 STEEL LADDERS

A. General: Fabricate ladders for the locations shown, with dimensions, spacings, details, and anchorages as indicated. Comply with requirements of ANSI A14.3.

B. Siderails: Continuous, steel, 1/2-by-2-1/2-inch flat bars, with eased edges, spaced 18 inches apart.

C. Bar Rungs: 3/4-inch-diameter smooth steel bars, spaced 12 inches o.c.

D. Fit rungs in centerline of side rails, plug weld and grind smooth on outer rail faces.

E. Support each ladder at top and bottom and at intermediate points spaced not more than 60 inches o.c. with welded or bolted steel brackets.

1. Size brackets to support design dead and live loads indicated and to hold centerline of ladder rungs clear of the wall surface by not less than 7 inches.
2. Extend side rails to within 2 inches of underside of roof hatch.

2.6 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of the required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

2.7 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports for applications indicated that are not a part of structural steel framework as required to complete the Work.

B. Fabricate units to sizes, shapes, and profiles indicated and required to receive other adjacent construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.

a. Except as otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4 inch thick by 8 inches long.

2.8 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and bars of profiles shown with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices wherever possible.

B. Provide cutouts, fittings, and anchorages as required to coordinate assembly and installation with other work. Provide anchors, welded to trim, for embedding in concrete or masonry construction, spaced not more than 6 inches from each end, 6 inches from corners, and 24 inches o.c., unless otherwise indicated.

C. Galvanize miscellaneous steel trim in the following locations:

1. Exterior locations where indicated.
2. Interior locations where indicated.

2.9 FLOOR PLATE

A. Fabricate floor plates from rolled-steel floor plate of thickness and in pattern indicated below:

1. Thickness: 1/4 inch.
2. Flat plate smooth finish - waxed.

2.10 STAINLESS STEEL HAND RAILS

A. Provide stainless steel handrails of dimension indicated.

B. Weld all seams and joints and, blend smooth and surface finish to match rail finish.

2.11 FINISHES, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designing finishes.

B. Finish metal fabrications after assembly.

2.12 STEEL AND IRON FINISHES

A. Galvanizing: For those items indicated for galvanizing, apply zinc coating by the hot-dip process complying with the following requirements:

1. ASTM A 153 for galvanizing iron and steel hardware.
2. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch thick or thicker.

B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B): SSPC-SP 6 "Commercial Blast Cleaning."
2. Interiors (SSPC Zone 1A): SSPC-SP 3 "Power Tool Cleaning."

C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA 1 "Paint Application Specification No. 1" for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.13 ALUMINUM FINISHES

A. Aluminum Finishes: Designations are as established by the Aluminum Association.

1. Brushed No. 4 finish

2.14 STAINLESS STEEL FINISHES

A. Stainless-Steel Finishes:

1. Satin, Directional Polish: No. 6 finish.

2.15 ALUMINUM AND STAINLESS STEEL FABRICATION

A. Provide necessary rebates, lugs, and brackets to assemble units and to attach to other work.

B. Clean and dress exposed welded and brazed joints.

C. Mill joints to a tight, hairline fit; cope or miter corners. Form joints exposed to weather to exclude water.

D. Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

2.16 SUSPENDED FRAMING WITH FIBERGLASS GRID DECK

A. Suspended framing system based on Unistut P-1000 channel frame and support. Provide substitution submittal per Division 1 for alternate framing system.

1. Channel frame: Unistrut P-1000, 1-5/8" x 1-5/8" x 12 ga., solid channel (no slots or holes.)
2. Spring nuts and non-spring nuts as required.
3. Fitting clips and supports
   a. Flat fittings
   b. Angular Fittings
   c. "Z" Shape fittings
   d. "U" Shape fittings
   e. Custom brake shape fittings per drawings
   f. End Caps
4. General hardware
   a. Hex head screws
   b. Countersunk screws
   c. Pan head screws
   d. Flat Washers
   e. Lock washers
   f. Threaded rod
   g. Rod coupler nuts
5. Material Finish: all framing material and fittings shall be Pre-galvanized (PG), and all hardware shall be electro-galvanized (EG)

B. Deck for suspended storage area is based on McNichols Quality Molded Grating. Provide substitution submittal per Division 1 for alternate deck material.

1. Grating Material: Square mesh molded fiber glass, MSGFR, weight 3.8 lbs./ Square Foot, color dark gray, 1-1/2" square grid, 1-1/2" thickness, smooth surface, 70% open area, Flame spread rating – Class 1 per ASTM E84, UV resistant.
2. Flat panel overlay: Polycarbonate clear panel, size and thickness as indicated in drawings. Loose laid, no attachment required.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

B. Set sleeves in concrete with tops flush with finish surface elevations. Protect sleeves from water and concrete entry.

3.2 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.

E. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.3 SETTING LOOSE PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

B. Set loose leveling and bearing plates on wedges or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.

1. Use nonshrink, metallic grout in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of the shop paint on miscellaneous metal is specified in Division 9 Section "Painting."

B. For galvanized surfaces, clean welds, bolted connections, and abraded areas, and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION 05500

SECTION 05510 - METAL STAIRS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: This Section specifies prefabricated metal stairs and railings.

B. Related Requirements:

1. Section 03300 - Cast-in-Place Concrete.
2. Section 05500 – Miscellaneous Metal Fabrications

1.02 REFERENCES

A. Reference Standards:

1. ASTM International (ASTM):
   a. ASTM A36 Standard Specification for Carbon Structural Steel.
   b. ASTM A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   c. ASTM A500 Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
   d. ASTM A513 Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing.
   e. ASTM A786 Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.
   f. ASTM A1008 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.
   g. ASTM A1011 Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
2. American Welding Society (AWS):
   a. AWS D1.1 Structural Welding Code - Steel.
   b. AWS D1.3 Structural Welding Code - Sheet Steel.
3. American National Standards Institute (ANSI):
   a. ANSI A117.1 Accessible and Usable Buildings and Facilities Standards.
4. New York City Building Code Reference Standard:
   a. RS 6-1 Photoluminescent Exit Path Markings.
   b. RS 6-1A Additional Standards as Required by Reference Standard RS 6-1 for Photoluminescent Exit Path Markings.
5. The Society for Protective Coatings (SSPC):
   a. SSPC-SP3 Power Tool Cleaning.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate work of this Section with work of other trades for proper time and sequence to avoid construction delays.

B. Sequencing: Sequence work of this section in accordance with manufacturer’s written recommendations for sequencing construction operations].

1.04 ACTION SUBMITTALS

A. General: Submit listed submittals in accordance with Contract Conditions.

B. Product Data: Submit specified products as follows:

1. Manufacturer’s product data.
2. Manufacturer’s installation instructions.

C. Shop Drawings: Indicate information on shop drawings as follows:
   1. Stair plans, elevations, details, methods of installation and anchoring.
      a. Show members, sizes and thickness, anchorage locations and accessory items.
      b. Furnish setting diagrams for anchorage installation as required.
      c. Include calculations stamped by a structural engineer registered in the jurisdiction in which the project is located.

D. Samples: Submit as follows:
   1. Two samples, minimum size 6 inches (152 mm) square, representing actual product, finish and patterns for each finished tread product specified.

1.05 INFORMATION SUBMITTALS

A. General: Submit listed submittals in accordance with Contract Conditions and Division 1.

B. Manufacturer's Instructions: Submit manufacturer's storage and installation instructions.

C. Source Quality Control: Submit documentation verifying that components and materials specified in this Section are from single manufacturer.

D. Qualification Statements:
   1. Submit letter of verification for Manufacturer's Qualifications.
   2. Submit letter of verification for Installer's Qualifications.

E. LEED Submittals:

   1. Credit MR C4: For products having recycled content, including postconsumer and pre-consumer recycled content. Provide the following information:
      a. Product Data
      b. Percent Content (post and pre-consumer)
      c. Invoices indicating cost of material (no labor included.)

   2. Credit MR C5: For products and materials that comply with requirements for regional materials based on location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Provide the following information:
      a. Product Data
      b. Fraction by weight of regional material
      c. Invoices indicating cost of material (no labor included.)
      d. Distance from Project

1.06 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer:
      a. 10 years experience manufacturing components similar to or exceeding requirements of project.
      b. Having sufficient capacity to produce and deliver required materials without causing delay in work.
   2. Installer: Acceptable to manufacturer.

1.07 DELIVERY, STORAGE & HANDLING

A. Delivery and Acceptance Requirements:
   1. Deliver material in accordance with manufacturers written instructions.
   2. Deliver materials in manufacturers original packaging with identification labels intact and in sizes to suit project.

B. Storage and Handling Requirements:
   1. Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.

C. Packaging Waste Management:
   1. Separate waste materials for reuse and recycling
   2. Remove packaging materials from site and dispose of at appropriate recycling facilities.
   3. Fold metal and plastic banding; flatten and place in designated area for recycling.
   4. Remove:
      a. Pallets from site and return to supplier or manufacturer.

PART 2 PRODUCTS

2.01 METAL STAIRS

A. Manufacturer:
   1. Single Source Responsibility: Provide components and materials specified in this section from a single manufacturer.
      a. American Stair
      b. Pacific Stair
      c. Worthington Industries

B. Description:
   1. Regulatory Requirements:
      a. In accordance with all applicable local and national building codes.
   2. Compatibility:
      a. Ensure components and materials are compatible with specified accessories and adjacent materials.

C. Design Criteria:
   1. Structural Performance of Stairs: Stairs shall withstand the following structural loads without exceeding the allowable design working stress of materials, including anchors and connections. Apply each load to produce the maximum stress in each component:
      a. Treads and Platforms of Metal Stairs: Capable of withstanding a uniform load of 100 psf (4.8 kN/m^2) and concentrated load of 300 lbf (1.33 kN) applied on an area of 4 square inches (2581 square mm). Concentrated and uniform loads need not be assumed to act concurrently.
      b. Stair Framing: Capable of withstanding stresses resulting from loads specified, in addition to stresses resulting from railing system loads.
      c. Limit Deflection of Treads, Platforms and Framing Members: To L/240.
   2. Structural Performance of Handrails and Railings: Handrails and railings shall withstand the following structural loads without exceeding the allowable design working stress of materials, including handrails, railings, anchors and connections.
      a. Top Rail of Guardrail: Capable of withstanding a concentrated load of 200 lbf (0.89 kN) applied in any direction and a uniform load of 50 psf (2.39 kN/m^2) applied in any direction. Concentrated and uniform loads need not be assumed to act concurrently.

D. Standard Stair and Rail System:
   1. Manufacturer's pre-engineered straight run stair and landing system, consisting of hot rolled steel sheet stringers, risers, treads, landings, fasteners/supports and railings, and handrail.
      a. Stringers:
         1) Steel plate with side mounted prefabricated railings.
         2) Minimum thickness or gage as determined by structural design calculations, structural grade steel plate or channel.
   2. Risers: Closed riser, minimum 14 gage (1.9 mm) hot rolled mild steel sheet, sloped maximum 1 1/2 inches (38.1 mm) and conforming to Americans with Disabilities Act (ADA) nosing requirements.
   3. Treads: Manufacturer's standard concrete pan system, field poured. Tread pans to be minimum of

14 gage (1.9 mm), or as determined by design calculations. Pan depth 1 1/2 inches (38.1 mm). Exposed welds from the bottom side of flight assemblies will not be allowed. All welds to be from topside of tread pans as recommended by manufacturer.

4. Mid Landings: Minimum of 12 gage (2.7 mm) hot-rolled mild steel sheets, formed for a minimum 2 1/2 inches (64 mm) concrete fill, with 11 gage channel supports and bracing welded to perimeter frame at 12 inches (305 mm) on center.
5. Fasteners and Supports: Sized by the manufacturer to meet structural design criteria. If hanger rod connections are applicable to any of the landing connections, they shall be a minimum of 5/8 inch (15.9 mm) diameter steel rod, with actual size based on stair load.
6. Manufacturer's standard welded steel tube railing system complying with the following requirements:
    a. Rails: 1 1/2 inches (38.1 mm) diameter × 13 gage (2.3 mm) minimum round steel tube, continuous multi-strand type, equally spaced with not more than 3 15/16 inches (100 mm) clearance between strands and with a minimum extension per code at top and bottom risers. Wrap rail continuously past space between flights to form guardrail as required by building code. Terminate rail ends with radiused returns, newel posts or safety terminations approved by local code. Provide not less than 1 1/2 inches (38.1 mm) clearing between rail and wall.
    b. Rail Posts: 1 1/2 inches (38.1 mm) square × 11 gage (3 mm) tubing. Rail posts to fasten to side of plate stringers per manufacturer's shop drawings. Manufacturer to pre-weld erection aid to rail post for proper height to aid stair erector. Erection aid (setting block) to be removed and weld-ground smooth after installation.
    c. Fabrication:
        1) Use preformed or prefabricated bends.
        2) Butt weld tee and cross intersections in tubing. Cope and weld intersections in pipe. Miter elbows.
        3) Mechanically fasten internal sleeves and fittings.
        4) Provide minimum 12 gage (2.7 mm) welded steel plate closures or hemispherical closure fittings on all exposed rail ends.

E. Custom Stair and Rail System:
1. Support System: Provide landing support with manufacturer's standard system. Comply with details indicated on Drawings.
    a. Shelf angle landing supports.
2. Rail System: Provide guardrail system. Comply with details indicated on Drawings.
    a. Standard 42 inch (1067 mm) height guard rail system with 42 inch (1067 mm) guardrails at landings and openings.
        1) Rail Type: 7-Line sweep guard rail. Stainless Steel grab rail – See Section 05500 Miscellaneous Metal Fabrications.
3. Tread Construction: Comply with details indicated on Drawings.
    a. Treads: Manufacturer's standard concrete pan system, field poured. Tread pans to be minimum of 14 gage (1.9 mm), or as determined by design calculations. Pan depth 1 1/2 inches (38.1 mm). Exposed welds from the bottom side of flight assemblies will not be allowed. All welds to be from topside of tread pans as recommended by manufacturer.
4. Rised Construction: Comply with details indicated on Drawings.
    a. Risers: Closed riser, minimum 14 gage (1.9 mm)perforated hot rolled mild steel sheet, sloped maximum 1 1/2 inches (38.1 mm) and conforming to Americans with Disabilities Act (ADA) nosing requirements.

F. Materials:
1. Steel Shapes and Plates: To ASTM A36.
2. Steel Pipe: To ASTM A53 Type E or S, Grade B.
3. Steel Tubing:

a. Structural Use: To ASTM A500, Grade B or C.

b. Non-Structural Use: To ASTM A513, hot rolled or cold rolled (mill option).

4. Steel Sheet:

a. Structural Use: To ASTM A1011 (hot rolled).

b. Non-Structural Use: To ASTM A786, ASTM A1008.

5. Fasteners: As recommended by manufacturer.

6. Welding Rods: In accordance with AWS code and AWS filler metal specifications for material being welded.

7. Primer: HAPS-free, solvent-based, rust inhibitive primer containing less than 3.5 lb/gal (1.6 kg/L) Volatile Organic Compounds (VOC) and compatible with conventional alkyds topcoats.

G. Fabrication:

1. Use same material and finish as parts being joined. Use stainless steel between dissimilar metals and non-corrosive fasteners at exterior connections or joints.

2. Provide fasteners of sufficient strength to support connected members and loads, and to develop full strength of parts fastened or connected.

3. Construct stairs and rails with all components necessary for support and anchorage, and for a complete installation.

H. Finishes

1. Rails and Stair Components: Completely remove oil, grease, dirt, mill scale, rust, corrosion products, oxides, paint or other foreign matter from steel surface in accordance with SSPC SP3.

2. Shop primer immediately after fabrication and cleaning, spray apply primer to dry film thickness recommended by primer manufacturer, but not less than 2.0 mil thickness. Apply one coat High Solids Red Oxide Anticorrosive primer meeting SSPC-15 Paint.

2.02 ACCESSORIES

A. Anchor bolts, clip angles, hanger rods, hardware and incidental materials required for complete installation, as recommended by the manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that conditions of substrates previously installed under other sections or contracts are acceptable for product installation in accordance with manufacturer's instructions prior to metal stair and railing installation.

1. Inform Owner and Architect of unacceptable conditions immediately upon discovery.

3.02 PREPARATION

A. Ensure structure or substrate is adequate to support metal stairs and railings.

3.03 INSTALLATION

A. Coordinate installation of metal stairs and railings.

B. Coordinate metal stairs and railings work with work of other trades for proper time and sequence to avoid construction delays.

C. Install stairs, landings and handrails in accordance with manufacturer's instructions. Install square, plumb, straight and true to line and level, with neatly fitted joints and intersections.

1. Do not cut or alter structural components without written authorization.

2. Field welding and joining shall conform to AWS D1.1 and AWS D1.3.

3. Grind all exposed welds smooth and touch-up shop-primed areas with same primer as used by Manufacturer

3.04 ADJUSTING

A. Adjust components and systems for correct function and operation in accordance with manufacturer's written instructions.

3.05 CLEANING

A. Perform cleanup in accordance with Division 1 and General Conditions requirements.

B. Upon completion, remove surplus materials, rubbish, tools and equipment.

C. Waste Management:

1. Coordinate recycling of waste materials.

2. Collect recyclable waste and dispose of or recycle field generated construction waste created during demolition, construction or final cleaning.

END OF SECTION 05400

SECTION 06100 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Framing with dimension lumber.
2. Wood furring, grounds, nailers, and blocking.
3. Sheathing.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 6 Section "Finish Carpentry" for nonstructural carpentry items exposed to view and not specified in another Section.

1.3 DEFINITIONS

A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise specified.

B. Exposed Framing: Dimension lumber not concealed by other construction and indicated to receive a stained or natural finish.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for the following products:

1. Metal framing anchors.
2. Construction adhesives.

C. 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's (ALSC) Board of Review.

D. Wood treatment data as follows, including chemical treatment manufacturer's instructions for handling, storing, installing, and finishing treated materials:

1. For each type of preservative-treated wood product, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
2. For waterborne-treated products, include statement that moisture content of treated materials was reduced to levels indicated before shipment to Project site.
3. For fire-retardant-treated wood products, include certification by treating plant that treated materials comply with specified standard and other requirements as well as data relative to bending strength, stiffness, and fastener-holding capacities of treated materials.

E. Material test reports from a qualified independent testing agency indicating and interpreting test results relative to compliance of fire-retardant-treated wood products with requirements indicated.

F. Warranty of chemical treatment manufacturer for each type of treatment.

G. LEED Submittals:
1. Credit MR C4: For products having recycled content, including postconsumer and pre-consumer recycled content. Provide the following information:
a. Product Data
b. Percent Content (post and pre-consumer)
c. Invoices indicating cost of material (no labor included.)

2. Credit MR C6: For products and material that is certified as rapidly renewable material. Provide the following information:
a. Product Data
b. Quantity of material
c. Invoices indicating cost of material (no labor included.)

3. Credit MR C7: For wood products that are certified in accordance with FSC principles and criteria including chain-of-custody certificates.
a. Product Data
b. Quantity of FSC certified material
c. Quantity of non-FSC certified material
d. Line item cost of all wood material
e. Chain-of-custody certificates for all FSC certified material

4. Credit IEQ 4.1: For adhesives and sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
a. Product Data
b. Laboratory Test Reports

5. Credit IEQ 4.4: For all composite wood and agrifiber products installed in the building interior, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
a. Product Data
b. Laboratory Test Reports

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: To qualify for approval, an independent testing agency must demonstrate to Architect's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E 699, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.

B. Single-Source Responsibility for Fire-Retardant-Treated Wood: Obtain each type of fire-retardant-treated wood product from one source and by a single producer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Keep materials under cover and dry. Protect from weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.

1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Fire-Retardant-Treated Materials, Interior Type A:

    a. Baxter: J. H. Baxter Co.
    b. Chemical Specialties, Inc.
    c. Continental Wood Preservers, Inc.
    d. Hickson Corp.
    e. Hoover Treated Wood Products, Inc.

2. Metal Framing Anchors:

    a. Cleveland Steel Specialty Co.
    b. Harlen Metal Products, Inc.
    c. Silver Metal Products, Inc.
    d. Simpson Strong-Tie Company, Inc.
    e. Southeastern Metals Manufacturing Co., Inc.

2.2 LUMBER, GENERAL

A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by ALSC's Board of Review. Min. 50% of all wood material specified in this section to be harvested from a certified forest. Provide vendor's or manufactures Forest Stewardship Council Chain of Custody Certificate Number.

B. Inspection Agencies: Inspection agencies, and the abbreviations used to reference them, include the following:

1. NELMA - Northeastern Lumber Manufacturers Association.
2. NLGA - National Lumber Grades Authority (Canadian).
3. RIS - Redwood Inspection Service.
4. SPIB - Southern Pine Inspection Bureau.
5. WCLIB - West Coast Lumber Inspection Bureau.
6. WWPA - Western Wood Products Association.

C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.

1. For exposed lumber, furnish pieces with grade stamps applied to ends or back of each piece, or omit grade stamps and provide grade-compliance certificates issued by inspection agency.

D. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.

1. Provide dressed lumber, S4S, unless otherwise indicated.
2. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.
3. Provide lumber with 15 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

A. General: 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). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.

1. Do not use chemicals containing chromium or arsenic.
2. For exposed items indicated to receive stained finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.

B. Pressure treat aboveground items with waterborne preservatives to a minimum retention of 0.25 lb/cu. ft. After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 and 15 percent, respectively. 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 members less than 18 inches above grade.
4. Wood floor plates installed over concrete slabs directly in contact with earth.

C. Pressure treat wood members in contact with ground or freshwater with waterborne preservatives to a minimum retention of 0.40 lb/cu. Ft.

D. Complete fabrication of treated items before treatment, where possible. If cut after treatment, apply field treatment complying with AWPA M4 to cut surfaces. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

2.4 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated wood is indicated, comply with applicable requirements of AWPA C20 (lumber) and AWPA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL; U.S. Testing; Timber Products Inspection, Inc.; or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Research or Evaluation Reports: Provide fire-retardant-treated wood acceptable to authorities having jurisdiction and for which a current model code research or evaluation report exists that evidences compliance of fire-retardant-treated wood for application indicated.
2. For exposed items indicated to receive stained finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.

B. Interior Type A: For interior locations, use chemical formulation that produces treated lumber and plywood with the following properties under conditions present after installation:

1. Bending strength, stiffness, and fastener-holding capacities are not reduced below values published by manufacturer of chemical formulation under elevated temperature and humidity conditions simulating installed conditions when tested by a qualified independent testing agency.
2. No form of degradation occurs due to acid hydrolysis or other causes related to treatment.
3. Contact with treated wood does not promote corrosion of metal fasteners.

C. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.

2.5 DIMENSION LUMBER

A. General: Provide dimension lumber of grades indicated according to the ALSC National Grading Rule (NGR) provisions of the inspection agency indicated.

B. Other Framing Not Listed Above: Provide the following grades and species:

1. Grade: No. 2.
2. Species: Douglas fir-larch north; NLGA.
3. Species: Douglas fir-larch; WCLIB or WWPA.

C. Exposed Framing: Provide material hand-selected from lumber of species and grade indicated below for uniformity of appearance and freedom from characteristics that would impair finish appearance.

2.6 MISCELLANEOUS LUMBER

A. General: Provide lumber for support or attachment of other construction, including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.

B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.

C. Moisture Content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.

D. Grade: For dimension lumber sizes, provide No. 3 or Standard grade lumber per ALSC's NGRs of any species. For board-size lumber, provide No. 3 Common grade per NELMA, NLGA, or WWPA; No. 2 grade per SPIB; or Standard grade per NLGA, WCLIB or WWPA of any species.

2.7 WOOD-BASED STRUCTURAL-USE PANELS, GENERAL

A. Structural-Use Panel Standard: Provide plywood panels complying with DOC PS 1, "U.S. Product Standard for Construction and Industrial Plywood."

B. Trademark: Factory mark structural-use panels with APA trademark evidencing compliance with grade requirements.

2.8 STRUCTURAL-USE PANELS FOR BACKING

A. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant-treated plywood panels with grade, BC, in thickness indicated or, if not otherwise indicated, not less than 3/4 inch thick.

2.9 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of Type 304 stainless steel.

B. Nails, Wire, Brads, and Staples: FS FF-N-105.

C. Power-Driven Fasteners: CABO NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1. (ASME B18.2.3.8M)

F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

2.10 METAL FRAMING ANCHORS

A. General: Provide galvanized steel framing anchors of structural capacity, type, and size indicated and as follows:

1. Allowable Design Loads: Provide products with allowable design loads, 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.

B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653, G60 coating designation; structural, commercial, or lock-forming quality, as standard with manufacturer for type of anchor indicated.

C. Bridging: Rigid, V-section, nailless type, 0.064 inch (1.6 mm) thick, length to suit joist size and spacing.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Discard units of material with defects that impair quality of rough carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.

B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.

C. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.

D. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

E. Use common wire nails, unless otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.

G. Use hot-dip galvanized or stainless-steel nails where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity.

H. Countersink nail heads on exposed carpentry work and fill holes with wood filler.

3.2 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

A. Install wood grounds, nailers, blocking, and sleepers where shown and where required for screeding or attaching other work. Form to shapes shown and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

C. Install permanent grounds of dressed, preservative-treated, key-beveled lumber not less than 1-1/2 inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WOOD FURRING

A. Install plumb and level with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

1. Firestop furred spaces of walls at each floor level and at ceiling with wood blocking or noncombustible materials, accurately fitted to close furred spaces.

B. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal- (19-by-38-mm actual-) size furring at 16 inches (406 mm) o.c., vertically.

3.4 WOOD FRAMING, GENERAL

A. Framing Standard: Comply with AFPA's "Manual for Wood Frame Construction," unless otherwise indicated.

B. Install framing members of size and at spacing indicated.

C. Do not splice structural members between supports.

D. Firestop concealed spaces of wood-framed walls and partitions at each floor level and at ceiling line of top story. Where firestopping is not inherent in framing system used, provide closely fitted wood blocks of 2-inch nominal- (38-mm actual-) thickness lumber of same width as framing members.

3.5 INSTALLATION OF STRUCTURAL-USE PANELS

A. General: Comply with applicable recommendations contained in APA Form No. E30, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.

1. Comply with "Code Plus" provisions of above-referenced guide.

B. Fastening Methods: Fasten panels as indicated below:

1. Sheathing: Nail to framing.
2. Plywood Backing Panels: Nail or screw to supports.

END OF SECTION 06100

SECTION 06402 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Interior standing and running trim.
2. Wood cabinets (casework).
3. Laminate-clad cabinets (plastic-covered casework).
4. Plastic-laminate countertops.
5. Solid surfacing material countertops.
6. Shop finishing of woodwork.
7. Wood veneer wall panels.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 5 Section ‘Miscellaneous Metals’ for exposed metal supports.
2. Division 6 Section "Rough Carpentry" for exposed framing and for furring, blocking, shims, and hanging strips for installing interior woodwork.
3. Division 8 Section "Flush Wood Doors" for doors specified by reference to architectural woodwork standards.
4. Division 9 Section "Painting" for field finishing of installed interior architectural woodwork not finished in the shop.

1.3 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction prior to woodwork installation.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of product and process specified and incorporated into items of architectural woodwork during fabrication, finishing, and installation.

C. Fire-retardant-treatment data for material treated to reduce combustibility. Include certification by treating plant that treated materials comply with requirements.

D. Shop drawings showing location of each item, dimensioned plans and elevations, large-scale sections and details, attachment devices, and other components.

1. Show details full size.
2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcing specified in other Sections.
3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, and other items installed in architectural woodwork.
4. Show veneer leaves with dimensions, grain direction, exposed face, and an identification number indicated for each leaf. Identification number shall indicate the flitch and the sequence within the flitch for each leaf.
5. Apply WIC Certified Compliance Label to first page of shop drawings.

E. Samples for initial selection of the following in the form of manufacturer's color charts consisting of actual units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated.

1. Shop-applied transparent finishes.
2. Plastic laminates.
3. Solid surfacing materials.

F. Samples for verification of the following:

1. Lumber with or for transparent finish, 50 sq. in. (300 sq. cm), for each species and cut, finished on one side and one edge.
2. Veneer leaves representative of and selected from flitches to be used for transparent-finished woodwork.
3. Wood-veneer-faced panel products, with or for transparent finish, 18 by 24 inches, for each species and cut. Include at least one face-veneer seam and finish one-half of face as specified. Show panel match sample.

    a. Step finish materials on sample to show and clearly define each coat.
    b. Provide separate samples of unfaced panel product used for core.

4. Lumber and panel products with shop-applied opaque finish, 8 by 10 inches (200 by 250 mm) for panels and 50 sq. in. (300 sq. cm) for lumber, for each finish system and color, with one-half of exposed surface finished.
5. Laminate-clad panel products, 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish, with separate samples of unfaced panel product used for core.
6. Thermoset decorative-overlay surfaced panel products, 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish, with separate samples of unfaced panel product used for core.
7. Solid surfacing materials, 6 inches (150 mm) square.
8. Exposed cabinet hardware, one unit for each type and finish.

G. Product certificates signed by woodwork fabricator certifying that products comply with specified requirements.

H. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

I. LEED Submittals:

1. Credit MR C6: For products and material that is certified as rapidly renewable material. Provide the following information:
    a. Product Data
    b. Quantity of material
    c. Invoices indicating cost of material (no labor included.)

2. Credit MR C7: For wood products that are certified in accordance with FSC principles and criteria including chain-of-custody certificates.
    a. Product Data
    b. Quantity of FSC certified material
    c. Quantity of non-FSC certified material
    d. Line item cost of all wood material
    e. Chain-of-custody certificates for all FSC certified material

3. Credit IEQ 4.2: For paints and coatings, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
    a. Product Data

b. Laboratory Test Reports

4. Credit IEQ 4.4: For all composite wood and agrifiber products installed in the building interior, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
   a. Product Data
   b. Laboratory Test Reports

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in producing architectural woodwork similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units without delaying the Work.

B. Installer Qualifications: Arrange for interior architectural woodwork installation by a firm that can demonstrate successful experience in installing architectural woodwork items similar in type and quality to those required for this Project.

C. Single-Source Responsibility: Arrange for production of interior architectural woodwork with sequence-matched wood veneers by a single firm.

D. Single-Source Responsibility for Fabrication and Installation: Engage a qualified woodworking firm to assume undivided responsibility for fabricating, finishing, and installing woodwork specified in this Section.

E. Quality Standard: Except as otherwise indicated, comply with the following standard:

1. AWI Quality Standard: "Architectural Woodwork Quality Standards" of the Architectural Woodwork Institute for grades of interior architectural woodwork, construction, finishes, and other requirements. Premium Grade.

   a. Provide AWI Certification Labels or Certificates of Compliance indicating that woodwork meets requirements of grades specified.

2. The Contract Documents contain selections chosen from options in the Quality Standard as well as additional requirements beyond those of the Quality Standard. Comply with such selections and requirements in addition to the Quality Standard.

F. Fire-Test-Response Characteristics: Provide materials with the following fire-test-response characteristics as determined by testing identical products per ASTM test method indicated below by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify fire-retardant-treated material with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.

1. Surface-Burning Characteristics: Not exceeding values indicated below, tested per ASTM E 84 for standard time period (10 minutes).

   a. Flame Spread: 75.
   b. Smoke Developed: 450.

2. Surface-Burning Characteristics: Not exceeding values indicated below, tested per ASTM E 84 for 30 minutes with no evidence of significant combustion. In addition, the flame front shall not progress more than 10-1/2 feet (3.2 m) beyond the center line of the burner at any time during the test.

   a. Flame Spread: 25.
   b. Smoke Developed: 450.

G. Mockup: Prior to fabricating or installing interior architectural woodwork, construct mockup to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mockup of the size indicated, using materials indicated for final unit of work, and complying with the following requirements.

1. Locate mockup on site in the location indicated or, if not indicated, as directed by Architect.
2. Demonstrate the proposed range of aesthetic effects and workmanship.
3. Obtain Architect's acceptance of mockup before start of final unit of Work.
6. Retain and maintain mockup during construction in an undisturbed condition as a standard for judging the completed Work.

a. When directed, demolish and remove mockup from Project site.
b. Accepted mockup in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration.

B. Do not deliver woodwork until painting and similar operations that could damage, soil, or deteriorate woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions."

1.7 PROJECT CONDITIONS

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

B. Environmental Limitations: Obtain and comply with woodwork fabricator's and Installer's coordinated advice for optimum temperature and humidity conditions for woodwork during its storage and installation. Do not install woodwork until these conditions have been attained and stabilized so that woodwork will be within plus or minus 1.0 percent of optimum moisture content from date of installation through remainder of construction period.

C. Field Measurements: Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before fabrication, and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Verify locations of concealed framing, blocking, reinforcements, and furring that support woodwork by accurate field measurements before being enclosed. Record measurements on final shop drawings.
2. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site and coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions.

1.8 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

B. Hardware Coordination: Distribute copies of approved schedule for cabinet hardware specified in Division 8 Section "Door Hardware" to fabricator of architectural woodwork; coordinate cabinet shop drawings and fabrication with hardware requirements.

PART 2 - PRODUCTS

2.1 WOODWORK FABRICATORS

A. Available Fabricators: Subject to compliance with requirements, any fabricator offering interior architectural woodwork shall be AWI certified.

2.2 MATERIALS

A. General: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade indicated and, where the following products are part of interior woodwork, with requirements of the referenced product standards that apply to product characteristics indicated:

1. Hardboard: AHA A135.4.
2. Medium-Density Fiberboard: ANSI A208.2.
3. Particleboard: ANSI A208.1, Grade M-2.
4. Softwood Plywood: PS 1.
5. Hardwood Plywood and Face Veneers: HPVA HP-1.

B. Fiberboard: Medium-density fiberboard made with no additional urea formaldehyde and complying with ANSI A208.2.

1. Product: Subject to compliance with requirements, provide Medite II by Medite Corp or Uniboard by Nu-Green Corp.

C. Particleboard: ANSI A208.1, Grade M-2 made with phenol-formaldehyde resins.

D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.

1. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates by one of the following:

a. Formica Corporation.
b. Laminart.
c. Nevamar Corp.
d. Ralph Wilson Plastics Co.

E. Adhesive for Bonding Plastic Laminate: Aliphatic resin.

F. Thermoset Decorative Overlay: Decorative surface of thermally fused polyester or melamine-impregnated web, bonded to specified substrate and complying with ALA 1992. Melamine only for interior cabinets.

1. Substrate: Fire-retardant, medium-density fiberboard.

G. Solid Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with the material and performance requirements of ANSI Z124.3, Type 5 or Type 6, without a precoated finish.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

a. Avonite Sufaces by Aristech Acrylics, LLC See Finish Schedule for colors.
b. Zodiac Quartz SSurfaces, Dupont, Inc. See Finish Schedule for colors.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where indicated, use materials impregnated with fire-retardant chemical formulations indicated by a pressure process or other means acceptable to authorities having jurisdiction to produce products with fire-test-response characteristics specified.

B. Fire-Retardant Chemicals: Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated material from untreated material.

C. Fire-Retardant-Treated Lumber: Comply with the following:

1. Organic-Resin-Based Formulation: Exterior type per AWPA C20, consisting of organic-resin solution, relatively insoluble in water, thermally set in wood by kiln drying.
2. Low-Hygroscopic Formulation: Interior Type A per AWPA C20.
3. Nonpressure-Treatment Formulation: Nontoxic, water-soluble product applied by dip, spray, roller, curtain coating, vacuum chamber, or soaking.
4. Mill lumber after treatment, within limits set for wood removal that does not affect listed fire-test-response characteristics, using a woodworking plant certified by testing and inspecting agency.
5. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.
6. Kiln-dry material before and after treatment to levels required for untreated material.
7. Discard treated material that does not comply with requirements of referenced woodworking standard. Do not use twisted, warped, bowed, discolored, or otherwise damaged or defective material.
8. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
9. Products: Subject to compliance with requirements, provide one of the following:

a. Organic-Resin-Based Formulation (Exterior Type):

1) Exterior Fire-X; American Wood Treaters, Inc.
2) Exterior Fire-X; Hoover Treated Wood Products, Inc.

b. Low-Hygroscopic Formulation (Type A):

1) D-Blaze; J. H. Baxter Co.
2) D-Blaze; Chemical Specialties, Inc.
3) Pyro-guard; Continental Wood Preservers, Inc.
4) Dricon; Hickson Corp.
5) Pyro-guard; Hoover Treated Wood Products, Inc.

c. Nonpressure-Treatment Formulation:

1) Gaia Process; Fibretech, Inc.

D. Fire-Retardant Particleboard: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve products identical to those tested for flame spread of 25 or less and for smoke developed of 25 or less per ASTM E 84 by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting agency.

1. For panels 3/4 inch (19 mm) thick and less and 45-lb/cu. ft (720-kg/cu. m) density, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: modulus of rupture, 1600 psi (11 MPa); modulus of elasticity, 300,000 psi (2000 MPa); internal bond, 80 psi (550 kPa); and screw-holding capacity on face and edge, 250 lbf (1100 N) and 225 lbf (1000 N) respectively.
2. For panels 13/16 to 1-1/4 inches (20 to 32 mm) thick and 44-lb/cu. ft (705-kg/cu. m) density, comply with ANSI A208.1 for Grade M-1 except for the following minimum properties: modulus of rupture, 1300 psi (9 MPa); modulus of elasticity, 250,000 psi (1700 MPa); linear expansion, 0.50 percent; and screw-holding capacity on face and edge, 250 lbf (1100 N) and 175 lbf (780 N) respectively.
3. Product: Subject to compliance with requirements, provide Duraflake FR by Willamette Industries, Inc.

E. Fire-Retardant Fiberboard: Medium-density fiberboard panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve products identical to those tested for flame spread of 25 or less and for smoke developed of

200 or less per ASTM E 84 by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting agency.

1. Product: Subject to compliance with requirements, provide Medite FR by Medite Corp.

2.4 CABINET HARDWARE AND ACCESSORY MATERIALS

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 Section "Door Hardware."

B. Cabinet Hardware Schedule: Refer to schedule at end of this Section for cabinet hardware required for architectural cabinets.

C. Hardware Standard: Comply with BHMA A156.9 for items indicated by reference to BHMA numbers or referenced to this standard.

D. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA code number indicated.

1. Satin Stainless Steel, Stainless-Steel Base: BHMA 630.

E. For concealed hardware provide manufacturer's standard finish that complies with product class requirements of BHMA A156.9.

2.5 INSTALLATION MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.

B. Screws: Select material, type, size, and finish required for each use. Comply with ASME B18.6.1 for applicable requirements.

1. For metal framing supports, provide screws as recommended by metal-framing manufacturer.

C. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.

E. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors.

2.6 FABRICATION, GENERAL

A. Interior Woodwork Grade: Provide interior woodwork complying with the referenced quality standard and of the following grade:

1. Grade: Premium.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to relative humidity conditions existing during time of fabrication and in installation areas.

C. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

D. Fabricate woodwork to dimensions, profiles, and details indicated.

E. Complete fabrication, including assembly, finishing, and hardware application, before shipment to Project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Trial fit assemblies at the fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on approved shop drawings before disassembling for shipment.

F. Shop-cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges with a water-resistant coating.

2.7 LAMINATE-CLAD CABINETS (PLASTIC-COVERED CASEWORK)

A. Quality Standard: Comply with AWI Section 400 requirements for laminate-clad cabinets.

B. AWI Type of Cabinet Construction: Flush overlay.

C. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:

1. Horizontal Surfaces Other than Tops: GP-50, 0.050-inch (1.270-mm) nominal thickness.
2. Postformed Surfaces: PF-42, 0.042-inch (1.067-mm) nominal thickness.
3. Vertical Surfaces: GP-50, 0.050-inch (1.270-mm) nominal thickness.
4. Edges: 3-mm PVC edge banding, flat profile color selected by Architect from full range of colors..

D. Materials for Semiexposed Surfaces: Provide surface materials indicated below:

1. Surfaces Other than Drawer Bodies: High-pressure decorative laminate, Grade GP-28.
2. Drawer Sides and Backs: Solid hardwood lumber, shop finished.
3. Drawer Bottoms: Thermoset decorative overlay.

E. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. Refer to Casework Drawings , Interior Elevation Drawings, and Finish Schedule.

F. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers except where located directly under tops.

2.9 SOLID SURFACING MATERIAL AND COUNTERTOPS

A. Quality Standard: Comply with applicable WIC section indicated below:

B. Fabrication: Fabricate tops in one piece with shop-applied backsplashes and edges, unless otherwise indicated. Comply with solid surfacing material manufacturer's recommendations for adhesives, sealers, fabrication, and finishing.

1. Drill holes in countertops for plumbing fittings and soap dispensers in the shop.

C. Solid Surfacing and polycarbonate Material Thickness: As indicated.

D. Colors, Patterns, and Finishes: Provide materials and products that result in colors of solid surface material and polycarbonate complying with the following requirements:

1. As indicated in drawings

PART 3 - EXECUTION

3.1 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas before installing.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

3.2 INSTALLATION

A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.

B. Quality Standard: Install woodwork to comply with WIC Section 26 for the same grade specified in Part 2 of this Section for type of woodwork involved.

C. Install woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm)

D. Plumb and level (including tops).

E. Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

F. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with recommendations of chemical treatment manufacturer, including those for adhesives used to install woodwork.

G. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork and matching final finish where transparent finish is indicated.

H. Cabinets: Install without distortion so that doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.

J. Tops: Anchor securely to base units and other support systems as indicated. Caulk space between backsplash and wall with specified sealant.

1. Install countertops with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
2. Secure backsplashes to tops with concealed metal brackets at 16 inches (400 mm) o.c.

K. Complete the finishing work specified in this Section to the extent not completed at shop or before installation of woodwork. Fill nail holes with matching filler where exposed. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats were applied in the shop.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork where possible to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

3.4 PROTECTION

A. Provide final protection and maintain conditions in a manner acceptable to fabricator and Installer that ensures that woodwork is without damage or deterioration at the time of Substantial Completion.

3.5 CABINET HARDWARE AND ACCESSORY SCHEDULE

A. BHMA numbers are used below to designate hardware requirements, except as otherwise indicated.

B. Butt Hinges: 2-3/4-inch (70-mm), 5-knuckle stainless steel hinges made from 0.095-inch- (2.4-mm-) thick metal, and as follows:

1. Semiconcealed Hinges for Overlay Doors: B01521.

C. Pulls: Sugatsune Sug-SN-95-S (3-3/4”)

D. Catches: As follows:

1. Ball Friction Catches: B03013.

E. Shelf Rests: B04013.

F. Drawer Slides: Side-mounted, full-extension, zinc-plated steel drawer slides with steel ball bearings, complying with BHMA A156.9, Grade 1 and rated for the following loads:

1. Box Drawer Slides: 100 lbf (440 N).
2. File Drawer Slides: 200 lbf (890 N).
3. Pencil Drawer Slides: 45 lbf (200 N).

G. Door Locks: E07121.

H. Drawer Locks: E07041.

END OF SECTION 06402

SECTION 07121 - COLD FLUID-APPLIED WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Surface preparation and substrate treatment.
2. Waterproofing membrane.
3. Flashings and accessories.
4. Protection Boards\Drainage panels.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 3 Section "Cast-in-Place Concrete" for concrete placement, curing, and finishing.
2. Division 7 Section "Joint Sealants" for joint sealant materials and installation.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide waterproofing that prevents the passage of liquid water under hydrostatic pressure and complies with physical requirements of ASTM C 836 as demonstrated by testing performed by an independent testing agency of manufacturer's current waterproofing formulations.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of waterproofing specified, including manufacturer's printed instructions for evaluating, preparing, and treating the substrate, technical data, and tested physical and performance properties.

C. Shop Drawings showing locations and extent of waterproofing, including details for substrate joints and cracks, sheet flashings, penetrations, and other termination conditions.

D. Samples, 3-by-6-inch (75-by-150-mm) minimum size, of each waterproofing material required for Project.

E. Installer certificates signed by manufacturer certifying that Installers comply with requirements under the "Quality Assurance" Article.

F. Product test reports from a qualified independent testing agency evidencing compliance of waterproofing with requirements based on comprehensive testing of current product formulations.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed similar waterproofing to that indicated for this Project and is certified in writing by waterproofing manufacturer as qualified to install manufacturer's waterproofing.

B. Manufacturer Qualifications: Engage a firm experienced in manufacturing cold fluid-applied waterproofing similar to that indicated for this Project and that has a record of successful in-service performance.

C. Single-Source Responsibility: Obtain waterproofing materials from a single manufacturer regularly engaged in manufacturing waterproofing.

D. Field Samples: Apply waterproofing field sample to 16 sq. ft. of wall area to demonstrate surface preparation, joint and crack treatment, thickness, texture, standard detailing, and standard of workmanship.

1. Notify Architect one week in advance of the dates and times when field sample will be prepared.
2. If Architect determines that field sample does not meet requirements, reapply waterproofing until field sample is approved.
3. Retain and maintain approved field sample during construction in an undisturbed condition as a standard for judging the completed waterproofing. An undamaged field sample may become part of the completed Work.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."

1. Before installing waterproofing, meet with Owner, Architect, consultants, independent testing agency, waterproofing manufacturer, and other concerned entities.
2. Review requirements for waterproofing, including surface preparation specified under other Sections, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, inspection and testing procedures, and protection and repairs.
3. Notify participants at least 7 working days before conference.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original containers with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, shelf life, and directions for storing and mixing with other components.

B. Store materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by waterproofing manufacturer. Protect stored materials from direct sunlight.

C. Remove and replace material that cannot be applied within its stated shelf life.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F (3 deg C) above dew point.

1. Do not apply waterproofing in snow, rain, fog or mist, or when such weather conditions are imminent during the application and curing period.

B. Maintain adequate ventilation during application and through complete curing of waterproofing materials.

1.8 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Submit a written warranty signed by waterproofing manufacturer and Installer agreeing to repair or replace waterproofing that does not meet requirements or that does not remain watertight within the specified warranty period. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate that exceed 1/16 inch (1.6 mm) in width.

1. Warranty Period: 3 years after date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the following:

1. Single-Component Modified Polyurethane:

a. Miraseal; Carlisle Corporation, Carlisle Coatings & Waterproofing Div.
b. Tremproof 250GC; Tremco.

2.2 WATERPROOFING MATERIALS

A. General: Provide waterproofing materials recommended by manufacturer to be fully compatible with and able to develop bond to substrate under conditions of service and application required, as demonstrated by waterproofing manufacturer based on testing and field experience.

1. Compound waterproofing for vertical or horizontal application and slope of substrate indicated. Provide waterproofing with not less than 90 percent solids.

B. Single-component, bitumen-modified polyurethane complying with performance and physical requirements of ASTM C 836 and with manufacturer's printed physical requirements as certified by a qualified independent testing agency.

2.3 AUXILIARY MATERIALS

A. Primer: Manufacturer's standard factory-formulated polyurethane or epoxy primer.

B. Sheet Flashing: 50-mil- (1.3-mm-) minimum, nonstaining uncured sheet neoprene.

1. Adhesive: Manufacturer's recommended contact adhesive.

C. Reinforcing Strip: Manufacturer's recommended fiberglass mesh or polyester fabric.

D. Joint Sealant: Multicomponent polyurethane sealant complying with ASTM C 920 Type M, Class 25, Grade NS for sloping and vertical applications or Grade P for deck applications. Use NT and as recommended by manufacturer for substrate and joint conditions and for compatibility with waterproofing.

1. Backer Rod: Closed-cell polyethylene foam.

E. Protection Course at back filled walls: Semirigid sheets of fiberglass or mineral reinforced-asphaltic core, pressure laminated between 2 asphalt-saturated fibrous liners and as follows:

1. Thickness: 1/8 inch (3 mm), nominal.

F. Cant strip: semi-rigid fiberglass or mineral reinforced-asphaltic core wrapped with asphalt satuated fibrous liner.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions under which waterproofing systems will be applied, with Installer present, for compliance with requirements. Do not proceed with installation until unsatisfactory conditions have been corrected.

1. Do not proceed with installation until after the minimum concrete curing period recommended by waterproofing manufacturer.
2. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by the plastic sheet method according to ASTM D 4263.
3. Notify Architect in writing of anticipated problems using waterproofing over substrate.

3.2 SURFACE PREPARATION

A. Clean and prepare substrate according to manufacturer's recommendations. Provide clean, dust-free, and dry substrate for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage or overspray affecting other construction.

C. Remove grease, oil, form release agents, paints, and other penetrating contaminants from concrete. Remove fins, ridges, and other projections and fill honeycomb, aggregate pockets, and other voids.

1. Abrasive blast clean concrete surfaces uniformly to expose top surface of fine aggregate according to ASTM D 4259. Remove material to provide a sound surface free of laitance, glaze, efflorescence, curing compounds, concrete hardeners, or form release agents. Remove remaining loose material and clean surfaces according to ASTM D 4258.

3.3 PREPARATION AT TERMINATIONS AND PENETRATIONS

A. Prepare vertical and horizontal surfaces at terminations and penetrations through waterproofing and at expansion joints, drains, and sleeves according to ASTM C 898 and manufacturer's recommendations.

B. Prime substrate when recommended by waterproofing manufacturer.

C. Apply a double thickness of waterproofing and embed a joint reinforcing strip in preparation coat when recommended by waterproofing manufacturer.

1. Provide sealant cants around penetrations and at inside corners of deck-to-wall butt joints when recommended by waterproofing manufacturer.

3.4 JOINT AND CRACK TREATMENT

A. Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 898 and waterproofing manufacturer's recommendations. Remove dust and dirt from joints and cracks complying with ASTM D 4258 prior to coating surfaces.

1. Comply with recommendations of ASTM C 1193 for joint sealant installation.
2. Apply bond breaker between sealant and preparation strip when required by waterproofing manufacturer.
3. Prime substrate when recommended by waterproofing manufacturer and apply a single thickness of preparation strip extending a minimum of 3 inches (75 mm) along each side of joint. Apply a double thickness of waterproofing and embed a joint reinforcing strip in preparation coat when recommended by waterproofing manufacturer.

B. Install sheet flashing and bond to deck and wall substrates where indicated or required according to waterproofing manufacturer's recommendations.

1. Extend sheet flashings onto perpendicular surfaces and other work penetrating substrate according to ASTM C 898 and as recommended by waterproofing manufacturer.

3.5 WATERPROOFING APPLICATION

A. Apply waterproofing according to ASTM C 898 and manufacturer's recommendations.

B. Start installing waterproofing in presence of manufacturer's technical representative.

C. Apply primer over prepared substrate when recommended by manufacturer and at manufacturer's recommended rate.

D. Mix materials according to manufacturer's instructions.

E. Apply waterproofing, according to manufacturer's recommendations, by spray, roller, notched squeegee, trowel, or other application method suitable to slope of substrate.

F. Apply one or more coats of waterproofing to obtain a seamless membrane free of entrapped gases, with an average dry film thickness of 60 mils (1.5 mm) and a minimum dry film thickness of 50 mils (1.3 mm) at any point.

G. Apply waterproofing to prepared wall terminations and vertical surfaces to heights indicated according to manufacturer's recommendations and details.

H. Verify wet film thickness of waterproofing every 100 sq. ft. (9.3 sq. m).

I. Install protection course with butted joints over nominally cured membrane no later than recommended by manufacturer and before starting subsequent construction operations.

1. Molded-sheet drainage panels may be used in lieu of protection course to vertical applications when approved by waterproofing manufacturer.

3.6 FIELD QUALITY CONTROL

A. Owner will engage an independent testing agency to perform field inspections, sample and test materials being used, observe flood tests, and report whether tested Work conforms to or deviates from requirements.

1. Testing agency will identify, seal, and certify samples of materials delivered to Project site, with Contractor present.
2. Testing agency will perform tests for any of the product characteristics specified, using referenced test procedures and other tests cited in manufacturer's Product Data.
3. Testing agency will verify thickness of waterproofing membrane.
4. Testing agency will examine inside of walls and terminations for evidence of leaks.

C. Correct deficiencies in or remove waterproofing that does not comply with requirements, repair substrates, reapply waterproofing, and repair sheet flashings.

1. After flood tests, repair leaks and make further repairs until the waterproofing installation is watertight.

D. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with requirements.

3.7 CURING, PROTECTING, AND CLEANING

A. Cure waterproofing according to manufacturer's recommendations, taking care to prevent contamination and damage during application stages and curing.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07121

SECTION 07210 - BUILDING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Glass-Fiber Insulation

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 9 Section for insulation installed as part of metal-framed wall and partition assemblies.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of insulation product specified.

C. Product test reports from and based on tests performed by a qualified independent testing agency evidencing compliance of insulation products with specified requirements including those for thermal resistance, fire-test-response characteristics, water-vapor transmission, water absorption, and other properties, based on comprehensive testing of current products.

D. Research or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence compliance of foam-plastic insulations with building code in effect for Project.

E. LEED Submittals:

1. Credit MR C4: For products having recycled content, including postconsumer and pre-consumer recycled content. Provide the following information:
   a. Product Data
   b. Percent Content (post and pre-consumer)
   c. Invoices indicating cost of material (no labor included.)

2. Credit MR C5: For products and materials that comply with requirements for regional materials based on location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Provide the following information:
   a. Product Data
   b. Fraction by weight of regional material
   c. Invoices indicating cost of material (no labor included.)
   d. Distance from Project

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products complying with requirements indicated without delaying the Work.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated on Drawings or specified elsewhere in this Section as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency

acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Surface-Burning Characteristics: ASTM E 84.
2. Fire-Resistance Ratings: ASTM E 119.
3. Combustion Characteristics: ASTM E 136.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Glass-Fiber Insulation:

a. CertainTeed Corporation.
b. Knauf Fiber Glass GmbH.
c. Owens-Corning Fiberglas Corporation.

2.2 INSULATING MATERIALS

A. Paper Faced Mineral-Fiber Blanket Insulation: Thermal insulation combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665, Type III; with kraft paper faced membrane on 1 face.

1. Mineral-Fiber Type: Fibers manufactured from glass.

2. Flanged Units: Provide blankets fabricated with facing incorporating 1-inch wide flanges along edges for attachment to framing members.

3. Location: Elevator penthouse walls, and miscellaneous exterior wall insulation locations.

B. Unfaced Mineral-Fiber Blanket Insulation: Thermal insulation combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665, Type I (blankets without membrane facing).

1. Mineral-Fiber Type: Fibers manufactured from glass.
2. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indices of 25 and 50, respectively.
3. Locations: Interior partition walls and areas not noted above.

2.3 INSULATION FASTENERS

A. Tape and/or adhesive products to attach faced insulation to metal stud systems to maintain contiuity of vapor barrier.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or that interfere with insulation attachment.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, unsoiled, and has not been exposed at any time to ice and snow.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Seal joints between closed-cell (nonbreathing) insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

C. Set vapor-retarder-faced units with facing to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.

1. Tape joints and ruptures in facing, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

D. Install mineral-fiber blankets in cavities formed by framing members according to the following requirements:

1. Use blanket widths and lengths that fill cavities formed by framing members. Where more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
2. For exterior steel stud frame use faced blankets having flanges, position insulation to produce (1”) one inch continuous air space unless otherwise indicated. Secure insulation by overlapping flanges of adjacent blankets and tape to form airtight seal.
3. For interior partitions indicated to have batt insulation provide unfaced glass-fiber batts of width required to fill cavity formed by framing members for friction fit and provide in lengths to provide snug fit at ends. Provide loose-fill insulation for miscellaneous voids and cavity spaces where shown and where sound insulation is indicated. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.

3.5 PROTECTION

A. General: Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07210

SECTION 07435 - INSULATED METAL WALL PANELS

Part 1: General

General: Construct panel system to provide for expansion and contraction of component materials without causing buckling, failure of joint seals, undue stress on fasteners, other detrimental effects to the panel system or adjacent building systems, or warping of faces of panel system.

1.1 SECTION INCLUDES

A. Insulated Metal Wall Panels and Related Accessories.

1.2 RELATED SECTIONS

A. Section 03300 – Concrete: Foundations

B. Section 05120 – Structural Steel: Primary structure.

C. Section 05500 – Steel Fabrication: Supporting structure.

D. Section 07620 - Sheet Metal Flashing and Trim.

E. Section 07900 - Joint Sealers

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM) C578: Standard Test Methods for Characteristics of Expanded Polystyrene.

B. ASTM D1622 - 08 Standard Test Method for Apparent Density of Rigid Cellular Plastics.

C. ASTM C518 - 10 Standard Test Method for Steady State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

D. ASTM D1621 - 10 Standard Test Method for Compressive Properties Of Rigid Cellular Plastics.

E. ASTM C203 - 05a(2012) Standard Test Methods for Breaking Load and Flexural Properties of Block Type Thermal Insulation.

F. ASTM D1623 - 09 Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.

G. ASTM E96 / E96M - 10 Standard Test Methods for Water Vapor Transmission of Materials.

H. ASTM C272 / C272M - 12 Standard Test Method for Water Absorption of Core Materials for Sandwich Constructions.

I. ASTM D696 - 08 Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics.

J. ASTM D2863 - 12 Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle like Combustion of Plastics (Oxygen Index).

L. ASTM E84 - 12b Standard Test Method for Surface Burning Characteristics of Building Materials

M. ASTM A653 / A653M - 11 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot- Dip Process.

N. ASTM A924 / A924M - 10a Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

O. ASTM E18 - 11 Standard Test Methods for Rockwell Hardness of Metallic Materials.

P. ASTM E72 - 10 Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.

Q. ASTM E1996 - 12 Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.

R. ASTM E330 - 02(2010) Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

S. Factory Mutual Research Corporation FM 4471 test leakage and moisture penetration test procedure for class 1 panel roof.

T. Metal paint testing requirements:

1. Metal film thickness. ASTM D 5796.
2. Metal Color: ASTM D 1729.
3. Specular Gloss ASTM D 523 at a gloss meter angle of 60°.
4. Minimum pencil hardness of Metal per ASTM D 3363 is “F”
5. Solvent Resistance of Metal Passes ASTM D 5402
6. Cross hatch Adhesion passes Per ASTM D 3359
7. Impact resistance per ASTM D 2794
8. Humidity Resistance No blistering, cracking, peeling, loss of gloss or softening of finish per ASTM D 2247
9. Cleveland Condensing no blistering, rusting or loss of adhesion of finish per ASTM D 4585
10. Water immersion Test per ASTM D 870 with no loss of gloss, blistering, cracking, color change or softening
11. Salt Spray resistance Per ASTM B 117 no loss of adhesion and scribe creep no greater than 1/8”
12. Chemical resistance per ASTM D 1308 7.2 spot test
13. Kestermich Test no color change after 10 cycles per ASTM G 87
14. Accelerated weathering per ASTM G 87
15. Exterior weathering ASTM D 2244 at least #8 chalk rating per ASTM D4214
16. Abrasion Resistance per ASTM D 968 Method A “Pass”
17. Flame Spread rating per ASTM E 84 Class A or 1

U. Adhesive P 1001U Isocyanate rigid Polyurethane Foam adhesive system

1. Tensile Adhesion ASTM D 1623
2. Shear Adhesion ASTM C 273

1.4 Performance Requirements: Design and construct panels to meet requirements as indicated.

A. Structural and Wind load Tests:

1. Design panel composition to resist wind load mandated by code, with deflection limit of L/240.

2. No permanent damage to panels or connections when subjected to 1.5 times the design wind pressures for both inward and outward.

B. Thermal Performance:

1. Panels shall produce no post manufacturing off gassing which could result in loss of future thermal resistance and must have a certified Long Term R- Value (LTR).

C. Fire:

1. Surface Burning Characteristics: Insulated core shall have been tested in accordance with ASTM E 84 and UL 723, NFPA 255 for surface burning characteristics. The core shall have a maximum flame spread of 0 and a smoke developed rating of 175.

2. Surface Burning Characteristics: Exterior panel skin shall have been tested in accordance with ASTM E 84 and UL723, NFPA 255 for surface burning characteristics. The exterior shall have a maximum flame spread of 0 and a smoke developed rating of 185.

D. Vapor Barrier:

1. Water Spray Leakage test shall show no evidence of penetration through the panels or panel joints when subjected to a preload air pressure of 30 psi and a water spray rate of 5 gallons/ psf/ per hour for 15 minutes, per Factory Mutual Research Corporation FM 4471 test procedures for class 1 roof panels.

2. Static Water Penetration must exhibit no sign of leakage for a period of 7 days with ponded water at a 6 inch continuous water depth for the duration of the test, per Factory Mutual Research corporation FM4471 test procedures for class 1 roof panels.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

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

1. Preparation instructions and recommendations.

2. Storage and handling requirements and recommendations.

3. Material type, metal thickness and finish

4. Installation methods

C. Shop Drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, including specific requirements indicated.

1. Profile and gauge of both exterior and interior sheet.

2. Metal finish

3. Relationship to other work

4. Fully show details and connections to and locations of supporting steel indicating control points.

D. Engineered Drawings and Calculations: For installed products indicated to comply with certain design loadings, include structural analysis data and design prepared by an independent third party signed and sealed by the qualified professional engineer responsible for their preparation.

1. Panel engineering to be prepared by the following, or another qualified engineer submitted and approved in accordance with prior approval process.

a. Paul D. Hatch, PE, PC, 1061 Timber Ridge Lane, Ellijay, GA 30540. Phone:770-889-7000; E-mail: phatchpe@bellsouth.net.

E. Color Samples: For each finish product specified, one color chart representing manufacturer's full range of available colors.

F. Verification Samples: For each finish product specified, two color submission samples representing actual product color.

G. Quality Control Submittals:

1. Statement of qualifications

2. Design data

3. Test reports

H. LEED Submittals: Provide documentation of how the requirements of Credit will be met:

1. EA - Energy and Atmosphere:

a. EA Credit 1: Optimize Energy Performance: Demonstrate percentage of performance improvement that meets or surpasses ASHRAE/IESNA Standard 90.1-2004.

b. EA Credit 2: Minimum Energy Performance: Roof panels contribute to higher energy efficiency of a building that must comply with a 10 percent improvement in the performance compared to benchmark rating based on ASHRAE/IESNA Standard 90.1-2007 (with errata but without addenda) in EA Prerequisite 2.

2. MR - Material and Resource:

a. MR Credit 4: Recycled Content:

(1) Percentage weight of post-consumer and pre-consumer recycled content using materials with recycled content.

(2) Recycled content value of product assembly by weight.

(3) Indicate total value (cost) of each product used.

d. MR Credit 6: Rapidly Renewable Materials: Foam core in panels using rapidly renewable buildings materials and products for 2.5 percent of the total value of all buildingmaterials and products used in the project (based on cost.)

3. IEQ - Indoor Environmental Quality:

a. IEQ Credit 4.1: Low-Emitting Materials, Adhesives and Sealants: Product data on adhesives and sealants to comply with standards of South Coast Air Quality Management District Rule #1168.

1.6 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Company specializing in manufacturing of all required aspects of insulated metal panel production.

1. No less than 10 years' experience in the actual production of specified products.

2. Third party certification of Quality Control program and materials utilized, in compliance with rigid factory guidelines, which includes quarterly unannounced inspections by independent testing laboratories, capable of providing reports directly to code authority.

3. Successfully completed not less than 100 comparable scale projects using this system.

4. Company specializing in manufacturing factory continuous lamination of insulated metal panels with a minimum documented experience of ten years.

4. Company specializing in on site manufacturing rigid foam insulation for the purpose of insulated metal panels with a minimum documented experience of ten years.

B. Installer's Qualifications: Experienced in installation of system similar in complexity for specific requirements.

1. Installer shall be responsible for installation of panel and support framing as specified in this section to comply with the following:

a. Wind load engineering to comply with code requirements.

2. Acceptable to or licensed by manufacturer.

C. Product Requirements:

1. Metal members (prone to rust) and wood or wood by-products (prone to moisture absorption and rot), shall not be permitted within the panel connection system.

2. Expanded Polystyrene (EPS) type I Rigid Foam Insulation must be kiln dried at 153 (F) degrees (67.22 degrees C) for seven simultaneous days by the manufacturer.

3. Insulated panels, related accessories, and construction details shall be in accordance with the following regulatory agency, where required:

a. United States Department of Agriculture (USDA)

b. Canadian Food Inspection Agency (CFIA)

4. Wall panels, insulated with Type ix Expanded Polystyrene (EPS) manufactured to EPS Type ix standards per (ASTM) C578.

5. Panel manufacturer shall have third party inspection of panel manufacturing process on a quarterly basis.

6. Foam plastic insulation components delivered to the job site shall bear the label of an approved agency showing the manufacturer's name, product listing, product identification, and information to indicate that the product is suitable for the intended use and will comply with code requirements.

D. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques, detail interfaces with other materials, corner condition, edge conditions, and application workmanship.

1. Finish areas designated by architect.

2. Do not proceed with remaining work until workmanship, color and sheen are approved by architect.

3. Refinish mock-up area as required to produce acceptable work.

E. Extra Stainless Steel Cladding Material:

1. Provide excess stainless steel coil material that was not required for the forming of the required panels and overage to be delivered to the project at the direction of the Construction Manager for maintence stock and for use in fabrication of other parts of the weathering system by others.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in per manufacturer's recommendation until ready for installation.

B. Store products off the ground, with panels sloped for drainage and covered to protect factory finishes from damage.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

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 WARRANTY

A. Provide manufacturer's one year limited warranty that panels are free from defects in materials and workmanship, beginning from the date of shipment of panels, but excluding coil coatings (paint finishes) covered under a separate warranty. Warranty does not include interior painted surface of panels.

B. Provide coil coater's written warranty on paint finish for adhesion to the substrate.

C. Provide exterior paint manufacturers written limited 25 year warranty for chalking and color fade of exterior paint finishes only.

PART 2: PRODUCTS & MATERIALS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
   a. Permatherm Inc.
   b. Precision Foam Fabricators
   c. Or prior approved equal.

2.2 Insulated Metal Wall Panels

A. Panel General Requirements: Roll-formed exterior and interior steel sheet faces laminated to panel grade Type IX expanded polystyrene (EPS) foam core. EPS foam core shall not contain CFC's, HCFC's or HFC's. Insulated wall panels shall be supplied in widths of as indicated on drawings. Panel lengths shall be factory cut to meet required site dimensions.

   1. Panel Thicknesses:

      a. See drawings for panel thicknesses

2.3 Materials

A. Interior Face

   1. Interior face of wall panels shall be clad with 26 gauge (0.455 mm) pre-painted G90 galvanized steel where indicated. Smooth face finish.

B. Exterior Face

   1. Exterior face of insulated panels shall be clad on the weather-exposed side with 26 gauge (0.455 mm) pre-painted G90 galvanized steel or 26 gauge polished stainless steel mirror finish (2BB) where indicated. Smooth face finish.

C. Lamination and Joint fabrication

   1. Metal skins shall be thermal-set to the Type IX EPS insulation. Insulated panels shall be manufactured individually laminated, insuring uniform adhesion between metal skins and EPS insulation.

2. Panel edges shall be fabricated with a tongue-in groove type panel connection system (slip joint).

3. Slip joints shall be sealed internally by running continuous beads of FSI-96 butyl caulking (or approved alternate) along the warm inside edge of the female side of the panel joints.

D. Foam Core:

1. Wall panels and ceiling panels shall consist of Type IX Expanded Polystyrene (EPS) insulation, density as indicated in drawings and as required for loading requirements of panels..

2. Finished panels shall have a Long Term R-value (LTR) of 4.76 per inch at 40 degrees F.
Insulation thickness of panels shall be adjusted in accordance with design R-value requirements.

3. Insulation shall not contain CFC's or HCFC's, or other expanding agents, resulting in zero ODP and zero VOC production.

4. Foam shall be Type IX EPS shall be manufactured with NOVA M33B or M77B bead size (or approved alternate), ensuring uniform densities throughout the insulation.

5. EPS Type IX panel grade insulation shall meet or exceed federal standards for Type IX EPS.

E. Exterior paint finish: Kynar paint System. Color to be selected by Architect from full Kynar color deck.

F. Interior paint finish: Kynar paint System. Color to be selected by Architect from full Kynar color deck.

G. Flashing and Trim: Brake-formed sheet metal in the same thickness and finish to match the panels.

H. Fasteners: Clips, anchoring devices, fasteners, and accessories for installation of panel system as recommended by panel manufacturer for the system specified.

I. Sealant: Sealant as recommended by panel manufacturer.

PART 3: INSTALLATION AND EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

1. Panel installer to verify that structural steel supports for wall panels are within tolerances in the AISC Code of Standard Practice, Section 7 and supplement modification controlling Section 7.11.3, adjustable items. Limit maximum deviation of steel alignment to plus or minus 3/16 inch (4mm) from the control with a 1/8 inch (3 mm) maximum change in deviation for any member for any 10 feet (3 m) length of panel.

2. Do not proceed until unsatisfactory conditions have been corrected.

B. If support system preparation is the responsibility of another installer, notify architect of unsatisfactory preparation before proceeding.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions and industry standards. Due to the nature of the finish workers will need to take care to protect the finish surfaces from dirt and oils that may be deposited during handling. It is advisable to wear suitable hand protection to minimize damage and cleaning at the end of construction. Review finishes and provide suitable, durable, clean gloves as required to protect the finish surfaces.

B. Fasteners according to manufacturer's recommendations and verified as suitable by the engineer or installer.

C. Factory fabrication of corner panels shall be mitered, flashed, and finished. .

D. Form panel shape as indicated on Drawings, accurate in size, square, and free from distortion or defects.

E. Install flashing and trim true and in proper alignment.

F. Install sealants where indicated to clean dry surfaces only without skips or voids, to ensure weather tightness and integrity of the vapor barrier.

3.3 FIELD QUALITY CONTROL

A. Installer shall make periodic inspections and issue report to architect regarding compliance with manufacturer's installation recommendations developed for the project.

3.4 ADJUSTING AND CLEANING

A. Repair damage caused during construction.

1. Paint: Touch-up mars, scratches, and cut edges to match original finish.
2. Polished Stainless Steel: Polish out mars or scratches to match original finish.
3. If repairs cannot be made to comply with architect's requirements, remove damage and install new materials.

B. Replace damaged panels and other components of work, which cannot be repaired by finish touch-up or similar minor repair.

C. Wipe clean finished surfaces clean prior to turn over at completion of project. Clean surfaces in accordance with manufacturer's instructions for each type of surface.

END OF SECTION 07435

SECTION 07531 - EPDM SINGLE-PLY MEMBRANE ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Adhered sheet roofing.
2. Roof insulation.
3. Walkway pads.

B. Related Sections include the following:

1. Division 6 Section "Rough Carpentry" for wood nailers, curbs, and blocking; and wood-based, structural-use roof deck panels.
2. Division 6 Section "Miscellaneous Carpentry" for wood nailers, curbs, and blocking; and wood-based, structural-use roof deck panels.
3. Division 7 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.
4. Division 7 Section "Roof Expansion Assemblies."
5. Division 7 Section "Joint Sealants."
6. Division 15 Section "Plumbing Specialties" for roof drains.

1.3 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 for definition of terms related to roofing work not otherwise defined in this Section.

1.4 PERFORMANCE REQUIREMENTS

A. General: Install sheet membrane roofing and base flashing that are watertight; will not permit the passage of liquid water; and will withstand wind loads, thermally induced movement, and exposure to weather without failure.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing system manufacturer based on testing and field experience.

C. FM Listing: Provide sheet membrane, base flashings, and component materials that meet requirements of FM 4450 and FM 4470 as part of a roofing system and that are listed in FM's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM markings.

1. Roofing system shall comply with the following:

a. Fire/Windstorm Classification: Class 1A-90.

D. Roofing System Design: Provide a roofing system that complies with roofing system manufacturer's written design instructions and with the following:

1. SPRI's "Wind Design Guide for Adhered Roofing Systems."

1.5 SUBMITTALS

A. Product Data: For each type of roofing product specified. Include data substantiating that materials comply with requirements.

B. Shop Drawings: Include plans, sections, and details of the following:

1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.

C. Samples for Verification: Of the following products:

1. 12-by-12-inch (300-by-300-mm) square of sheet roofing, of color specified, including T-shaped side and end lap seam.
2. 12-by-12-inch (300-by-300-mm) square of roof insulation.
3. 12-by-12-inch (300-by-300-mm) square of walkway pads or rolls.
4. 12-inch (300-mm) length of metal termination bars.
5. 12-inch (300-mm) length of battens.
6. 6 insulation fasteners of each type, length, and finish.
7. 6 roof cover fasteners of each type, length, and finish.

D. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install specified roofing system.

E. Manufacturer Certificates: Signed by roofing manufacturer certifying that the roofing system complies with requirements specified in the "Performance Requirements" Article. Upon request, submit evidence of meeting requirements.

F. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

G. Product Test Reports: Based on evaluation of tests performed by manufacturer and witnessed by a qualified independent testing agency, indicate compliance of components of roofing system with requirements based on comprehensive testing of current product compositions.

H. Research/Evaluation Reports: Evidence of roofing system's compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

I. Maintenance Data: For roofing system to include in the maintenance manuals specified in Division 1.

J. Warranty: Sample copy of standard roofing system manufacturer's warranty stating obligations, remedies, limitations, and exclusions of warranty.

K. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

L. LEED Submittals:
1. Credit SS 7.2: For roof materials, documentation indicating that roof materials comply with Solar Reflectance Index requirement.
   a. Product Data
   b. Laboratory Test Reports

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing roofing similar to that required for this Project and who is approved, authorized, or licensed by the roofing system manufacturer to install manufacturer's product.

B. Fire-Test-Response Characteristics: Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method indicated below by UL, FM, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Exterior Fire-Test Exposure: Class A; ASTM E 108, for application and slopes indicated.

C. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site. Meet with the same participants and review the same items listed for the preinstallation conference. In addition, review status of submittals and coordination of work related to roof construction. Notify participants at least 5 working days before conference.

D. Preinstallation Conference: Before installing roofing system, conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings." Notify participants at least 5 working days before conference.

1. Meet with Owner; Architect; Owner's insurer, if applicable; testing and inspecting agency representative; roofing Installer; roofing system manufacturer's representative; deck Installer; and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
4. Review loading limitations of deck during and after roofing.
5. Review flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing.
6. Review governing regulations and requirements for insurance, certificates, and inspection and testing, if applicable.
7. Review temporary protection requirements for roofing system during and after installation.
8. Review roof observation and repair procedures after roofing installation.
9. Document proceedings, including corrective measures or actions required, and furnish copy of record to each participant.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with roofing work only when existing and forecasted weather conditions permit roofing to be installed according to manufacturers' written instructions and warranty requirements.

1.9 WARRANTY

A. General Warranty: The warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Standard Roofing Manufacturer's Warranty: Submit a written warranty, without monetary limitation, signed by roofing system manufacturer agreeing to promptly repair leaks resulting from defects in materials or workmanship for the following warranty period:

1. Warranty Period: 20 years.

C. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering Work of this Section, including membrane roofing, sheet flashing, roof insulation, fasteners, and vapor retarders, if any, for the following warranty period:

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Firestone EPDM EcoWhite roof system or comparable product by one of the following:

1. EPDM Sheet:

a. Apache Products Co.
b. Atlas Roofing Corporation.
c. Celotex Corp. (The).
d. Carlisle Roofing Co.
d. GAF Materials Corp.
e. NRG Barriers, Inc.
f. Firestone EPDM EcoWhite or approved equal

2. Polyisocyanurate Board Insulation:

a. Apache Products Co.
b. Atlas Roofing Corporation.
c. Celotex Corp. (The).
d. Carlisle Roofing Co.
d. GAF Materials Corp.
e. NRG Barriers, Inc.

3. Perlite Board Insulation:

a. GAF Materials Corp.
b. Schuller Roofing Systems.

2.2 EPDM SHEET

A. EPDM Sheet: Uniform, flexible sheet formed from a terpolymer of ethylene-propylene-diene, complying with ASTM D 4637, Type 1, of the following grade, class, thickness, backing, and exposed face color:

1. Grade and Class: Grade 1 and Class U, unreinforced.
2. Thickness: 60 mils (1.5 mm), nominal.

3. Exposed Face Color: White. SRI Minimum 78

2.3 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by roofing system manufacturer for intended use and compatible with EPDM membrane roofing.

1. Furnish liquid-type auxiliary materials that meet VOC limits of authorities having jurisdiction.

B. Sheet Flashing: 60-mil- (1.5-mm-) thick EPDM, uncured or cured, according to application.

C. Epichlorohydrin Sheet: 60-mil- (1.5-mm-) thick, unreinforced flexible sheet with the following properties as determined per ASTM test method indicated:

1. Tensile Strength: 1500 psi (10.3 MPa); ASTM D 412.
2. Ultimate Elongation: 200 percent; ASTM D 412.
3. Tear Resistance: 150 lbf/in. (26.3 kN/m); ASTM D 412.
4. Brittleness Temperature: Minus 20 deg F (Minus 29 deg C); ASTM D 746.
5. Resistance to Ozone Aging: No cracks after 168 hours' exposure of 50 percent elongated sample at 104 deg F (40 deg C) and 100-pphm (100-MPa) ozone; ASTM D 1149.
6. Resistance to Oil Aging: 15 percent maximum mass change after 168 hours' immersion in diesel fuel No. 2 at 158 deg F (70 deg C); ASTM D 471.

D. Bonding Adhesive: Manufacturer's standard bonding adhesive.

E. Splice Adhesive and Cleaner: Single-component butyl splicing adhesive and solvent-based splice cleaner.

F. Splice Primer and Tape: Manufacturer's standard synthetic rubber polymer primer and 3-inch- (75-mm-) wide minimum, butyl splice tape with release film.

G. Lap Sealant: Manufacturer's standard single-component sealant.

H. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.

I. Metal Termination Bars: Manufacturer's standard aluminum bars, approximately 1 inch (25 mm) wide, roll formed and prepunched.

J. Metal Battens: Manufacturer's standard aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch (25 mm) wide by 0.05 inch (1.3 mm) thick, prepunched.

K. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions of FM 4470, designed for fastening sheet to substrate, and acceptable to roofing system manufacturer.

L. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, in-seam sealants, termination reglets, and other accessories recommended by roofing system manufacturer for intended use.

2.5 VAPOR RETARDER

A. Polyethylene Vapor Retarder: ASTM D 4397, 6 mils (0.15 mm) thick, minimum, with maximum permeance rating of 0.13 perm (7.5 ng/Pa x s x sq. m).

1. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor retarder manufacturer for sealing joints and penetrations in vapor retarder.
2. Adhesive: Manufacturer's standard roofing adhesive, FM approved for vapor-retarder application.

2.6 INSULATION MATERIALS

A. General: Provide preformed roof insulation boards that comply with requirements, selected from manufacturer's standard sizes and of thicknesses indicated.

1. Provide preformed, tapered insulation boards where indicated for sloping to drain. Fabricate with the following taper:

a. As indicated on Drawings.

2. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

B. Polyisocyanurate Board Insulation: Rigid, cellular polyisocyanurate thermal insulation with core formed by using HCFCs as blowing agents to comply with ASTM C 1289, classified by facer type as follows:

1. Facer Type: Type II, felt or glass-fiber mat on both major surfaces.

2.7 INSULATION ACCESSORIES

A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatible with sheet roofing material.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions of FM 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

C. Metal Securement System: L-shaped securement flashing and other required insulation strapping fabricated from stainless steel, a minimum of 0.031 inch (0.8 mm) thick. Provide fasteners as recommended by insulation manufacturer.

2.8 ASPHALT MATERIALS

A. Roofing Asphalt: ASTM D 312, Type III or IV.

B. Asphalt Primer: ASTM D 41.

2.9 WALKWAY PADS

A. Walkway Pad Rolls: X-Tred Walkway Pad as manufactured by Firestone Building Products or approved equal compatible with roofing system similarly approved. Factory-formed, open grid, 100% TPO, slip-resisting, surface-textured grid, approximately 9/16 inch (14 mm) thick, and acceptable to roofing system manufacturer.

B. Attachment strips: Ultra-Ply Membrane strips cut to recommended size and heat welded to field membrane per manufacturers recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions under which roofing will be applied, with Installer present, for compliance with requirements.

B. Verify that roof openings and penetrations are in place and set and braced and that roof drains are properly clamped into position.

C. Verify that wood nailers are in place and secured and match thicknesses of insulation required.

D. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of the roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 INSULATION INSTALLATION

A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with roofing system manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated and to Shop Drawings.

D. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2 inches (50 mm) or greater, install required thickness in 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.

1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.

G. Attached Insulation: Prime surface of deck with asphalt primer at rate of 3/4 gal./100 sq. ft. (0.3 L/sq. m) and allow primer to dry. Set each layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F (14 deg C) of equiviscous temperature and at a rate required by insulation manufacturer.

OR

Attached Insulation: Attach insulation to metal deck utiizing mechanical anchors with size and spacing as requitred for complete anchorage to comply with uplift load calculated for field, perimeter, and corners, providing the spcing bsaed on the most stringent losading criteria calculated.

I. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Loosely butt cover boards together and fasten to roof deck according to roofing system manufacturer's written instructions.

3.5 ADHERED SHEET INSTALLATION

A. Install EPDM sheet over area to receive roofing according to roofing system manufacturer's written instructions. Unroll sheet and allow to relax for a minimum of 30 minutes.

B. Start installation of sheet in presence of roofing system manufacturer's technical personnel.

C. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Apply bonding adhesive to substrate and underside of sheet at rate required by manufacturer and allow to partially dry. Do not apply bonding adhesive to splice area of sheet.

E. Apply a solid mopping of hot roofing asphalt to substrate at rate required by manufacturer and install fabric-backed sheet. Do not apply roofing asphalt to splice area of sheet.

F. Mechanically or adhesively fasten sheet securely at terminations and perimeter of roofing.

G. Apply roofing sheet with side laps shingled with slope of roof deck where possible.

H. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing sheet in place with clamping ring.

I. Apply epichlorohydrin sheet over EPDM sheet at locations indicated according to roofing system manufacturer's written instructions.

3.6 SEAM INSTALLATION

A. Clean both faces of splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet terminations.

1. Apply a continuous bead of in-seam sealant before closing splice if required by roofing system manufacturer.

B. Clean and prime both faces of splice areas, apply splice tape, and firmly roll side and end laps of overlapping sheets according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet terminations.

C. Repair tears, voids, and lapped seams in roofing that does not meet requirements.

3.7 FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of flashing sheet at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing as recommended by manufacturer.

D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

E. Terminate and seal top of sheet flashings.

F. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.8 WALKWAY INSTALLATION

A. Walkways: Install walkway pads in locations indicated with Side A as top surface. Attach walkway products to field membrane with cut strips (3/4” x 10”) of UltraPly membrane. Thread strips through pad grid. With weathering side up, heat weld ends down onto field membrane. Avoid attaching strips over heat welded TPO seams in the field membrane. Space strips approximately 36” apart on sides, and minimum 2 at ends.

3.9 FIELD QUALITY CONTROL

A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.

1. Notify Architect or Owner 48 hours in advance of the date and time of inspection.

3.10 PROTECTING AND CLEANING

A. Protect sheet membrane roofing from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing that does not comply with requirements, repair substrates, reinstall roofing, and repair sheet flashings to a condition free of damage and deterioration at the time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.11 ROOFING INSTALLER'S WARRANTY

A. WHEREAS <NAME> of <ADDRESS>, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner:
2. Address:
3. Building Name/Type:
4. Address:
5. Area of Work:
6. Acceptance Date:
7. Warranty Period:
8. Expiration Date:

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:

a. lightning;
b. peak gust wind speed exceeding 110 mph;
c. fire;
d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
f. vapor condensation on bottom of roofing; and
g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof has been paid by Owner or by another responsible party so designated.
3. The Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents, resulting from leaks or faults or defects of work.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void, unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. The Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

END OF SECTION 07531

SECTION 07810 - SPRAY-APPLIED FIRE RESISTIVE MATERIALS

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 Sprayed-Applied Fire-Resistive Materials (SFRMs).

B. Related Requirements:

1. Division 05 Section Structural Steel
2. Division 05 Section Steel Floor Deck

1.3 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1. Review products, design ratings, restrained and unrestrained conditions, densities, thicknesses, bond strengths, and other performance requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:

1. Product Data for Credit EQ 4.2: For paints and coatings, documentation including printed statement of VOC content.
2. Laboratory Test Reports for Credit EQ 4: For paints and coatings used inside the weatherproofing system, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Drawings: Framing plans, schedules, or both, indicating the following:

1. Extent of fireproofing for each construction and fire-resistance rating.
2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
3. Minimum fireproofing thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
4. Treatment of fireproofing after application.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and testing agency.

B. Product Certificates: For each type of fireproofing.

C. Evaluation Reports: For fireproofing, from ICC-ES.

D. Preconstruction Test Reports: For fireproofing.

E. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.

B. Mockups:

1. Build mockup in area designated at pre-installation meeting. Mock up shall include all elements and components of the approved SFRM system.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

C. It is recommended that industry guidelines as noted in National Fireproofing Contractors Association (NFCA) 100 – Standard Practice for the Application of Spray-Applied Fire Resistive Materials (SFRMs) be maintained on the project site.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified testing agency to perform preconstruction testing on fireproofing.

1. Provide test specimens and assemblies representative of proposed materials and construction.

B. Preconstruction Adhesion and Compatibility Testing: Test for compliance with requirements for specified performance and test methods.

1. Bond Strength: Test for cohesive and adhesive strength according to ASTM E 736. Provide bond strength indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
2. Density: Test for density according to ASTM E 605. Provide density indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
3. Verify that manufacturer, through its own laboratory testing or field experience, attests that primers or coatings are compatible with fireproofing.
4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
5. For materials failing tests, obtain applied-fireproofing manufacturer's written instructions for corrective measures including the use of specially formulated bonding agents or primers.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is 40 degree F (4.4 degree C) or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours prior to, during, and for 24 hours after product application.

B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing a minimum 4 complete air exchanges per hour and according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.

B. Source Limitations: Obtain fireproofing from single source.

C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119/UL 263 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Steel members are to be considered unrestrained unless specifically noted otherwise.

D. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction.

E. Low-Emitting Materials: Fireproofing used within the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

F. Asbestos: Provide products containing no detectable asbestos.

2.2 SPRAY-APPLIED FIRE RESISTIVE MATERIALS

A. SFRM: Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design, and mixed with water at Project site to form a slurry or mortar before conveyance and application or conveyed in a dry state and mixed with atomized water at place of application.

B. Products: Subject to compliance with requirements, provide one of the following:
1. Concealed/Commercial SFRMs:
a. Isolatek International; CAFCO® 300 Series, CAFCO® BLAZE-SHIELD® II
b. Physical Properties:
1) Bond Strength: Minimum 150-lbf/sq. ft. (7.18-kPa) cohesive and adhesive strength based on field testing according to ASTM E 736.
2) Density: Not less than 15 lb/cu. ft. (240 kg/cu. m) as specified in the approved fire-resistance design, according to ASTM E 605.
3) Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design.
4) Combustion Characteristics: When tested in accordance with ASTM E 136 shall be noncombustible.
5) Surface-Burning Characteristics: When tested in accordance with ASTM E84 or CAN4-S102, the material shall exhibit the following surface burning characteristics:
a) Flame Spread Index 10 or less
b) Smoke Developed 10 or less
6) Compressive Strength: When tested in accordance with ASTM E761, the material shall not deform more than 10 percent when subjected to a crushing force of 750 psf (35.9 kPa).
7) Corrosion Resistance: No evidence of corrosion according to ASTM E 937.
8) Deflection: No cracking, spalling, or delamination according to ASTM E 759.
9) Effect of Impact on Bonding: No cracking, spalling, or delamination according to ASTM E 760.
10) Air Erosion: Maximum weight loss of 0.025 g/sq. ft. (0.270 g/sq. m) in 24 hours according to ASTM E 859.
11) Fungal Resistance: When tested in accordance with ASTM G21, the material shall show resistance to mold growth for a minimum period of 28

2.3 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

B. Substrate Primers: Primers approved by fireproofing manufacturer and complying with one or both of the following requirements:

1. Fireproofing manufacturer shall be contacted for procedures on handling primed/painted steel.
2. Primer's bond strength in required fire-resistance design complies with specified bond strength for fireproofing and with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction, based on a series of bond tests according to ASTM E 736.

C. Bonding Agent: Product approved by fireproofing manufacturer and complying with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction.

D. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required, according to fire-resistance designs indicated and fireproofing manufacturer's written recommendations. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive fireproofing.

E. Reinforcing Fabric: Glass or carbon fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by fireproofing manufacturer.

F. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fireproofing manufacturer. Include pins and attachment.

G. Sealer: If required, a transparent-drying, water-dispersible, tinted protective coating as recommended by fireproofing manufacturer.

1. Product: Subject to compliance with requirements, provide CAFCO® BOND-SEAL or CAFCO® BOND-SEAL Type X" by Isolatek International.

H. Topcoat: If required, a topcoat suitable for application over applied fireproofing; of type recommended by fireproofing manufacturer.

1. Cement-Based Topcoat: Factory-mixed, cementitious hard-coat formulation for trowel or spray application over SFRM.

a. Product: Subject to compliance with requirements, provide CAFCO® FENDOLITE® M-II/CAFCO® FENDOLITE® TG by Isolatek International.

2. Water-Based Permeable Topcoat: Factory-mixed formulation for brush, roller, or spray application over applied SFRM. Provide application at a rate of [30 sq. ft./gal. (0.75 sq. m/L)] [60 sq. ft./gal. (1.5 sq. m/L)] [120 sq. ft./gal. (3 sq. m/L)].

a. Product: Subject to compliance with requirements, provide CAFCO® TOP-COTE by Isolatek International.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design. Verify compliance with the following:

1. Substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fireproofing with substrates under conditions of normal use or fire exposure.
2. Clips, hangers, supports, sleeves and other attachments to the substrate are to be placed by others prior to the application of the fireproofing materials.
3. The installation of ducts, piping, conduit or other suspended equipment shall not take place until the application of the fireproofing is complete in an area.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

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

3.2 PREPARATION

A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.

B. Clean substrates of substances that could impair bond of fireproofing.

3.3 APPLICATION

A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, sealers, topcoats, finishing, and other materials and procedures affecting fireproofing work.

B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.

1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.

D. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written recommendations for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.

E. Spray apply fireproofing to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.

F. Extend fireproofing in full thickness over entire area of each substrate to be protected.

G. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.

H. For applications over encapsulant materials, including lockdown (post-removal) encapsulants, apply fireproofing that differs in color from that of encapsulant over which it is applied.

I. Where sealers are used, apply products that are tinted to differentiate them from fireproofing over which they are applied.

J. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.

K. Cure fireproofing according to fireproofing manufacturer's written recommendations.

L. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.

M. Finishes: Where indicated, apply fireproofing to produce the following finishes:

1. Manufacturer's Standard Finishes: Finish according to manufacturer's written instructions for each finish selected.
2. Spray-Textured Finish: Finish left as spray-applied with no further treatment.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Test and inspect as required by the IBC, 1704.10.

2. For reference, utilize AWCI - Inspection Procedure for Field-Applied Sprayed Fire-Resistive Materials, Technical Manual 12-A; an annotated guide.

B. Test and inspect completed work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.

C. Fireproofing will be considered defective if it does not pass tests and inspections.

1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.

D. Prepare test and inspection reports.

3.5 CLEANING, PROTECTING, AND REPAIRING

A. Cleaning: Immediately after completing spraying operations in each containable area of project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

B. Protect fireproofing, according to advice of manufacturer and installer, from damage resulting from construction operations or other causes, so fireproofing will be without damage or deterioration at time of Substantial Completion.

C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.

D. Repair fireproofing damaged by other work before concealing it with other construction.

E. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION 07810

SECTION 07901 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes sealants for the following applications:

1. Exterior joints in the following vertical surfaces and nontraffic horizontal surfaces:

a. Joints between different materials.
b. Perimeter joints between materials and frames of doors and windows.
c. Other joints as indicated.

2. Exterior joints in the following horizontal traffic surfaces:

a. Control, expansion, and isolation joints in cast-in-place concrete slabs adjacent to structures.
b. Other joints as indicated.

3. Interior joints in the following 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. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
d. Perimeter joints between interior wall surfaces and frames of interior doors, and windows.
e. Joints between plumbing fixtures and adjoining walls, floors, and counters.
f. Other joints as indicated.

4. Interior joints in the following horizontal traffic surfaces:

a. Control and expansion joints in cast-in-place concrete slabs.
b. Other joints as indicated.

C. Related Sections include the following:

1. Division 2 Section "Pavement" for sealing joints in pavements, walkways, and curbing.
2. Division 8 Section "Glazing" for glazing sealants.

1.3 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.

1.4 SUBMITTALS

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

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Product Certificates: Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.

D. Warranties: Special warranties specified in this Section.

E. LEED Submittals:
1. Credit IEQ 4.1: For adhesives and sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
a. Product Data
b. Laboratory Test Reports

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multi-component materials.

B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer.
2. When joint substrates are wet.

B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.8 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Provide manufacturer’s warranty for material and installation for minimum five year period commencing on date of Final Completion.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified in the sealant schedules at the end of Part 3.

2.2 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 for this characteristic.

2.3 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant in the Elastomeric Joint-Sealant Schedule at the end of Part 3, including those referencing ASTM C 920 classifications for type, grade, class, and uses.

B. Additional Movement Capability: Where additional movement capability is specified in the Elastomeric Joint-Sealant Schedule, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at the time of installation and remain in compliance with other requirements of ASTM C 920 for uses indicated.

C. Stain-Test-Response Characteristics: Where elastomeric sealants are specified in the Elastomeric Joint-Sealant Schedule to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

2.4 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are non-staining; 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: ASTM C 1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

1. Open cell foam.

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.

2.5 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 with joint substrates.

C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

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

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. 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 from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:

    a. Concrete.

3. Remove laitance and form-release agents from concrete.
4. 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.

    a. Metal.
    b. Glass.

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.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. 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.

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

D. Install sealants by proven techniques to 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 provided for each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Non-sag 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 sealants from surfaces adjacent to joint.
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.

3.4 CLEANING

A. Clean off excess sealants 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.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

3.6 ELASTOMERIC JOINT-SEALANT SCHEDULE

A. Low-Modulus Nonacid-Curing Silicone Sealant. Where joint sealants of this type are indicated, provide products complying with the following:

1. Products: Available products include the following:

    a. 790; Dow Corning.
    b. Silpruf; GE Silicones.
    c. UltraPruf SCS2300; GE Silicones.
    d. HiFlex 331; NUCO Industries, Inc.
    e. NuFlex 309; NUCO Industries, Inc.
    f. VP 275; Ohio Sealants, Inc.
    g. 864; Pecora Corporation.
    h. 890; Pecora Corporation.
    i. PSI-641; Polymeric Systems, Inc.
    j. Omniseal; Sonneborn Building Products Div., ChemRex Inc.
    k. Spectrem 1; Tremco.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Additional Movement Capability: 50 percent movement in extension and 50 percent movement in compression for a total of 100 percent movement.
5. Use Related to Exposure: NT (nontraffic).
6. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.

    a. Use O Joint Substrates: Coated glass, anodic aluminum, galvanized steel, concrete, masonry, painted surfaces.

7. Stain-Test-Response Characteristics: Nonstaining to porous substrates per ASTM C 1248.
8. Applications:

    a. Perimeter of hollow metal door/windows.
    b. Metal to metal, metal to concrete, metal to gwb.

B. Mildew-Resistant Silicone Sealant. Where joint sealants 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. Products. Available products include the following:

    a. 786 Mildew Resistant; Dow Corning.
    b. Sanitary 1700; GE Silicones.
    c. NuFlex 302; NUCO Industries, Inc.
    d. 898 Silicone Sanitary Sealant; Pecora Corporation.
    e. PSI-611; Polymeric Systems, Inc.
    f. Tremsil 600 White; Tremco.

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. Use O Joint Substrates: Coated glass, glass fiber reinforced plastic panels, anodic aluminum, stainless steel, galvanized steel, ceramic fixtures and ceramic tile.

6. Applications:

    a. Vertical and floor/ceiling intersections of glass fiber reinforced plastic panels.
    b. At base and wall attachments of plumbing fixtures.
    c. Counter top/wall interface at casework.

C. LATEX JOINT SEALANTS: Provide manufacturer's standard one-part, nonsag, mildew-resistant, paintable latex sealant of formulation indicated that is recommended for exposed applications on interior and protected exterior locations and that accommodates indicated percentage change in joint width existing at time of installation without failing either adhesively or cohesively.

1. Acrylic-Emulsion Sealant:

    a. "AC-20," Pecora Corp.
    b. "Sonolac," Sonneborn Building Products Div., ChemRex, Inc.
    c. "Tremco Acrylic Latex 834," Tremco, Inc.

2. Applications:

    a. Painted vertical and floor/ceiling intersections.
    b. At base and wall appurtenance joint to painted wall finish.
    c. Painted frame to painted wall finish.

END OF SECTION 07920

SECTION 08110 - STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes steel doors and frames.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 8 Section "Door Hardware" for door hardware and weatherstripping.
2. Division 9 Section "Gypsum Board Assemblies" for spot grouting frames in gypsum board partitions.
3. Division 9 Section "Painting" for field painting primed doors and frames.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of door and frame specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, profiles, and finishes.

C. Shop Drawings showing fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.

D. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on Contract Drawings.

E. LEED Submittals:

1. Credit MR C4: For products having recycled content, including postconsumer and pre-consumer recycled content. Provide the following information:
   a. Product Data
   b. Percent Content (post and pre-consumer)
   c. Invoices indicating cost of material (no labor included.)

2. Credit MR C5: For products and materials that comply with requirements for regional materials based on location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Provide the following information:
   a. Product Data
   b. Fraction by weight of regional material
   c. Invoices indicating cost of material (no labor included.)
   d. Distance from Project

3. Credit IEQ 4.2: For paints and coatings, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
   a. Product Data
   b. Laboratory Test Reports

1.4 QUALITY ASSURANCE

A. Provide doors and frames complying with ANSI/SDI 100 "Recommended Specifications for Standard Steel Doors and Frames" and as specified.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage.

B. Inspect doors and frames on delivery for damage. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect; otherwise, remove and replace damaged items as directed.

C. Store doors and frames at building site under cover. Place units on minimum 4-inch- (100-mm-) high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If cardboard wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch (6-mm) spaces between stacked doors to promote air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
1. Steel Doors and Frames:

a. Amweld Building Products, Inc.
b. Benchmark Commercial Doors.
c. Ceco Door Products.
d. Copco Door Co.
e. Curries Co.
f. NADCOR
g. Steelcraft, Ingersoll Rand Co.

2.2 MATERIALS

A. Hot-Rolled Steel Sheets and Strip: Commercial-quality carbon steel, pickled and oiled, complying with ASTM A 569 (ASTM A 569M).

B. Cold-Rolled Steel Sheets: Carbon steel complying with ASTM A 366 (ASTM A 366M), commercial quality, or ASTM A 620 (ASTM A 620M), drawing quality, special killed.

C. Galvanized Steel Sheets: Zinc-coated carbon steel complying with ASTM A 526 (ASTM A 526M), commercial quality, or ASTM A 642 (ASTM A 642M), drawing quality, hot-dip galvanized according to ASTM A 525, with A 60 or G 60 (ASTM A 525M, with Z 180 or ZF 180) coating designation, mill phosphatized.

D. Supports and Anchors: Fabricated from not less than 0.0478-inch- (1.2-mm-) thick steel sheet; 0.0516-inch- (1.3-mm-) thick galvanized steel where used with galvanized steel frames.

E. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are to be built into exterior walls, hot-dip galvanize complying with ASTM A 153, Class C or D as applicable.

2.3 DOORS

A. Steel Doors: Provide 1-3/4-inch- (44-mm-) thick doors of materials and ANSI/SDI 100 grades and models specified below, or as indicated on Drawings or schedules:

1. Interior Doors: Grade II, heavy-duty, Model 2, seamless design, minimum 0.0598-inch(16 ga.) thick cold-rolled steel sheet faces.
2. Exterior Doors: Grade II, heavy-duty, Model 2, seamless design, minimum 0.0747-inch- (14 ga.) thick galvanized steel sheet faces.

2.4 FRAMES

A. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, according to ANSI/SDI 100, and of types and styles as shown on Drawings and schedules. Conceal fastenings, unless otherwise indicated. Fabricate frames of minimum 0.0598-inch thick cold-rolled steel sheet.

1. Fabricate frames with mitered or coped and continuously welded corners.
2. Form exterior frames from 0.0747-inch- thick galvanized steel sheet.

B. Door Silencers: Except on weatherstripped frames, drill stops to receive 3 silencers on strike jambs of single-door frames and 2 silencers on heads of double-door frames.

C. Plaster Guards: Provide minimum 0.0179-inch- (0.45-mm-) thick steel plaster guards or mortar boxes at back of hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.

2.5 FABRICATION

A. Fabricate steel door and frame units to be rigid, neat in appearance, and free from defects, warp, or buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site. Comply with ANSI/SDI 100 requirements.

1. Internal Construction: One of the following manufacturer's standard core materials according to SDI standards:

a. Rigid polyurethane conforming to ASTM C 591.

2. Clearances: Not more than 1/8 inch (3.2 mm) at jambs and heads, except not more than 1/4 inch (6.4 mm) between non-fire-rated pairs of doors. Not more than 3/4 inch (19 mm) at bottom.

B. Fabricate exposed faces of doors and panels from only cold-rolled steel sheet.

C. Tolerances: Comply with SDI 117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.

E. Galvanized Steel Doors, Panels, and Frames: For all exterior locations locations, fabricate doors, panels, and frames from galvanized steel sheet according to SDI 112. Close top and bottom edges of doors flush as an integral part of door construction or by addition of minimum 0.0635-inch- (1.6-mm-) thick galvanized steel channels, with channel webs placed even with top and bottom edges. Seal joints in top edges of doors against water penetration.

F. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.

G. Thermal-Rated (Insulating) Assemblies: At exterior locations and elsewhere as shown or scheduled, provide doors fabricated as thermal-insulating door and frame assemblies and tested according to ASTM C 236 or ASTM C 976 on fully operable door assemblies.

1. Unless otherwise indicated, provide thermal-rated assemblies with U-value rating of 0.41 Btu/sq. ft. x h x deg F (2.33 W/sq. m x K) or better.

H. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements of SDI 107 and ANSI A115 Series specifications for door and frame preparation for hardware.

I. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.

J. Locate hardware as indicated on Shop Drawings or, if not indicated, according to the Door and Hardware Institute's (DHI) "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."

2.6 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual" for recommendations relative to applying and designating finishes.

B. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for steel sheet finishes.

C. Apply primers and organic finishes to doors and frames after fabrication.

2.7 GALVANIZED STEEL SHEET FINISHES

A. Surface Preparation: Clean surfaces with non-petroleum solvent so that surfaces are free of oil or other contaminants. After cleaning, apply a conversion coating of the type suited to the organic coating applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.

1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.

B. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply air-dried primer specified below immediately after cleaning and pretreatment.

1. Shop Primer: Zinc-dust, zinc-oxide primer paint complying with performance requirements of FS TT-P-641, Type II.

2.8 STEEL SHEET FINISHES

A. Surface Preparation: Solvent-clean surfaces to comply with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel to comply with SSPC-SP 5 (White Metal Blast Cleaning) or SSPC-SP 8 (Pickling).

B. Pretreatment: Immediately after surface preparation, apply a conversion coating of type suited to organic coating applied over it.

C. Factory Priming for Field-Painted Finish: Apply shop primer that complies with ANSI A224.1 acceptance criteria, is compatible with finish paint systems indicated, and has capability to provide a sound foundation for field-applied topcoats. Apply primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.

B. Placing Frames: Comply with provisions of SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.

1. Except for frames located in existing concrete, masonry, or gypsum board assembly construction, place frames before constructing enclosing walls and ceilings.
2. At concrete construction, install at least 3 completed opening anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Set frames and secure to adjacent construction with bolts and masonry anchorage devices.
4. In metal-stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In steel-stud partitions, attach wall anchors to studs with screws.

C. Door Installation: Fit hollow-metal doors accurately in frames, within clearances specified in ANSI/SDI 100.

3.2 ADJUSTING AND CLEANING

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

B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION 08110

SECTION 08120 - ALUMINUM FRAMES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes interior aluminum frames for doors and glazing installed in gypsum board partitions.

B. Related Sections:

1. Section 08211 "Flush Wood Doors" for wood doors installed in interior aluminum frames.
2. Section 08410 "Aluminum Entrances and Storefronts" for aluminum-framed glass doors installed in interior aluminum frames.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, fire-resistance rating, and finishes.

B. Shop Drawings: Include the following:

1. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
2. Locations of reinforcements and preparations for hardware.
3. Details of each different wall-opening condition.
4. Details of anchorages, joints, field splices, and connections.
5. Details of accessories.
6. Details of moldings, removable stops, and glazing.
7. Details of conduits and preparations for power, signal, and control systems.

C. Samples for Initial Selection: For units with factory-applied finishes.

1. Include similar Samples of seals, gaskets, and accessories involving color selection.

D. Samples for Verification: For interior aluminum frames, prepared on Samples of size indicated below:

1. Framing Member: 12 inches long.
2. Corner Fabrication: 12-by-12-inch- long, full-size window corner, including full-size sections of extrusions with factory applied color finish.

E. Schedule: for interior aluminum frames. Use same designations indicated on Drawings. Coordinate with door hardware schedule and glazing.

F. LEED Submittals:

1. Credit MR C4: For products having recycled content, including postconsumer and pre-consumer recycled content. Provide the following information:
   a. Product Data
   b. Percent Content (post and pre-consumer)
   c. Invoices indicating cost of material (no labor included.)

2. Credit MR C5: For products and materials that comply with requirements for regional materials based on location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Provide the following information:
   a. Product Data
   b. Fraction by weight of regional material

c. Invoices indicating cost of material (no labor included.)
d. Distance from Project

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of interior aluminum frame.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For interior aluminum frames to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain interior aluminum frames from single source from single manufacturer.

B. Fire-Rated Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

C. Smoke- and Draft-Control Assemblies At corridors, smoke barriers, and smoke partitions, provide assemblies tested according UL 1784 and installed in compliance with NFPA 105.

1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. at the tested pressure differential of 0.3-inch wg of water.

D. Mockups: Build mockups to verify selections under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical wall area as shown on Drawings.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Preinstallation Conference: Conduct conference at Project site.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver interior aluminum frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic. Store interior aluminum frames under cover at Project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Wilson Partitions, Series 200 with 1-1/2" snap on trim or comparable product by one of the following:

1. Advanced Architectural Frames.
2. Custom Components Company.
3. Dual Lock Partition Systems, Inc.; Avalon International Aluminum.
4. Frameworks Manufacturing.
5. Interior Components Inc.
6. Modulex, Inc; Division of Pacific National Group.
7. RACO Interior Products, Inc.
8. Versatrac.
9. Western Integrated Materials, Inc.
10. Wilson Partitions.

2.2 COMPONENTS

A. Aluminum Framing: ASTM B 221 Alloy 6063-T5 or alloy and temper required to suit structural and finish requirements, not less than 0.062 inch thick.

B. Door Frames: Extruded aluminum, reinforced for hinges, strikes, and closers.

1. 90-Minute Fire-Protection Rating: Fabricate aluminum frame assemblies with a cold- formed, primed, interior steel liner.

C. Glazing Frames: Extruded aluminum, for glazing thickness indicated.
D. Ceiling Tracks: Extruded aluminum.
E. Trim: Extruded aluminum, not less than 0.062 inch thick, with removable snap-in casing trim, glazing stops, and door stops without exposed fasteners.

1. Trim Style: Square flush trim, 1-1/2” wide.

2.3 ACCESSORIES

A. Fasteners: Aluminum, nonmagnetic, stainless-steel or other noncorrosive metal fasteners compatible with frames, stops, panels, reinforcement plates, hardware, anchors, and other items being fastened.

B. Door Silencers: Manufacturer's standard continuous mohair, wool pile, or vinyl seals; grey.

C. Smoke Seals: Intumescent strip or fire-rated gaskets; grey.

D. Glazing Gaskets: Manufacturer's standard extruded or molded plastic, to accommodate glazing thickness indicated**; grey.**

E. Glazing: Comply with requirements in Section 08800 "Glazing."

F. Hardware: Comply with requirements in Section 08710 "Door Hardware".

2.4 FABRICATION

A. Provide concealed corner reinforcements and alignment clips for accurately fitted hairline joints at butted or mitered connections.

B. Factory prepare interior aluminum frames from template to receive mortised hardware; include cutouts, reinforcements, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Section 087100 "Door Hardware."

1. Locate hardware as required by fire-rated label for assembly.

C. Fabricate frames for glazing with removable stops to allow glazing replacement without dismantling frame.

1. Locate removable stops on the inside of spaces accessed by keyed doors.

D. Fabricate components to allow secure installation without exposed fasteners.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls, floors, and ceilings, with Installer present, for conditions affecting performance of the Work.

B. Verify that wall thickness does not exceed standard tolerances allowed by throat size indicated.

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

3.2 INSTALLATION

A. General: Install interior aluminum frames plumb, rigid, properly aligned, and securely fastened in place; comply with manufacturer's written instructions.

B. Set frames accurately in position and plumbed, aligned, and securely anchored to substrates.

1. At fire-protection-rated openings, install interior aluminum frames according to NFPA 80 and NFPA 105.

C. Install frame components in the longest possible lengths; components up to 96 inches long must be one piece.

1. Fasten to suspended ceiling grid on maximum 24” centers, using sheet metal screws or other fasteners approved by frame manufacturer.
2. Use concealed installation clips to produce tightly fitted and aligned splices and connections.
3. Secure clips to extruded main-frame components and not to snap-in or trim members.
4. Do not leave screws or other fasteners exposed to view when installation is complete.

3.3 CLEANING

A. Clean exposed frame surfaces promptly after installation, using cleaning methods recommended by frame manufacturer and according to AAMA 609 & 610.

B. Touch up marred frame surfaces so touchup is not visible from a distance of 48 inches. Remove and replace frames with damaged finish that cannot be satisfactorily repaired.

END OF SECTION 08120

SECTION 08211 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Solid-core doors with wood-veneer faces.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.
4. Solid-core doors with plastic-laminate faces.

1.3 SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction, trim for openings.

1. Include factory-finishing specifications.

B. Samples for Verification: As follows:

1. Corner sections of doors approximately 8 by 10 inches with door faces and edgings representing the typical range of color and grain for each species of veneer, each plastic laminate type, and solid lumber required. Finish sample with same materials proposed for factory-finished doors.

C. LEED Submittals:

1. Credit MR C4: For products having recycled content, including postconsumer and pre-consumer recycled content. Provide the following information:
   a. Product Data
   b. Percent Content (post and pre-consumer)
   c. Invoices indicating cost of material (no labor included.)

2. Credit MR C5: For products and materials that comply with requirements for regional materials based on location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Provide the following information:
   a. Product Data
   b. Fraction by weight of regional material
   c. Invoices indicating cost of material (no labor included.)
   d. Distance from Project

3. Credit MR C6: For products and material that is certified as rapidly renewable material. Provide the following information:
   a. Product Data
   b. Quantity of material
   c. Invoices indicating cost of material (no labor included.)

4. Credit MR C7: For wood products that are certified in accordance with FSC principles and criteria including chain-of-custody certificates.
   a. Product Data
   b. Quantity of FSC certified material
   c. Quantity of non-FSC certified material
   d. Line item cost of all wood material
   e. Chain-of-custody certificates for all FSC certified material

5. Credit IEQ 4.1: For adhesives and sealants, documentation indicating that products comply

with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
a. Product Data
b. Laboratory Test Reports

6. Credit IEQ 4.2: For paints and coatings, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
   a. Product Data
   b. Laboratory Test Reports

7. Credit IEQ 4.4: For all composite wood and agrifiber products installed in the building interior, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
   a. Product Data
   b. Laboratory Test Reports

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.

B. Quality Standard: Comply with the following standard:

1. NWWDA Quality Standard: NWWDA I.S.1-A, "Architectural Wood Flush Doors."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect doors 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 plastic bags or cardboard cartons.

B. Mark each door with individual opening numbers used on Shop Drawings. Use removable tags or concealed markings.

1.6 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 levels during the remainder of the construction period.

1.7 WARRANTY

A. General Warranty: Door manufacturer's warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Door Manufacturer's Warranty: Submit written agreement on door manufacturer's standard form, signed by manufacturer, Installer, and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section or that show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span, or do not comply with tolerances in referenced quality standard.

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 after the date of Substantial Completion:

a. Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, FSC Certified manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Flush Wood Doors:

a. Eggers Industries; Architectural Door Division.
b. Algoma Hardwoods, inc.
c. Mohawk Flush Door, Inc.

2.2 DOOR CONSTRUCTION, GENERAL

A. Doors for Transparent Finish: Comply with the following requirements:

1. Grade: Premium, with Grade AA faces.
2. Faces: Ash.
3. Match between Veneer Leaves: Book match.
4. Match within Door Faces: slip and center.
5. Pair and Set Match: Provide for pairs of doors and for doors hung in adjacent sets.
6. Stiles: Same species as face.

2.3 SOLID-CORE DOORS

A. Interior Veneer-Faced Doors: Comply with the following requirements:

1. Core: Low formaldehyde (phenol-formaldehyde) or formaldehyde free particle board.
2. Construction: Five plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.

2.4 FABRICATION

A. Fabricate flush wood doors in sizes indicated for Project site fitting.

B. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:

1. Comply with clearance requirements of referenced quality standard for fitting.

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: Premachine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

2.5 FACTORY FINISHING

A. Finish wood doors at factory.

B. Transparent Finish: Comply with requirements indicated for grade, finish system, staining effect, and sheen.

1. Grade: Premium.
2. Finish: AWI System TR-6 Catalyzed Polyurethane.

3. Staining: None required.
4. Effect: Filled finish.
5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
2. Reject doors with defects.

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

3.2 INSTALLATION

A. Hardware: For installation, see Division 8 Section "Door Hardware."

B. Manufacturer's Written Instructions: Install wood doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.

C. Job-Fit Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.

1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold.
2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
3. Bevel fire-rated doors 1/8 inch in 2 inches on lock edge; trim stiles and rails only to extent permitted by labeling agency.

D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

E. Factory-Finished Doors: Restore finish before installation, if fitting or machining is required at Project site.

3.3 ADJUSTING AND PROTECTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Refinish or replace doors damaged during installation.

C. Protect doors as recommended by door manufacturer to ensure that wood doors are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 08211

SECTION 08305 - ACCESS DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following types of access doors:

1. Wall access doors.
2. Ceiling access doors.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 7 Section "Roof Accessories" for roof hatches.
2. Division 8 Section "Door Hardware" for mortise or rim cylinder locks.
3. Division 9 Section "Gypsum Board Assemblies" for gypsum board walls and ceilings.
4. Division 9 Section "Tile" for ceramic tile walls.
5. Division 9 Section "Acoustical Tile Ceilings" for access tile in suspended or furred acoustical tile ceilings.
6. Division 15 Section "Duct Accessories" for duct access doors.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of access door assembly specified, including details of construction relative to materials, individual components, profiles, finishes, and fire-protection ratings (if required).

1. Include complete schedule, including types, general locations, sizes, wall and ceiling construction details, latching or locking provisions, and other data pertinent to installation.

C. Shop drawings showing fabrication and installation of customized access doors and frames, including details of each frame type, elevations of door design types, anchorage, and accessory items.

D. Samples, 3-inch (75-mm) by 5-inch (125-mm) minimum size, of each panel face material showing factory-finished color and texture.

E. LEED Submittals:

1. Credit MR C4: For products having recycled content, including postconsumer and pre-consumer recycled content. Provide the following information:
    a. Product Data
    b. Percent Content (post and pre-consumer)
    c. Invoices indicating cost of material (no labor included.)

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain access doors for entire Project from one source and by a single manufacturer.

B. Size Variations: Obtain Architect's acceptance of manufacturer's standard size units, which may vary slightly from sizes indicated.

1.5 COORDINATION

A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed equipment, and indicate on schedule specified under "Submittals" Article.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Acudor Products Inc.
2. Bar-Co, Inc. Div., Alfab, Inc.
3. Cesco Products.
4. Elmdor Manufacturing Co.
5. J.L. Industries.
6. Karp Associates, Inc.
7. Larsen's Manufacturing Co.
8. Milcor, Inc.
9. Nystrom, Inc.
10. The Williams Bros. Corporation of America.

2.2 MATERIALS

A. Steel Sheet: ASTM A 366 (ASTM A 366M) commercial-quality, cold-rolled steel sheet with baked-on, rust-inhibitive primer.

B. Zinc-Coated Steel Sheet: ASTM A 591 (ASTM A 591M), Electrolytic zinc-coated steel sheet with Class C coating and phosphate treatment to prepare surface for painting.

C. Stainless-Steel Sheet: ASTM A 167, Type 304 with No. 4 finish according to ASTM A 480 (ASTM A 480M).

2.3 ACCESS DOORS

A. Flush Access Doors with Exposed Trim for Tile walls: Units consisting of frame with exposed trim, door, hardware, and complying with the following requirements:

1. Frame: 0.0625-inch- (1.59-mm-) thick stainless-steel sheet.
2. Door: 0.0781-inch- (1.98-mm-) thick stainless-steel sheet.
3. Trim: Flange integral with frame, 3/4 inch (19 mm) wide, overlapping surrounding finished surface.
4. Hinge: Continuous type.
5. Locks: Key-operated cylinder lock.

B. Trimless, Flush Access Doors for Gypsum Board: Units consisting of frame, concealed edge trim, door, hardware, and complying with the following requirements:

1. Frame: 0.0625-inch- (1.59-mm-) thick stainless-steel sheet.
2. Door: 0.0781-inch- (1.98-mm-) thick stainless-steel sheet at walls.
3. Door: 0.0781-inch- (1.98-mm-) thick primed steel sheet at ceilings.
4. Concealed, Gypsum Board Edge Trim: 0.0299-inch (0.76-mm) zinc-coated or galvanized-steel sheet with face flange formed to receive joint compound.
5. Hinge: Concealed spring pin or continuous type.
6. Locks: Key-operated cylinder lock.

2.4 FABRICATION

A. General: Manufacture each access door assembly as an integral unit ready for installation.

B. Steel Access Doors and Frames: Continuous welded construction. Grind welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.

C. Locking Devices: Furnish number required to hold door in flush, smooth plane when closed.

1. For cylinder lock, furnish 2 keys per lock and key all locks alike.

PART 3 - EXECUTION

3.1 PREPARATION

A. Advise Installers of other work about specific requirements relating to access door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring devices. Furnish inserts and anchoring devices for access doors that must be built into other construction. Coordinate delivery with other work to avoid delay.

3.2 INSTALLATION

A. Comply with manufacturer's instructions for installing access doors.

B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finished surfaces.

C. Install concealed-frame access doors flush with adjacent finish surfaces.

3.3 ADJUST AND CLEAN

A. Adjust hardware and panels after installation for proper operation.

B. Remove and replace panels or frames that are warped, bowed, or otherwise damaged.

END OF SECTION 08305

SECTION 08410 - ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Exterior entrance systems.
2. Exterior storefront systems.

B. Related sections include the following:

1. Division 7 Section "Joint Sealants" for joint sealants installed as part of aluminum entrance and storefront systems.
2. Division 8 Section "Glazing."

1.3 SYSTEM DESCRIPTION

A. General: Provide aluminum entrance and storefront systems capable of withstanding loads and thermal and structural movement requirements indicated without failure, based on testing manufacturer's standard units in assemblies similar to those indicated for this Project. Failure includes the following:

1. Air infiltration and water penetration exceeding specified limits.
2. Framing members transferring stresses, including those caused by thermal and structural movement, to glazing units.

B. Glazing: Physically and thermally isolate glazing from framing members.

C. Glazing-to-Glazing Joints: Provide glazing-to-glazing joints that accommodate thermal and mechanical movements of glazing and system, prevent glazing-to-glazing contact, and maintain required edge clearances.

D. Structural Silicone-Sealant Joints: Provide systems with structural silicone-sealant joints complying with the following requirements:

1. Tensile or shear stress in joints is less than 20 psi.
2. Structural sealant withstands tensile and shear stresses imposed by storefront systems without failing adhesively or cohesively. When tested for adhesive compatibility with each substrate and condition required, provide sealant that fails cohesively before it fails adhesively. Adhesive and cohesive failure are defined as follows:

a. Adhesive failure occurs when sealant pulls away from a substrate cleanly, leaving no sealant material behind.
b. Cohesive failure occurs when sealant breaks or tears within a joint but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.

E. Wind Loads: Provide entrance and storefront systems, including anchorage, capable of withstanding wind-load design pressures calculated according to requirements of authorities having jurisdiction or the American Society of Civil Engineers' ASCE 7, "Minimum Design Loads for Buildings and Other Structures," 6.4.2, "Analytical Procedure," whichever are more stringent.

1. Deflection of framing members in a direction normal to wall plane is limited to 1/175 of clear span or 3/4 inch, whichever is smaller, unless otherwise indicated.

2. Static-Pressure Test Performance: Provide entrance and storefront systems that do not evidence material failures, structural distress, failure of operating components to function normally, or permanent deformation of main framing members exceeding 0.2 percent of clear span when tested according to ASTM E 330.

    a. Test Pressure: 150 percent of inward and outward wind-load design pressures.
    b. Duration: As required by design wind velocity; fastest 1 mile of wind for relevant exposure category.

G. Dead Loads: Provide entrance- and storefront-system members that do not deflect an amount which will reduce glazing bite below 75 percent of design dimension when carrying full dead load.

1. Provide a minimum 1/8-inch clearance between members and top of glazing or other fixed part immediately below.
2. Provide a minimum 1/16-inch clearance between members and operable windows and doors.

H. Live Loads: Provide entrance and storefront systems, including anchorage, that accommodate the supporting structures' deflection from uniformly distributed and concentrated live loads indicated without failure of materials or permanent deformation.

I. Air Infiltration: Provide entrance and storefront systems with permanent resistance to air leakage through fixed glazing and frame areas of not more than 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a static-air-pressure difference of 1.57 lbf/sq. ft.

J. Water Penetration: Provide entrance and storefront systems that do not evidence water leakage through fixed glazing and frame areas when tested according to ASTM E 331 at minimum differential pressure of 20 percent of inward-acting wind-load design pressure as defined by ASCE 7, "Minimum Design Loads for Buildings and Other Structures," but not less than 6.24 lbf/sq. ft. Water leakage is defined as follows:

1. Uncontrolled water infiltrating systems or appearing on systems' normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials or finishes is not water leakage.

K. Thermal Movements: Provide entrance and storefront systems, including anchorage, that accommodate thermal movements of systems and supporting elements resulting from the following maximum change (range) in ambient and surface temperatures without buckling, damaging stresses on glazing, failure of joint sealants, damaging loads on fasteners, failure of doors or other operating units to function properly, and other detrimental effects.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

L. Structural-Support Movement: Provide entrance and storefront systems that accommodate structural movements including, but not limited to, sway and deflection.

M. Condensation Resistance: Provide storefront systems with condensation resistance factor (CRF) of not less than 45 when tested according to AAMA 1503.1.

N. Average Thermal Conductance: Provide storefront systems with average U-values of not more than 0.63 Btu/sq. ft. x h x deg F when tested according to AAMA 1503.1.

O. Dimensional Tolerances: Provide entrance and storefront systems that accommodate dimensional tolerances of building frame and other adjacent construction.

1.4 SUBMITTALS

A. Product Data: For each product specified. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes.

B. Shop Drawings: For entrance and storefront systems. Show details of fabrication and installation, including plans, elevations, sections, details of components, provisions for expansion and contraction, and attachments to other work.

1. For entrance systems, include hardware schedule and indicate operating hardware types, quantities, and locations.

C. Samples for Verification: Of each type of exposed finish required in manufacturer's standard sizes. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.

D. Cutaway Sample: Of each vertical-to-horizontal framing intersection of systems, made from minimum 6-inch lengths of full-size components and showing details of the following:

1. Joinery.
2. Anchorage.
3. Expansion provisions.
4. Glazing.
5. Flashing and drainage.
6. Structural-sealant joints.

E. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

F. Sealant Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating that materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with sealants; include joint sealant manufacturers' written interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in installing entrance and storefront systems similar to those required for this Project and who is acceptable to manufacturer.

1. Engineering Responsibility: Prepare data for entrance and storefront systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Source Limitations: Obtain each type of entrance and storefront system through one source from a single manufacturer.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of entrance and storefront systems and are based on the specific systems indicated. Other manufacturers' systems with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."

1. Do not modify intended aesthetic effect, as judged solely by Architect, except with Architect's approval and only to the extent needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.

D. Welding Standards: Comply with applicable provisions of AWS D1.2, "Structural Welding Code--Aluminum."

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating systems without field measurements. Coordinate construction to ensure actual dimensions correspond to established dimensions.

1.7 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to,

and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Submit a written warranty executed by the manufacturer agreeing to repair or replace components of entrance and storefront systems that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:

1. Structural failures including, but not limited to, excessive deflection.
2. Adhesive sealant failures.
3. Cohesive sealant failures.
4. Failure of system to meet performance requirements.
5. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
6. Failure of operating components to function normally.
7. Water leakage through fixed glazing and frame areas.

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Design is based on the MS Series 6000 frames as manufactured by Oldcastle, Inc. with member sizes as detailed and as designed to withstand required forces.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with the requirements of standards indicated below.

1. Solid Sheet, Perforated Sheet and Plate: ASTM B 209.
2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221.
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Bars, Rods, and Wire: ASTM B 211.
5. Welding Rods and Bare Electrodes: AWS A5.10.

B. Steel Reinforcement: Complying with ASTM A 36 for structural shapes, plates, and bars; ASTM A 611 for cold-rolled sheet and strip; or ASTM A 570 for hot-rolled sheet and strip.

C. Glazing as specified in Division 8 Section "Glazing."

D. Glazing Gaskets: Manufacturer's standard pressure-glazing system of black, resilient glazing gaskets, setting blocks, and shims or spacers, fabricated from an elastomer of type and in hardness recommended by system and gasket manufacturer to comply with system performance requirements. Provide gasket assemblies that have corners sealed with sealant recommended by gasket manufacturer.

E. Spacers, Setting Blocks, Gaskets, and Bond Breakers: Manufacturer's standard permanent, nonmigrating types in hardness recommended by manufacturer, compatible with sealants, and suitable for system performance requirements.

F. Structural Silicone Sealant: Type recommended by sealant and system manufacturers that complies with ASTM C 1184 requirements, is compatible with system components with which it comes in contact, and is specifically formulated and tested for use as a structural sealant.

1. Color: To be selected by Architect.
2. Tensile Strength: 100 psi minimum.
3. Provide sealant with modulus of elasticity that will not allow movement of more than 25 percent of joint width, unless less movement is required by structural-sealant-glazed systems' design.
4. Use neutral-cure silicone sealant with insulating-glass units.

G. Secondary Sealant: For use as weatherseal, compatible with structural silicone sealant and other system components with which it comes in contact, and that accommodates a 50 percent increase or decrease in joint width at the time of application when measured according to ASTM C 719.

1. Color: To be selected by Architect.
2. Use neutral-cure silicone sealant with insulating-glass units.

H. Framing system gaskets, sealants, and joint fillers as recommended by manufacturer for joint type.

I. Sealants and joint fillers for joints at perimeter of entrance and storefront systems as specified in Division 7 Section "Joint Sealants."

J. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos, formulated for 30-mil thickness per coat.

2.3 COMPONENTS

A. Doors: Provide manufacturer's standard 1-3/4-inch-thick glazed doors with minimum 0.125-inch-thick, extruded tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded or that incorporate concealed tie-rods.

1. Glazing Stops and Gaskets: Provide manufacturer's standard snap-on extruded-aluminum glazing stops and preformed gaskets.
2. Stile Design: As indicated on Drawings.

B. Brackets and Reinforcements: Provide manufacturer's standard brackets and reinforcements that are compatible with adjacent materials. Provide nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Reinforce members as required to retain fastener threads.
2. Do not use exposed fasteners, except for hardware application. For hardware application, use countersunk Phillips flat-head machine screws finished to match framing members or hardware being fastened, unless otherwise indicated.

D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.

E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing, compatible with adjacent materials, and of type recommended by manufacturer.

F. Weather Stripping: Manufacturer's standard replaceable weather stripping as follows:

1. Compression Weather Stripping: Molded neoprene complying with ASTM D 2000 requirements or molded PVC complying with ASTM D 2287 requirements.
2. Sliding Weather Stripping: Wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing complying with AAMA 701 requirements.

2.4 HARDWARE

A. General: Provide heavy-duty hardware units indicated in sizes, number, and type recommended by manufacturer for entrances indicated. Finish exposed parts to match door finish, unless otherwise indicated.

B. Geared Hinges: Full height heavy duty hinge.

C. Closers, General: Comply with manufacturer's recommendations for closer size, depending on door size, exposure to weather, and anticipated frequency of use.

1. Closing Cycle: Comply with requirements of authorities having jurisdiction or the Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," whichever are more stringent.
2. Opening Force: Comply with the following maximum opening-force requirements for locations indicated: Exterior Doors: 15 lbf.

D. Cylinders: As specified in Division 8 Section "Door Hardware."

E. Pull Handles: As specified in Division 8 Section "Door Hardware."

F. Exit Devices: As specified in Division 8 Section "Door Hardware."

G. Thresholds: At exterior doors, provide manufacturer's standard threshold with cutouts coordinated for operating hardware, with anchors and jamb clips, and not more than 1/2-inch-high, with beveled edges providing a floor level change with a slope of not more than 1:2, and in the following material:

1. Material: Aluminum, mill finish.

H. Weather Sweeps: Manufacturer's standard weather sweep for application to exterior door bottoms and with concealed fasteners on mounting strips.

2.5 FABRICATION

A. General: Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

1. Fabricate components for head- and sill-receptor frame construction with shear-block construction at intermediate horizontal components.

B. Forming: Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.

C. Prepare components to receive concealed fasteners and anchor and connection devices.

D. Fabricate components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.

E. Welding: Weld components to comply with referenced AWS standard. Weld before finishing components to greatest extent possible. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

F. Glazing Channels: Provide minimum clearances for thickness and type of glass indicated according to FGMA's "Glazing Manual."

G. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

H. Storefront: Fabricate framing in profiles indicated for flush glazing (without projecting stops). Provide subframes and reinforcing of types indicated or, if not indicated, as required for a complete system. Factory assemble components to greatest extent possible. Disassemble components only as necessary for shipment and installation.

I. Entrances: Fabricate door framing in profiles indicated. Reinforce as required to support imposed loads. Factory assemble door and frame units and factory install hardware to greatest extent possible. Reinforce door and frame units as required for installing hardware indicated. Cut, drill, and tap for factory-installed hardware before finishing components.

1. Exterior Doors: Provide compression weather stripping at fixed stops. At other locations, provide sliding weather stripping retained in adjustable strip mortised into door edge.

2.6 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 607.1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of entrance and storefront systems. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written instructions for protecting, handling, and installing entrance and storefront systems. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight.

B. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.

D. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction, unless otherwise indicated. Comply with requirements of Division 7 Section "Joint Sealants."

E. Install framing components plumb and true in alignment with established lines and grades without warp or rack of framing members.

F. Install entrances plumb and true in alignment with established lines and grades without warp or rack. Lubricate operating hardware and other moving parts according to hardware manufacturers' written instructions.

1. Install surface-mounted hardware according to manufacturer's written instructions using concealed fasteners to greatest extent possible.

G. Install glazing to comply with requirements of Division 8 Section "Glazing," unless otherwise indicated.

1. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
2. Install structural silicone sealant according to sealant manufacturer's written instructions.
3. Mechanically fasten glazing in place until structural sealant is cured.
4. Remove excess sealant from component surfaces before sealant has cured.

H. Install secondary-sealant weatherseal according to sealant manufacturer's written instructions to provide weatherproof joints. Install joint fillers behind sealant as recommended by sealant manufacturer.

I. Install perimeter sealant to comply with requirements of Division 7 Section "Joint Sealants," unless otherwise indicated.

J. Erection Tolerances: Install entrance and storefront systems to comply with the following maximum tolerances:

1. Variation from Plane: Limit variation from plane or location shown to 1/8 inch in 12 feet; 1/4 inch over total length.
2. Alignment: Where surfaces abut in line, limit offset from true alignment to 1/16 inch. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.
3. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.3 FIELD QUALITY CONTROL

A. Structural-Silicone-Sealant Adhesion Test: Test installed structural silicone sealant according to field adhesion test method described in AAMA CW #13, "Structural Sealant Glazing Systems (A Design Guide)."

1. Test a minimum of 2 areas.

B. Water Spray Test: After completing the installation of test areas indicated, test storefront system for water penetration according to AAMA 501.2 requirements.

C. Repair or remove and replace Work that does not meet requirements or that is damaged by testing; replace to conform to specified requirements.

3.4 ADJUSTING AND CLEANING

A. Adjust doors and hardware to provide tight fit at contact points and weather stripping, smooth operation, and weathertight closure.

B. Remove excess sealant and glazing compounds, and dirt from surfaces.

3.5 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure entrance and storefront systems are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 08410

SECTION 08450 - ALL-GLASS DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Interior doors.
2. Sidelights.

B. Related Sections include the following:

1. Division 7 Section "Joint Sealants" at interface of all-glass entrances and other building components.
2. Division 8 Section "Door Hardware"

1.3 SUBMITTALS

A. Product Data: For each type of product specified. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes.

B. Shop Drawings: Show details of fabrication and installation, including the following:

1. Plans, elevations, and sections.
2. Details of fittings.
3. Hardware quantities, locations, and installation requirements.
4. Anchorages and reinforcement.
5. Glazing details.

C. Samples for Verification: Of size indicated below and of same thickness and material indicated for Work. Show the full range of color and texture variations expected.

1. Metal Finishes: 6-inch- (150-mm-) long sections of patch fittings, rails, and other items.
2. Glass: 6 inches (150 mm) square showing exposed-edge finish.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing all-glass entrances similar to those required for this Project and with a record of successful in-service performance.

B. Source Limitations: Obtain each type of all-glass entrance through one source from a single manufacturer.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of all-glass entrances and are based on the specific system indicated. Other manufacturers' systems with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."

1. Do not modify intended aesthetic effects, as judged solely by the Architect, except with Architect's approval and only to the extent needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify opening dimensions of all-glass entrances by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating all-glass entrances without field measurements. Coordinate construction to ensure actual opening dimensions correspond to established dimensions.

1.6 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Submit a written warranty executed by the manufacturer agreeing to repair or replace components of all-glass entrances that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:

1. Structural failures.
2. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
3. Failure of operating components to function normally.

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Blumcraft of Pittsburgh.
2. CR Lawrence

2.2 MATERIALS

A. Clear Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated surfaces), Type I (transparent), Class 1 (clear) requirements. Provide products of thickness indicated that have been tested for surface and edge compression according to ASTM C 1048 and for impact strength according to CPSC 16 CFR, Part 1201 for Category II materials.

1. Thickness: 1/2 inch (12.7 mm).
2. Exposed Edges: Flat polished with eased edge.

B. Stainless-Steel Cladding: ASTM A 666, Type 304 #4 Finish.

2.3 COMPONENTS

A. Sidelight Channels: Provide manufacturer's standard head and sill channels for sidelight and transom-head support matching fitting-metal finish, unless otherwise indicated.

B. Concealed Sidelight Channels: Provide manufacturer's standard recessed head and sill channels for concealed sidelight and transom-head support, unless otherwise indicated.

C. Rails: At doors provide rails from the manufacturer's standard continuous horizontal fittings and as follows:

1. Rail Locations: As follows:

a. Door tops.
b. Door bottoms.

2. Rail Height: 1-3/8""
3. Rail Style: Flat top, square profile.

4. Material: Stainless-steel-clad aluminum.

E. Anchors and Fastenings: Manufacturer's standard concealed anchors and fastenings.

F. Sound Seal/Stripping: Manufacturer's standard silicone bubble-type seal stripping at both jambs and head.

2.4 HARDWARE

A. General: Heavy-duty hardware units indicated in sizes, number, and type recommended by manufacturer for all-glass entrances indicated. For exposed parts, match fitting metal and finish.

B. Closers: Center-hung, concealed floor closers complying with ANSI/BHMA A156.4, Grade 1 or Grade 2 requirements, including cases, bottom arms, top pivots, plates and accessories required for a complete installation, and as follows:

1. Swing: Single acting.
2. Hold Open: Automatic, at angle selected by Architect from manufacturer's standard options.
3. Positive Dead Stop: Coordinated with hold-open angle, if any, or at angle selected by Architect from manufacturer's standard options.
4. Delayed-Action Closing: Comply with requirements of authorities having jurisdiction or the Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," whichever are more stringent.
5. Opening Force: Comply with the following maximum opening-force requirements for locations indicated: Interior Doors: 5 lbf (22.2 N).

C. Push-Pull Set: As indicated in hardware specification section.

D. Single-Door Locksets: Manufacturer's standard locksets and as follows:

1. Location and Function: Dead bolt operated by key outside and thumb turn inside and engaging strike in floor. Deadbolt provided as part of exterior vertical pull handle.

E. Cylinders: As specified in Division 8 Section "Door Hardware."

F. Hardware Sets: See Hardware schedule for complete hardware required for all-glass doors/sidelights. All-glass supplier to provide complete hardware for door and sidelight installation, except as noted in the hardware schedule.

2.5 FABRICATION

A. General: Fabricate all-glass entrance components in sizes, profiles, and configurations indicated.

1. Provide holes and cutouts in glass to receive hardware, fittings, rails, and accessories before tempering glass. Do not cut, drill, or make other alterations to glass after tempering.
2. Fully temper glass using horizontal roller hearth process.
3. Factory assemble components and factory install hardware to greatest extent possible.

2.6 METAL FINISHES, GENERAL

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are

not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 STAINLESS-STEEL FINISHES

A. Remove or blend tool and die marks and stretch lines into finish.

B. Grind and polish surfaces to produce uniform, directional textured, brushed finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. Brushed No. 4 finish.

D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of all-glass entrances. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install all-glass entrances and associated components according to manufacturer's written instructions.

B. Set units level and plumb.

C. Maintain uniform clearances between adjacent components.

D. Lubricate hardware and other moving parts according to manufacturer's written instructions.

E. Set, seal, and grout floor closer cases as required by hardware and substrate.

3.3 ADJUSTING AND CLEANING

A. Adjust doors and hardware to provide tight fit at contact points, smooth operation.

B. Remove excess sealant and glazing compounds and dirt from all-glass entrance surfaces.

3.4 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure all-glass entrances are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 08450

SECTION 08625 - METAL FRAMED SKYLIGHTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes: Metal-framed skylights for applications using flat glass or metal panel infill, including below:

1. Structural design, engineering and fabrication of complete metal framed skylight system, including aluminum framing, integral closures, trim, perimeter flashing and surface requests as indicated on Drawings.
2. Glass and glazing for metal framed skylight system including gaskets, sealants, spacers, blocking and related materials.
3. Fasteners, anchors and related reinforcement of framing system as required to resist design loads.
4. Installation of entire metal framed skylight system.

B. Related Sections: Section(s) related to this section include:

1. Division 5 Section “Structural Steel”.
2. Division 5 Section “Metal Fabrications”.
3. Division 7 Section “Sheet Metal Flashing and Trim”.
4. Division 7 Section “Joint Sealants”.
5. Division 8 Section “Glasing”.
6. Division 8 Section “Glazed Aluminum Curtain Walls”.

1.3 REFERENCES

A. General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.

B. American Society for Testing and Materials (ASTM):

1. ASTM C509 Cellular Elastomeric Preformed Gasket and Sealing Material.
2. ASTM C794 Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
3. ASTM C864 Dense Elastomeric Compression Seal Gaskets, Setting Blocks and Spacers.
4. ASTM C1036 Specification for Flat Glass.
5. ASTM C1048 Specification for Heat-Treated Flat Glass, Kind HS,.Kind FT Coated and Uncoated Glass.
6. ASTM D1149 Test Method for Rubber Deterioration - Surface Ozone Cracking in a Chamber (Flat Specimen).
7. ASTM E283 Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors.
8. ASTM E330 Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
9. ASTM E331 Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
10. ASTM E773 Test Method for Seal Durability of Sealed Insulating Glass Units.
11. ASTM E774 Standard Specification for Sealed Insulating Glass Units.

C. Aluminum Association (AA):

1. AA Specifications for Aluminum Structures.

D. American Architectural Manufacturers Association (AAMA):

1. AAMA 501 Methods for Test for Metal Curtain Walls.
2. AAMA 603-98 Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
3. AAMA 2604-98 Voluntary Specification for High Performance Organic Coatings on Architectural Extrusions and Panels.
4. AAMA 611-98 Specification for Anodized Architectural Aluminum.
5. AAMA GDSG-1 Glass Design for Sloped Glazing.
6. AAMA SDGS-1 Structural Design Guidelines for Aluminum Framed Skylights.
7. AAMA TSSGG-1 Two-Sided Structural Glazing Guidelines for Aluminum Framed Skylights.

E. Flat Glass Marketing Association (GANA):

1. GANA Glazing Manual.

F. Insulating Glass Certification Council (IGCC):

1. IGCC Classification of Insulating Glass Units.

1.4 SYSTEM DESCRIPTION

A. Performance Requirements: Provide metal-framed skylights which have been manufactured, fabricated and installed to withstand loads required by code and to provide performance criteria required by these specifications without defects, damage or failure.

B. Skylight Performance Requirements:

1. Design framing system including glazing material to support the following load requirements with maximum allowable deflection of any glazing support member not to exceed L/240 of the unsupported span:

a. Concentrated live load of 250 pounds applied to any framing member at a location that will produce the most severe stress or deflection.
b. Thermal load for heated enclosures of plus or minus 50 degrees F (10 degrees C) from ambient temperature.

2. Air and Water Resistance:

a. ASTM E283: Allowable air infiltration shall not exceed 0.06 CFM through the total glazed surface area when system is tested in accordance with ASTM E283 at a static pressure of 6.24 psf (298 Pa).
b. ASTM E331: No uncontrolled water leakage shall occur when system is tested in accordance with ASTM E331 at a static pressure of 12 psf (574 Pa).
c. AAMA 501: No uncontrolled water leakage shall occur when system is tested for dynamic water resistance in accordance with MAMA 501.1 at a static pressure of 12 psf (573 Pa).

1.5 SUBMITTALS

A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.

B. Product Data: Submit product data, including manufacturer's SPEC-DATA product sheet, for specified products. Include manufacturer's air and water resistance test reports showing compliance with requirements specified performance requirements. Test reports must show evidence that system

experienced no uncontrolled water leakage after 150% positive and negative structural overload (ASTM E330) when system is retested in accordance with ASTM E331 at a static pressure of 12 psf (573 Pa). Include both published data and specific data prepared for this project.

C. Shop Drawings: Submit shop drawings showing layout, profiles and product components, including anchorage, accessories, finish colors, patterns and textures.

1. Submit shop drawings for approval prior to fabrication. Include detailed plans, elevations, and details of framing members, glazing materials, sealants, fasteners, anchors and thicknesses and types of formed flashing and closures and relationship with adjacent materials. Indicate maximum horizontal and vertical forces at rafters.
2. Calculations: Submit calculations certified by a professional engineer for review prior to fabrication.

D. Samples: Submit selection and verification samples for finishes, colors and textures.

1. Aluminum Finish: Submit color charts or range samples for initial color selection. Submit finished sample of color selected for use on metal coupons.
2. Glazing Materials: Submit a verification sample, 12" square, of the specified glass, including any integral tint, color, coating, or frit pattern specified. Submit standard sealant colors for selection and approval.

E. Quality Assurance Submittals: Submit the following:

1. Design Data: Showing all loading required.
2. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.

F. Closeout Submittals: Submit the following:

1. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.
2. Warranty: Warranty documents specified herein.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.

a. Installer: Manufacturer of skylight system, or a qualified installer, shall erect and glaze the system.

2. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction, approving acceptable installer and approving application method.

a. Manufacturer: Skylight systems shall be manufactured by a firm with a minimum of ten (10) years experience in the fabrication and installation of custom aluminum framed skylights.

1.7 DELIVERY, STORAGE & HANDLING

A. General: Comply with Division 1 Product Requirements Sections.

B. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Sequence deliveries to avoid delays, but minimize onsite storage.

D. Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer. Protect materials from damage from sunlight, weather, excessive temperatures and construction operations.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1. Measurements: Take accurate field measurements before preparation of shop drawings and fabrication. Do not delay job progress; work from "guaranteed dimensions" and allow for field trimming of perimeter flashing if taking field measurements before fabrication is not possible.

1.9 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official.

1. Skylight System Warranty: Provide written warranty signed by manufacturer, agreeing to repair or replace work which exhibits defects in materials or workmanship and guaranteeing weathertight and leak free performance. "Defects" are defined to include, but is not limited to, uncontrolled leakage of water, abnormal aging or deterioration – 2 year warranty.

2. Finish Warranty: Provide written warranty signed by manufacturer, agreeing to repair or replace work which exhibits defects in finish. "a Defect" is defined as: abnormal aging or deterioration and failure to perform as required. (For painted finishes, defects may also be defined to include peeling, chipping, chalking or fading.)

a. Warranty Period for Anodized Finish: Two (2) year from date of application for film integrity.

3. Glazing Material Warranty: Provide written warranty signed by manufacturer, agreeing to repair or replace glazing materials which exhibit defects in materials or workmanship. "Defects" are defined to include delamination, [seal failure,] [or deterioration of film coatings.]

a. Warranty Period: Five (5) years from date of manufacture.

PART 2 – PRODUCTS

2.1 METAL-FRAMED SKYLIGHTS

A. Manufacturer: Oldcastle BuildingEnvelope™ BMS-3000 Sloped Glazing System. Address: 803 Airport Road, Terrell, Texas 75160; Telephone: (800) 527-4018, (972) 551-6400; Fax (972) 551-6420; Email: www.oldcastlebe.com.

B. Basis of Design: BMS-3000 Sloped Glazing System.

2.2 MANUFACTURED METAL-FRAMED SKYLIGHT UNITS

A. Framing System:

1. Framing Members: Fabricate from 6063-T5, 6063-T6, or 6061-T6 extruded aluminum; temper and alloy as recommended by the manufacturer for design loading, cross-sectional configuration, fabrication requirements and required finish. Include an integral gutter system to control water infiltration and condensation.
2. Provide tubular rafter and purlin framing members with flush condensation gutters. Do not anchor sill members through integral secondary gutter area on pitches less than 4 on 12 from horizontal.
3. Formed Flashing and Closures: Minimum 0.040 inch thick aluminum for anodized.
4. Condensation and Water Infiltration Control: Provide framing system which will collect and channel condensation and water infiltration to the exterior through baffled weep holes or drain tubes in the sill or perimeter framing members.
5. Fabricate work to be straight, plumb, level and square. Provide work to sizes, shapes and profiles indicated on approved shop drawings. Make work with uniform, tight joints.
6. Use factory-performed heliarc welding with all exposed welds finished to match adjacent material.

B. Finishes: Provide the following finish for interior and exterior exposed aluminum surfaces.

1. Clear Anodic Coating, Class 1: MM1 OC22A41 clear anodized coating complying with AAMA 611-98, 0.7 mil thick minimum.

C. Glazing Technique:

1. Two-Sided Structural Silicone Glazing: Two sides of glazing unit retained with glazing caps mechanically secured with thermally insulated glazing clips with two remaining sides secured to a continuous aluminum fin using a shear-type silicone sealant joint design. Comply with AAMA Two-Sided Structural Glazing Guidelines for Aluminum Framed Skylights.

D. Sloped Glazing: Provide Glazing per section 08800.

E. Glazing Requirements:

1. Glass shall conform to applicable requirements of ASTM C1036 and ASTM C1 048.
2. Glass strengths shall be determined using AAMA Glass Design for Sloped Glazing Guidelines.
3. Glaze in accordance with GANA Glazing Manual and glass fabricator's guidelines.
4. Insulating glass construction shall be dual sealed with primary seal of polyisobutylene and secondary seal of two-part silicone equal to Dow Corning 982.
5. Insulating glass shall be IGCC Class A rated when tested in accordance with ASTM E773 and E774.

F. Glazing Gaskets and Blocking:

1. Continuous Cushion Below Glazing Materials: Provide extruded, dense EPDM black rubber gasket with 60 plus or minus 5 Shore A durometer complying with ASTM C864.
2. Continuous Spacer Above Glazing Materials: Provide extruded, closed-cell, sponge EPDM black rubber gasket complying with ASTM C509.
3. Ozone Resistance: Fabricate gaskets of material to withstand one part per million ozone for 500 hours at 20 percent elongation at 100?F when tested in accordance with ASTM D1149.

G. Anchors and Fasteners:

1. Provide cadmium plating for lag, sleeve and stud bolt anchors not exposed to the weather.
2. Provide anchors fabricated of stainless steel for anchors exposed to the weather.
3. Provide 300 Series stainless steel for bolted connections may and fasteners exposed to the weather, and where bolted connections penetrate secondary gutter of sill member.
4. Reinforce butt, mitered and expansion joint framing member splices with internal aluminum splice plates where possible; mechanically fastened with stainless steel truss head fasteners in accordance with the skylight manufacturer's standard connection details.

H. Sealants:

1. Skylight manufacturer shall be responsible for the selection of sealants. Surfaces shall be cleaned and primed as required to assure proper adhesion. Sealants shall be applied in accordance with sealant manufacturer's guidelines and joint dimensions shown on approved shop drawings.
2. Exterior metal to glass corner and cap seals shall be black in color. Exposed metal to metal joints shall be sealed with a standard color silicone sealant.
3. Sealants shall exhibit adequate adhesion to samples of metal and glass when tested in accordance with C794.
4. Structural sealants shall be compatible with all contact components.
5. For insulating glass, limit depth of silicone joint to the design thickness of the exterior lite. Use temporary clips to secure the purlin edges of the glass unit in place until the silicone sealant has fully cured. Comply with AAMA Two-Sided Structural Glazing Guidelines for Aluminum Framed Skylights for design and field procedures.

2.3 RELATED MATERIALS

A. Related Materials: Refer to other sections listed in Related Sections paragraph herein for related materials.

2.4 SOURCE QUALITY

A. Source Quality: Obtain metal-framed skylight materials from a single manufacturer.

PART 3 – EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions, and product carton instructions for installation.

3.2 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions.

3.3 PREPARATION

A. Preparation: Take field dimensions and examine conditions of substrates, supports, and other conditions under which this work is to be performed and notify Contractor, in writing, of circumstances detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected.

3.4 INSTALLATION

A. Skylight Installation:

1. Match profiles, sizes and spacings indicated on approved shop drawings. Ensure that weep and condensation control system operates properly. Do not perform structural silicone sealant work when the metal temperature is below 32 degreesF (0 degreesC) without written approval from silicone manufacturer.
2. Coordinate installation with adjacent work such as roofing, sheet metal and other work to ensure a complete weatherproof assembly. Anchor work securely to supporting structure, but allow for differential and thermal movement.
3. Isolate between aluminum and dissimilar metals with a protective coating or plastic strip to prevent electrolytic corrosion.

B. Site Tolerances: All support and adjacent construction will be held to within ± ½" of theoretical.

C. Related Products Installation: Refer to other sections listed in Related Sections paragraph herein for related products installation.

3.5 FIELD QUALITY REQUIREMENTS

A. Site Tests – Provide complete water test after installation per: See AAMA 501.2 for field water test procedures

3.6 ADJUSTING

A. Adjusting: During installation, remove labels, part number markings, sealant smears, handprints, and construction dirt from all components. Touch-up damaged coatings and finishes and repair minor damage to eliminate all evidence of repair. Remove and replace work which cannot be satisfactorily repaired.

3.7 CLEANING

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

1. Clean exposed surfaces including metal and glass using non-abrasive materials and methods recommended by manufacturer of material or product being cleaned. Remove and replace work that cannot be successfully cleaned.
2. Reclean as necessary to prevent damage. Protect completed work from damage and deterioration and inspect immediately before final acceptance of project.

3.8 PROTECTION

A. Protection: Protect installed product and finish surfaces from damage during construction.

END OF SECTION 08625

SECTION 08710 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes items known commercially as finish or door hardware that are required for swing, and sliding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.

B. This Section includes the following:

1. Hinges.
2. Pivots.
3. Lock cylinders and keys.
4. Lock and latch sets.
5. Bolts.
6. Exit devices.
7. Push/pull units.
8. Closers.
9. Overhead holders.
10. Miscellaneous door control devices.
11. Door trim units.
12. Protection plates.
13. Sliding door equipment.
14. Weatherstripping for exterior doors.
15. Sound stripping for interior doors.
16. Automatic drop seals (door bottoms).
17. Astragals or meeting seals on pairs of doors.
18. Thresholds.

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 6 Section "Interior Architectural Woodwork" for cabinet hardware.
2. Division 8 Section "Steel Doors and Frames" for silencers integral with hollow metal frames.
3. Division 8 Section "Flush Wood Doors" for factory prefitting and factory premachining of doors for door hardware.
4. Division 8 Section "Aluminum Entrances and Storefronts" for aluminum entrance door hardware, except as indicated.
5. Division 8 Section "All Glass Doors" for door hardware, except as indicated.

D. Products furnished but not installed under this Section include:

1. Cylinders for locks on doors.
2. Final installation of cores and keying to be done by Owner.

1.3 HARDWARE

A. Selection and Ordering: Furnish door hardware as selected by Architect and in such quantities as provided for under Division 1 Section and other general provisions of the Contract.

B. Door hardware supplier's responsibilities shall be as follows:

1. Submittals: Submit through Contractor required product data, final hardware schedule, separate keying schedule, and samples as specified in this Section, unless otherwise indicated.
2. Construction Schedule: Inform Contractor promptly of estimated times and dates that will be required to process submittals, to furnish templates, to deliver hardware, and to perform other work associated with furnishing door hardware for purposes of including this data in construction schedule. Comply with this schedule.
3. Coordination and Templates: Assist Contractor as required to coordinate hardware with other work in respect to both fabrication and installation. Furnish Contractor with templates and deliver hardware to proper locations.
4. Product Handling: Package, identify, deliver, and inventory door hardware specified in this Section.
5. Discrepancies: Based on requirements indicated in Contract Documents in effect at time of door hardware selection, furnish types, finishes, and quantities of door hardware, including fasteners, and Owner's maintenance tools required to comply with specified requirements and as needed to install and maintain hardware. Furnish or replace any items of door hardware resulting from shortages and incorrect items at no cost to the Owner or Contractor. Obtain signed receipts from Contractor for all delivered materials.

C. Contractor's responsibilities shall be as follows:

1. Submittals: Coordinate and process submittals for door hardware in same manner as submittals for other work.
2. Construction Schedule: Cooperate with door hardware supplier in establishing scheduled dates for submittals and delivery of templates and door hardware. Incorporate in construction schedule the times and dates related to furnishing hardware by door hardware supplier.
3. Coordination: Coordinate door hardware with other Work. Furnish hardware supplier or manufacturer with shop drawings of other work where required or requested. Verify completeness and suitability of hardware with supplier.
4. Product Handling: Provide secure lock-up for hardware delivered to the site. Inventory hardware jointly with representative of hardware supplier and issue signed receipts for all delivered materials.
5. Installation Information: The general types and approximate quantities of hardware required for this Project are indicated at the end of this Section in order to establish Contractor's costs for installation and other work not included in allowance.
6. No adjustments in Contract sum will be made for costs other than those covered by the allowances for subsequent increases or decreases in quantity of one or more hardware types that do not exceed 5 percent.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification sections.

B. Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.

C. Final hardware schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Final Hardware Schedule Content: Based on hardware indicated, organize schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:

a. Type, style, function, size, and finish of each hardware item.
b. Name and manufacturer of each item.
c. Fastenings and other pertinent information.
d. Location of each hardware set cross referenced to indications on Drawings both on floor plans and in door and frame schedule.
e. Explanation of all abbreviations, symbols, and codes contained in schedule.
f. Mounting locations for hardware.
g. Door and frame sizes and materials.

h. Keying information.

2. Submittal Sequence: Submit initial draft of final schedule along with essential product data in order to facilitate the fabrication of other work that is critical in the Project construction schedule. Submit final schedule after samples, product data, coordination with shop drawings of other work, delivery schedules, and similar information has been completed and accepted.

3. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.

4. Supplier of finish hardward must have as a fulltime employee a regular member of the American Society of Hardware Consultants (AHC), and hardware schedule must be prepared by that AHC member.

D. Samples of each type of exposed hardware unit in finish indicated and tagged with full description for coordination with schedule. Submit samples prior to submission of final hardware schedule.

1. Samples will be returned to the supplier. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated in the Work, within limitations of keying coordination requirements.

E. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

1.5 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer.

B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced architectural hardware consultant (AHC) who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.

1. Require supplier to meet with Owner to finalize keying requirements and to obtain final instructions in writing.

C. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by UL, Warnock Hersey, FM, or other testing and inspecting organization acceptable to authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and door frame labels.

1.6 PRODUCT HANDLING

A. Tag each item or package separately with identification related to final hardware schedule, and include basic installation instructions with each item or package.

B. Packaging of door hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.

C. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

D. Deliver individually packaged door hardware items promptly to place of installation (shop or Project site).

E. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.

1.7 MAINTENANCE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Butts and Hinges:

a. Ives.
b. McKinney Products Co.
c. Stanley Hardware, Div. Stanley Works.

2. Pivots:

a. Ives
b. Dorma.
c. LCN, Div. Ingersoll-Rand Door Hardware Group.
d. Norton Door Controls, Div. Yale Security Inc.
e. Rixson-Firemark, Div. Yale Security Inc.
f. Stanley Hardware, Div. Stanley Works.

3. Cylinders and Locks:

a. Schlage lock cylinders and Mortise Latchsets , Ingersol-Rand Corp. (No Substitution)

5. Bolts:

a. H. B. Ives, A Harrow Company
b. Glynn-Johnson Corp.
c. Hager Hinge Co.
d. Builders Brass Works Corp.
e. Trimco.
f. Stanley Hardware, Div. Stanley Works.

6. Exit/Panic Devices:

a. Von Duprin, Div. Ingersoll-Rand Door Hardware Group.

7. Wire Push/Pulls:

a. Ives.
d. Hager Hinge Co.
c. Triangle Brass Manufacturing Company (Trimco).

8. Overhead Closers:

a. LCN, Div. Ingersoll-Rand Door Hardware Group..

9. Floor Closers:

a. Dorma
b. Rixson-Firemark, Div. Yale Security Inc..

11. Door Control Devices:

a. Von Duprin.

12. Door Trim Units:

a. H. B. Ives, A Harrow Company.
b. Brookline Industries, Div. Yale Security Inc.
c. Builders Brass Works Corp.
d. Hager Hinge Co.
e. Baldwin Hardware Corp
f. Triangle Brass Manufacturing Company (Trimco).

13. Kick, Mop, and Armor Plates:

a. Baldwin Hardware Corp.
b. Brookline Industries, Div. Yale Security Inc.
c. Corbin & Russwin Architectural Hardware, Div. Black & Decker Corp.
d. Hager Hinge Co.
e. Hiawatha, Inc.
f. H. B. Ives, A Harrow Company.
g. Triangle Brass Manufacturing Company (Trimco).

14. Sliding Pocket Door Sets:

a. Grant Hardware Co.
b. P. C. Henderson Inc.
c. L. E. Johnson Products, Inc.
d. Stanley Hardware, Div. Stanley Works.

16. Door Stripping and Seals:

a. National Guard Products, Inc.
b. Pemko Manufacturing Co., Inc.
c. Reese Enterprises, Inc.
d. Sealeze Corp.
e. Ultra Industries.

18. Thresholds:

a. Hager Hinge Co.
b. National Guard Products, Inc.
c. Pemko Manufacturing Co., Inc.
d. Reese Enterprises, Inc.
e. Sealeze Corp.

19. Automatic Drop Seals:

a. Hager Hinge Co.
b. National Guard Products, Inc.
c. Pemko Manufacturing Co., Inc.
d. Reese Enterprises, Inc.

20. Sound Stripping:

    a. National Guard Products, Inc.
    b. Pemko Manufacturing Co., Inc.
    c. Reese Enterprises, Inc.

21. Astragals:

    a. Hager Hinge Co.
    b. National Guard Products, Inc.
    c. Pemko Manufacturing Co., Inc.
    d. Reese Enterprises, Inc

22. Floor Stops:

    a. Trimco Focal.

23. Automatic Door Operators

    a. Horton Automatics
    b. MS Sedco

2.2 SCHEDULED HARDWARE

A. Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of finish hardware are indicated in the "Hardware Schedule" at the end of this Section. Products are identified by using hardware designation numbers of the following:

1. Manufacturer's Product Designations: The product designation and name of one manufacturer are listed for each hardware type required for the purpose of establishing minimum requirements. Provide either the product designated or, where more than one manufacturer is specified under the Article "Manufacturers" in Part 2 for each hardware type, the comparable product of one of the other manufacturers that complies with requirements.

2. ANSI/BHMA designations used elsewhere in this Section to describe hardware items or to define quality or function are derived from the following standards. Provide products complying with these standards and requirements specified elsewhere in this Section.

    a. Butts and Hinges: ANSI/BHMA A156.1.
    b. Bored and Preassembled Locks and Latches: ANSI/BHMA A156.2.
    c. Exit Devices: ANSI/BHMA A156.3.
    d. Door Controls - Closers: ANSI/BHMA A156.4.
    e. Auxiliary Locks and Associated Products: ANSI/BHMA A156.5.
    f. Architectural Door Trim: ANSI/BHMA A156.6.
    g. Template Hinge Dimensions: ANSI/BHMA A156.7.
    h. Door Controls - Overhead Holders: ANSI/BHMA A156.8.
    i. Interconnected Locks and Latches: ANSI/BHMA A156.12.
    j. Mortise Locks and Latches: ANSI/BHMA A156.13.
    k. Sliding and Folding Door Hardware: ANSI/BHMA A156.14.
    l. Closer Holder Release Devices: ANSI/BHMA A156.15.
    m. Auxiliary Hardware: ANSI/BHMA A156.16.
    n. Self-Closing Hinges and Pivots: ANSI/BHMA A156.17.
    o. Materials and Finishes: ANSI/BHMA A156.18.

2.3 MATERIALS AND FABRICATION

A. Manufacturer's Name Plate: Do not use manufacturers' products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise acceptable to Architect.

1. Manufacturer's identification will be permitted on rim of lock cylinders only.

B. Base Metals: Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units by applicable ANSI/BHMA A156 series standards for each type of hardware item and with ANSI/BHMA A156.18 for finish designations indicated. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.

C. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.

D. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.

E. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of reinforcing the work adequately to fasten the hardware securely. Where thru-bolts are used as a means of reinforcing the work, provide sleeves for each thru-bolt or use sex screw fasteners.

2.4 HINGES, BUTTS, AND PIVOTS

A. Templates: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

B. Screws: Provide Phillips flat-head screws complying with the following requirements:

1. For metal doors and frames install machine screws into drilled and tapped holes.
2. For wood doors and frames install wood screws.
3. For fire-rated wood doors install #12 x 1-1/4-inch (32-mm), threaded-to-the-head steel wood screws.
4. Finish screw heads to match surface of hinges or pivots.

C. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

1. Out-Swing Exterior Doors: Nonremovable pins.
2. Out-Swing Corridor Doors with Locks: Nonremovable pins.
3. Interior Doors: Nonremovable pins.
4. Tips: Flat button and matching plug, finished to match leaves.

D. Number of Hinges: Provide number of hinges indicated but not less than 3 hinges per door leaf for doors 90 inches (2250 mm) or less in height and one additional hinge for each 30 inches (750 mm) of additional height.

1. Fire-Rated Doors: Not less than 3 hinges per door leaf for doors 86 inches (2150 mm) or less in height with same rule for additional hinges.

2.5 LOCK CYLINDERS AND KEYING

A. All locks and latches to be shipped without permanent cylinders unless required by Contractor for temporary security.

1. The Owner will install all permanent cylinders and perform all keying.

B. Contractor to provide own temporary construction, installation and “testing” cylinders.

2.6 KEY CONTROL SYSTEM

A. Not required for this project.

2.7 LOCKS, LATCHES, AND BOLTS

A. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set, unless otherwise indicated.

1. Provide flat lip strikes for locks with 3-piece, antifriction latchbolts as recommended by manufacturer.
2. Provide extra long strike lips for locks used on frames with applied wood casing trim.
3. Provide recess type top strikes for bolts locking into head frames, unless otherwise indicated.
4. Provide dust-proof strikes for foot bolts, except where special threshold construction provides nonrecessed strike for bolt.
5. Provide roller type strikes where recommended by manufacturer of the latch and lock units.
6. Center latches in strikes.

B. Use Schlage L9000 labeled mortise locks. Use “L” Full Face Escutcheon and “06” lever for trim design selection.

C. Use Schlage L400 labeled non-latching mortise locks where indicated.

D. Provide 2-3/4” backset.

E. Only ASA type strikes with no filing or other modifications to adjust fit.

F. All knobs, levers and handles shall comply with ADA requirments.

2.8 PUSH/PULL UNITS

A. Concealed Fasteners: Provide manufacturer's special concealed fastener system for installation, thru-bolted for matched pairs but not for single units.

2.9 CLOSERS AND DOOR CONTROL DEVICES

A. LCN 4040 or equivalent as indicated

B. Dorma BTS80 floor closers where indicated.

C. Size of Units: Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit depending on size of door, exposure to weather, and anticipated frequency of use.

1. Where parallel arms are indicated for closers, provide closer unit one size larger than recommended for use with standard arms.
2. Provide parallel arms for all overhead closers, except as otherwise indicated.

D. Access-Free Manual Closers: Where manual closers are indicated for doors required to be accessible to the physically handicapped, provide adjustable units complying with ANSI A117.1 provisions for door opening force and delayed action closing.

E. Flush Floor Plates: Provide finished metal flush floor plates for floor closers except where thresholds are indicated and cover plate is specified to be an integral part of threshold. Finish floor plate to match hardware sets, unless otherwise indicated.

G. Provide black resilient parts for exposed bumpers.

H. Provide 10 year warranty for closers.

I. Exit Devices: Use the function and trim as noted in the scheduled applications (designation based on Von Duprin products)

2.10 DOOR TRIM UNITS

A. Fasteners: Provide manufacturer's standard exposed fasteners for door trim units consisting of either machine screws or self-tapping screws.

B. Fabricate edge trim of stainless steel to fit door thickness in standard lengths or to match height of protection plates.

C. Fabricate protection plates not more than 1-1/2 inches (38 mm) less than door width on hinge side and not more than 1/2 inch (13 mm) less than door width on pull side by height indicated.

1. Metal Plates: Stainless steel, 0.050 inch (U.S. 18 gage) (1.3 mm).

2.11 HARDWARE FOR INTERIOR SLIDING DOORS

A. General: Provide manufacturer's standard hardware for interior sliding doors when not furnished as part of complete door package.

B. Operating Hardware for Pocket Doors: Provide manufacturer's complete set consisting of extruded aluminum or galvanized steel overhead track, adjustable hangers (carriages), galvanized steel split-jambs and split-studs, wood nailers for head track, jambs and studs, galvanized steel brackets for assembly and attachment to floor and wall framing, bumpers, and nylon floor guides designed to accommodate the number (single and biparting), size, thickness, and weight of door leaves indicated. Provide pull and lock for each door as indicated.

2.12 WEATHERSTRIPPING AND SEALS

A. General: Provide continuous weatherstripping on exterior doors and smoke, light, or sound seals on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

B. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strip is easily replaceable and readily available from stocks maintained by manufacturer.

C. Weatherstripping at Jambs and Heads: Provide bumper-type resilient insert and metal retainer strips, surface applied unless shown as mortised or semimortised, and of following metal, finish, and resilient bumper material:

1. Extruded aluminum with natural anodized finish, 0.062-inch (1.6-mm) minimum thickness of main walls and flanges.

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2. Sponge neoprene conforming to MIL R 6130, Class II (Closed Cell).

a. Grade A: 30 to 150 deg F (-1 to 65 deg C), oil-resistant and self-extinguishing.

3. Expanded neoprene: Cellular rubber conforming to ASTM D 1056 Type 2 (closed-cell); Class B (low-swell, oil-resistant); Grade 2 (compression-deflection of 5 - 9 psi (35 - 60 kPa)); and self-extinguishing.

D. Weatherstripping at Door Bottoms: Provide threshold consisting of contact-type resilient insert and metal housing of design and size shown and of following metal, finish, and resilient seal strip:

1. Extruded aluminum with natural anodized finish, 0.062-inch (1.6-mm) minimum thickness of main walls and flanges.

2.14 THRESHOLDS

A. General: Except as otherwise indicated, provide standard metal threshold unit of type, size, and profile as shown or scheduled.

B. Exterior Hinged or Pivoted Doors: Provide units not less than 4 inches (100 mm) wide, formed to accommodate change in floor elevation where indicated, fabricated to accommodate door hardware and to fit door frames.

2.15 HARDWARE FINISHES

A. BHMA 626 (US26D) satin chrome plate, uncoated.

B. BHMA 630 (US32D) satin stainless steel, uncoated.

C. BHMA 628 (US28) Satin Aluminum – Clear Anodized

D. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.

E. Provide protective lacquer coating on all exposed hardware finishes of brass, bronze, and aluminum, except as otherwise indicated. The suffix "-NL" is used with standard finish designations to indicate "no lacquer."

F. The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18, "Materials and Finishes," including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.

G. The designations used in schedules and elsewhere to indicate hardware finishes are the industry-recognized standard commercial finishes, except as otherwise noted.

2.16 AUTOMATIC DOOR OPERATORS

A. DOOR OPERATOR UNITS: Horton Automatics Series 4100LE: Surface Applied Operator with connecting arms and linkage shall provide positive control of door through entire swing.

1. Mounting: The operator header shall be mounted to the surface of the existing door frame or wall.
2. Door Arms: Connecting hardware shall be a double arm arrangement that can either push the door or pull the door open to suit the job condition. When the operator mounting is on the pull side and adjacent wall is within 4" (102 mm) of the door frame, provide a parallel arm.
3. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.

B. HEADER CASE: Shall be the following configuration:

1. Bottom Access: Shall be extruded aluminum case 4 1/2" x 6" (114 mm x 152 mm).
2. Extruded Aluminum: ASTM B221, 6063-T5 alloy and temper, anodized: Structural Header Sections: Minimum 1/8" (3 mm) thickness.
3. Finishes (for all exposed aluminum surfaces): Shall be 204-R1 Clear, Arch. Class 2 Clear Anodized Coating, AA-MI2C22A31.

C. OPERATOR: The Electric Operating Mechanism shall be Series 4000LE: Operator shall be isolation mounted and concealed in an extruded aluminum case for smooth and quiet operation. Maximum current draw shall not exceed 3.15 amps.

1. Opening Action: Shall be accomplished by a 1/8 HP D.C. permanent magnet motor working through reduction gears to the output shaft. Gear train bearings shall be sealed ball bearing types.
2. Field Adjustable Spring Closing Action: shall be accomplished by a maximum-duty Quadracoil™ spring (four independent coil springs separated by teflon discs and enclosed in an external spring

box) with a lifetime warranty. The spring shall be adjustable, without removing the operator from the header, to accommodate a wide range of field conditions.

3. Independent Adjustable Closing and Latching Speed Control: The operator shall employ a rheostat module to allow for independent field adjustment of closing and latching speeds using the motor as a dynamic brake.
4. Field Adjustable Open Stop: The operator shall provide a field adjustable open stop to accommodate opening angles from 80 to 135 degrees without the need for additional components.
5. Consistent Cycle: The operator shall deliver an even, consistent open force across the entire transition from door fully closed to door open check. Additionally, the range of the force shall be field adjustable to accommodate a wide range of on-site conditions.
6. Manual Use: The operator shall function as a manual door closer in the direction of swing with or without electrical power. The operator shall deliver an even, consistent open force across the entire transition from door fully closed to door fully open.
7. Controller Protection: The controller shall incorporate the following features to ensure trouble free operation:

a. Automatic Reset upon power up.
b. Main fuse protection.
c. Electronic surge protection.
d. Internal power supply protection.
e. Resettable sensor supply fuse protection.

8. Push Button Interface: The controller shall have push button switches with to allow for selection or change of the following parameters: carpet or timer logic, single or dual door, activation options, normal back check or large back check, push-to-open assist on/off.
9. Soft Start/Stop: A “soft-start” “soft-stop” motor driving circuit shall be provided for smooth normal opening and recycling.
10. Control Switch: Automatic door operators shall be equipped with a three position function switch to control the operation of the door. Control switch shall provide three modes of operation, Automatic, Off, and Hold-Open.
11. Master Control: Shall incorporate the following features:
    a. Adjustable time delay of 2 to 30 seconds (ANSI A156.19 requirement is 5 second minimum time delay).
    b. Infinite adjustment to opening and open check speeds including adjusting the opening force without affecting the opening speed.
    c. Immediate reversal of door motion without undue strain on the drive train. This will be accomplished by supplying stepped voltage to the motor. The door shall reverse when closing if an object stops the door.
    d. Motor Protection Circuit: A locked door motor protection circuit will be supplied that will shut off current to the motor when the door is inadvertently locked or otherwise prevented from opening.

D. ACTIVATING DEVICE: MS Sedco 59R4-SS with Clearpath Receiver CP-RX: Push plate switches shall be located on each side of the opening as per ANSI Safety Standard A117and shall be wireless radio (RF) control. Activating device shall be momentary contact microswitch assembly in the following configuration:
1. Push Plate Switch: 4.5" diameter, stainless steel switch with blue paint filled engravings. Wall mounted. Engraved with: International symbol for accessibility and “Press To Operate Door”.
2. RF Receiver: Receiver shall be Mode 1 at typical doors, Mode 3 with RXM add on module for dual receiver capability at doors with card reader access.

E. ELECTRICAL: To be provided under Division 16: 120 or 220 VAC, 60 cycle, 1 phase, 5 amps for single doors.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mount hardware units at heights indicated in following applicable publications, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by Architect.

1. "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.
2. "Recommended Locations for Builders Hardware for Custom Steel Doors and Frames" by the Door and Hardware Institute.
3. NWWDA Industry Standard I.S.1.7, "Hardware Locations for Wood Flush Doors."

B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.

C. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

D. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

E. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements specified in Division 7 Section "Joint Sealers."

F. Weatherstripping and Seals: Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

3.2 ADJUSTING, CLEANING, AND DEMONSTRATING

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.

1. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

2. All door closers shall be readjusted after air balance is complete.

B. Clean adjacent surfaces soiled by hardware installation.

C. Instruct Owner's personnel in the proper adjustment and maintenance of door hardware and hardware finishes.

D. Six-Month Adjustment: Approximately six months after the date of Substantial Completion, the Installer, accompanied by representatives of the manufacturers of latchsets and locksets and of door control devices, and of other major hardware suppliers, shall return to the Project to perform the following work:

1. Examine and re-adjust each item of door hardware as necessary to restore function of doors and hardware to comply with specified requirements.
2. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures.
3. Replace hardware items that have deteriorated or failed due to faulty design, materials, or installation of hardware units.
4. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

Finish Hardware Specification
Hardware Sets

Quantity	Item	Manuf.	Number	Note	Finish
	Group 1				
1	Gear Hinge	AL Door Supplier			628
1	Exit Device	Von Duprin	98-NL-OP		630
1	Auto Operator	Horton	4100LE		Alum
2	Push Plate Switch	MS Sedco	59R4-SS		
1	Wireless Receiver	MS Sedco	CP-RX		
1	Pull	CRL	K-S 48"		630
1	Cylinder	Schlage	Primus IC		630
1	Sweep/Door Bottom	AL Door Supplier			
1	Weather Strip	AL Door Supplier			
1	Threshold	AL Door Supplier	424		Mill Al.
	Group 2				
1	Gear Hinge	AL Door Supplier			628
1	Exit Device	Von Duprin	98 EO		630
1	Closer	LCN	5030		
1	Cylinder	Schlage	Primus IC		630
1	Threshold	AL Door Supplier	424		Mill Al.
1	Sweep/Door bottom	AL Door Supplier			
1	Weather Strip	AL Door Supplier			
1	Door Position Sensor	OTHERS			
	Group 3				
2	Gear Hinge	AL Door Supplier			628
1	Electric Exit Device	Von Duprin	98-EL		630
1	Exterior Trim Lever	Von Duprin	NL-06		630
1	Power Transfer	Von Duprin	EPT-10		
1	Removable Mullion (key)	Von Duprin	KR1654 w/ 1-1606 Strike		SP313
1	Auto Flush Bolts	Ives	FB-31P		652
1	Dust Proof Strike	Ives	DP-1		630
2	Closer	AL Door Supplier	5030		
1	Cylinder	Schlage	Primus IC		630
1	Threshold	AL Door Supplier	424		Mill Al.
2	Sweep/Door bottom	Al Door Supplier			
2	Weather Strip	Al Door Supplier			
2	Door Position Sensor	OTHERS			
1	Card Reader	OTHERS			
	Power Supply	Von Duprin	PS 902		

	Group 4				
3	Butt Hinges	Ives	5-BB-1-HW-4.5x4.5-NRP		652
1	Butt Hinge Elec.	Ives	TW4		652
1	Exit Device (Elec.)	Von Duprin	98 CX		630
1	Pull	Glynn Johnson	HL6		630
1	Closer	LCN	5030		
1	Cylinder	Schlage	Primus IC		630
1	Card Reader	OTHERS			
1	Door Position Switch	OTHERS			
	Power Supply	Von Duprin	PS914		
	Group 5				
4	Butt Hinges	Ives	5-BB-1-HW-4.5x4.5		630
1	Exit Device	Von Duprin	98NL-OP/ CD		630
1	Pull	CRL	K-S 48"		630
1	Cylinder	Schlage	Primus IC		630
1	Closer	LCN	4040		Alum
	Door Position Switch	OTHERS	(Door A103b only)		
	Group 6				
4	Butt Hinges	Ives	5-BB-1-HW-4.5x4.5		652
1	Latchset	Schlage	L9050		630
1	Cylinder	Schlage	Primus IC		630
1	Stop	Trimco	7281		
	Group 7				
1	Pivot - Top Center Hung	Ives	7255 Top		
1	Closer - Floor	Dorma	BTS-80	90 degree hold	
1	Pull	CRL	K-S 48"		630
1	Cylinder	Schlage	Primus IC		630
1	Deadbolt	Schlage	L464		630
	Group 8				
4	Butt Hinges	Ives	5-BB-1-HW-4.5x4.5		652
1	Auto Operator	Horton	4100LE	Para. Inswing	Alum
2	Push Plate Switch	MS Sedco	59R4-SS		
1	Wireless Receiver	MS Sedco	CP-RX / RXM		
1	Push	Ives	8200-4x16		630
1	Pull	Ives	8302F-4x16-8" Centers		630
1	Cylinder	Schlage	Primus IC		630
1	Deadbolt	Schlage	L463		630
1	Kickplate 10"x 2"LDW	Ives	8400		630

	Group 9			
8	Butt Hinges	Ives	5-BB-1-HW-4.5x4.5	652
1	Latchset	Schlage	L9080	630
1 set	Flush Bolts	Ives	FB31P	630
2	Door Bottom	NGP	423N	
1 set	Smoke seal	NGP	5050C	
1	Cylinder	Schlage	Primus IC	630
1	Hold Open	Ives		
1	Astragal	NGP	139SS	630
1 set	Astragal Seal	NGP	115NA	
	Group 10			
4	Butt Hinges	Ives	5-BB-1-HW-4.5x4.5	652
1	Latchset	Schlage	L9080	630
1	Cylinder	Schlage	Primus IC	630
	Group 11			
3	Butt Hinges	Ives	5-BB-1-HW-4.5x4.5	652
1	Butt Hinge Elec.	Ives	TW4	652
1	Latchset ELEC.	Schlage	L9080EL	630
1	Closer	LCN	4040	Alum
1	Cylinder	Schlage	Primus IC	630
1	Card Reader	OTHERS		
1	Door Position Sensor	OTHERS		
	Group 12			
4	Butt Hinges	Ives	5-BB-1-HW-4.5x4.5	652
1	Latchset	Schlage	L9080	630
1	Closer	LCN	4040	Alum
1	Door Bottom	NGP	423N	
1	Smoke Seals	NGP	5050C	
1	Cylinder	Schlage	Primus IC	630
	Group 13			
3	Butt Hinges	Ives	5-BB-1-HW-4.5x4.5	652
1	Butt Hinge Elec.	Ives	TW4	652
1	Latchset (ELEC.)	Schlage	L9080EL	630
1	Closer	LCN	4040	Alum
1	Cylinder	Schlage	Primus IC	630
1	Door Bottom	NGP	423N	
1	Weatherstrip	NGP	5050C	
1	Card Reader	OTHERS		
1	Door Position Sensor	OTHERS		

	Group 14			
7	Butt Hinges	Ives	5-BB-1-HW-4.5x4.5	652
1	Butt Hinge Elec.	Ives	TW4	652
1	Latchset (ELEC.)	Schlage	L9080EL	630
1	Closer	LCN	4040	Alum
2	Flush Bolts	Ives	FB457	630
1	Cylinder	Schlage	Primus IC	630
1	Astragal	NGP	139SS	630
1	Door Bottom	NGP	423N	
1	Card Reader	OTHERS		
1	Door Position Sensor	OTHERS		
At rated doors add the following				
1 set	Door Seal	NGP	700NA	
1 set	Astragal Seal	NGP	115NA	

	Group 15			
1	Head Track	LE Johnson	1500/1575 Adapt.	
1	Wheel Carrier	LE Johnson	1120/1125	
1	Latchset	Schlage	L0172	630
1	Deadbolt	Adams Rite	MS1850SN-050-628	628

	Group 16			
4	Butt Hinges	Ives	5-BB-1-HW-4.5x4.5	652
1	Latchset	Schlage	L9050	
1	Light Seal	NGP	5050C	
1	Door Bottom	NGP	423N	
1	Cylinder	Schlage	Primus IC	

	Group 17			
4	Butt Hinges	Ives	5-BB-1-HW-4.5x4.5	630
1	Latchset	Schlage	L9080	
1	Closer	LCN	4040	Alum
1	Cylinder	Schlage	Primus IC	
1	Threshold	NGP	424	Mill Al.
1	Door Sweep	NGP	198NA	
1	Seals	NGP	127NA	
1	Door Position Sensor	OTHERS		

	Group 18			
1	Pivots	CRL	1NT801/1NT803	
2	Door Rails	CRL	SP35BS12S	630
1	Floor Closer	Dorma	BTS80	630
2	Push/Pull	CRL	DB140K-S	630
1	Cylinder	Schlage	Primus IC	630
1	Transom Bar	CRL	B1250	630
1	Transom Head Channel	CRL	C7500BS	630
1	Dust Proof Strike	NGP	DP-1	630

	Group 19			
8	Butt Hinges	Ives	5-BB-1-HW-4.5x4.5	652
1	Latchset	Schlage	L9080	630
2	Flush Bolts	Ives	FB457	630
1	Cylinder	Schlage	Primus IC	630
1	Dust Proof Strike	Ives	DP1	630
1	Astragal	NGP	139SS	630
	Group 20			
8	Butt Hinges	Ives	5-BB-1-HW-4.5x4.5	652
1	Latchset	Schlage	L9080	630
2	Flush Bolts	Ives	FB457	630
1	Dust Proof Strike	Ives	DP1	630
1	Cylinder	Schlage	Primus IC	630
	Group 21			
4	Butt Hinges	Ives	5-BB-1-HW-4.5x4.5	652
1	Latchset	Schlage	L9496	630
1	Closer	LCN	4040	Alum
1	Cylinder	Schlage	Primus IC	630
	Group 22			
4	Butt Hinges	Ives	5-BB-1-HW-4.5x4.5	652
1	Exit Device w/ Latchset	Von Duprin	98 L-BE	630
1	Closer	LCN	4040	Alum
1	Door Bottom	NGP	423N	
1	Smoke Seals	NGP	5050C	
1	Door Position Sensor	OTHERS		
	Group 23			
8	Butt Hinges	Ives	5-BB-1-HW-4.5x4.5	630
1	Latchset	Schlage	L9080	630
2	Flush Bolts	Ives	FB457	630
2	Sweep	NGP	198NA	
2	Weatherstrip	NGP	127NA	
1	Cylinder	Schlage	Primus IC	630
1	Astragal	NGP	139SS	630
2	Door Position Sensor	OTHERS		
	Group 24			
8	Butt Hinges	Ives	5-BB-1-HW-4.5x4.5	630
1	Latchset	Schlage	L9080	630
1	Closer	LCN	4040	Alum
2	Flush Bolts	Ives	FB457	630
2	Sweep	NGP	198NA	
2	Weatherstrip	NGP	127NA	
1	Cylinder	Schlage	Primus IC	630
1	Astragal	NGP	139SS	630
1	Door Position Sensor	OTHERS		

	Group 25			
8	Butt Hinges	Ives	5-BB-1-HW-4.5x4.5	630
1	Latchset	Schlage	L9080	630
1	Closer	LCN	4040	Alum
2	Flush Bolts	Ives	FB457	
2	Sweep	NGP	198NA	
2	Weatherstrip	NGP	127NA	
1	Cylinder	Schlage	Primus IC	630
1	Astragal	NGP	139SS	630
1 set	Astragal Seal	NGP	115NA	
1	Door Position Sensor	OTHER		
1	Head Drip	NGP	16SS	630
	Group 26			
4	Butt Hinges	Ives	5-BB-1-HW-4.5x4.5	630
1	Latchset	Schlage	L9080	630
1	Closer	LCN	4040	Alum
1	Cylinder	Schlage	Primus IC	630
	Group 27			
4	Butt Hinges	Ives	5-BB-1-HW-4.5x4.5	600
1	Deadbolt	Schlage	L462	630
2	Cylinder	Schlage	Primus IC	630
2	Surface Bolts	Ives	SB360	603

END OF SECTION 08710

SECTION 08800 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes glazing for the following products, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Vision lites.

B. Related Sections: The following sections contain requirements that relate to this Section.

1. Division 7 Section " Sealants".

1.3 DEFINITIONS

A. Manufacturer is used in this Section to refer to a firm that produces primary glass or fabricated glass as defined in the referenced glazing standard.

B. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's directions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

C. Deterioration of Insulating Glass: Failure of the hermetic seal under normal use due to causes other than glass breakage and improper practices for maintaining, and cleaning insulating glass. Evidence of failure is the obstruction of vision by dust, moisture, or film on the interior surfaces of glass. Improper practices for maintaining and cleaning glass do not comply with the manufacturer's directions.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems that are produced, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading (where applicable), without failure including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; and other defects in construction.

B. Glass Design: Glass thicknesses indicated on Drawings are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for the various size openings in the thicknesses and strengths (annealed or heat-treated) to meet or exceed the following criteria:

1. Minimum glass thickness, nominally, of lites in exterior walls is 6 mm.
2. Tinted and heat-absorbing glass thicknesses for each tint indicated are the same throughout Project.
3. Minimum glass thicknesses of lites, whether composed of annealed or heat-treated glass, are selected so the worst-case probability of failure does not exceed the following:

a. 8 lites per 1000 for lites set vertically or not over 15 degrees off vertical and under wind action. Determine minimum thickness of monolithic annealed glass according to ASTM E 1300. For other than monolithic annealed glass, determine thickness per glass manufacturer's standard method of analysis including applying adjustment factors to ASTM E 1300 based on type of glass.
b. 1 lite per 1000 for lites set over 15 degrees off vertical and under action of wind or snow.

C. Normal thermal movement results from the following maximum change (range) in ambient and surface temperatures acting on glass-framing members and glazing components. Base engineering calculation on materials' actual surface temperatures due to both solar heat gain and nighttime sky heat loss.

1. Temperature Change (Range): 120 F deg, ambient; 180 F deg, material surfaces.

1.5 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

B. Product data for each glass product and glazing material indicated.

C. Samples for verification purposes of 12-inch square samples of each type of glass indicated except for clear monolithic glass products, and 12-inch long samples of each color required (except black) for each type of sealant or gasket exposed to view. Install sealant or gasket sample between two strips of material representative in color of the adjoining framing system.

D. Product certificates signed by glazing materials manufacturers certifying that their products comply with specified requirements.

1. Separate certifications are not required for glazing materials bearing manufacturer's permanent labels designating type and thickness of glass, provided labels represent a quality control program of a recognized certification agency or independent testing agency acceptable to authorities having jurisdiction.

E. Product test reports for each type of glazing sealant and gasket indicated, evidencing compliance with requirements specified.

F. Maintenance data for glass and other glazing materials to include in Operating and Maintenance Manual specified in Division 1.

G. LEED Submittals:
1. Credit IEQ 4.1: For adhesives and sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
    a. Product Data
    b. Laboratory Test Reports

1.6 QUALITY ASSURANCE

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. FGMA Publications: "FGMA Glazing Manual."

B. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.

1. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.

C. Insulating Glass Certification Program: Provide insulating glass units permanently marked either on spacers or at least one component lite of units with appropriate certification label of inspecting and testing agency indicated below:

1. Insulating Glass Certification Council (IGCC).
2. Associated Laboratories, Inc. (ALI).

D. Glazier Qualifications: Engage an experienced glazier who has completed glazing similar in material, design, and extent to that indicated for Project with a record of successful in-service performance.

E. Single-Source Responsibility for Glass: Obtain glass from one source for each product indicated below:

1. Primary glass of each (ASTM C 1036) type and class indicated.
2. Heat-treated glass of each (ASTM C 1048) condition indicated.
3. Laminated glass of each (ASTM C 1172) kind indicated.
4. Insulating glass of each construction indicated.

F. Single-Source Responsibility for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.

G. Pre-Installation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials to comply with manufacturer's directions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.8 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing materials manufacturer or when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Install liquid sealants at ambient and substrate temperatures above 40 deg F.

1.9 WARRANTY

A. General: Warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

B. Manufacturer's Warranty on Insulating Glass: Submit written warranty signed by manufacturer of insulating glass agreeing to furnish replacements for insulating glass units that deteriorate as defined in "Definitions" article, f.o.b. point of manufacture, freight allowed Project site, within specified warranty period indicated below. Warranty covers only deterioration due to normal conditions of use and not to handling, installing, protecting, and maintaining practices contrary to glass manufacturer's published instructions.

1. Warranty Period: Manufacturer's standard but not less than 10 years after date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the products listed in the Glazing Schedule on the Drawings.

2.2 PRIMARY FLOAT GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I (transparent glass, flat), Class as indicated below, and Quality q3 (glazing select).

1. Class 1 (clear).
2. Class 2 (tinted).

B. Refer to requirements for sealed insulating glass units for performance characteristics of assembled units composed of tinted glass, coated or uncoated, relative to visible light transmittance, U-values, shading coefficient, and visible reflectance.

2.3 HEAT-TREATED FLOAT GLASS

A. Uncoated, Clear, Heat-Treated Float Glass: ASTM C 1048, Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), kind as indicated below.

1. Kind HS (heat strengthened) where indicated.
2. Kind FT (fully tempered) where indicated.

B. Uncoated, Tinted, Heat-Treated Float Glass: ASTM C 1048, Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 2 (tinted), Quality q3 (glazing select), kind as indicated below.

1. Kind HS (heat strengthened) where indicated.
2. Kind FT (fully tempered) where indicated.

C. Coated, Clear, Heat-Treated Float Glass: ASTM C 1048, Condition C (other coated glass), Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), with coating type and performance characteristics complying with requirements specified under coated glass products; kind as indicated below:

1. Kind HS (heat strengthened) where indicated.
2. Kind FT (fully tempered) where indicated.

D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering heat-treated glass products that may be incorporated in the Work include, but are not limited to, the following companies.

1. AFG Industries, Inc.
2. Artistic Glass Products Co.
3. Cardinal IG.
4. Saint-Gobain.
5. Falconer Glass Industries.
6. Glasstemp, Inc.
7. Guardian Industries Corp.
8. Oldcastle Glass.
9. PPG Industries, Inc.
10. Spectrum Glass Products, Inc.
11. Tempglass.
12. Viracon, Inc.
13. Arch Aluminum

2.4 INSULATING GLASS PRODUCTS

A. Sealed Insulating Glass Units: Preassembled units consisting of organically sealed lites of glass separated by dehydrated air spaces complying with ASTM E 774 and with other requirements indicated.

1. For properties of individual glass lites making up units, refer to requirements specified elsewhere in this Section applicable to types, classes, kinds, and conditions of glass products comprising lites of insulating glass units.
2. Provide heat-treated, coated float glass of kind indicated or, if not otherwise indicated, Kind HS (heat strengthened) where recommended by manufacturer to comply with system performance requirements specified and Kind FT (fully tempered) where safety glass is designated or required.
3. Performance characteristics designated for coated insulating glass are nominal values based on manufacturer's published test data for units with lites 6 mm thick and nominal 1/2-inch dehydrated space between lites, unless otherwise indicated.
4. U-values are expressed as Btu/hr x sq. ft. x deg F.

B. Insulating units to be per Glazing Schedule in drawings with the following materials:

1. Glass panes as indicated.
2. Pane thickness per schedule.
3. Spacer – natural aluminum color
4. Sealant – as required by manufacturer.

2.5 LAMINATED GLASS PRODUCTS

A. Laminated Glass Products: Comply with ASTM C 1172 for kinds of laminated glass indicated and other requirements specified. Refer to primary and heat-treated glass requirements relating to properties of glass products comprising laminated glass products.

B. Interlayer: Interlayer material as indicated below, in clear or colors, and of thickness indicated with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation.

1. Interlayer Material: Polyvinyl butyral sheets.
2. Available Products: Subject to compliance with requirements, the plastic interlayer products that may be incorporated in the Work include, but are not limited to, the following:
   a. Polyvinyl Butyral Interlayer:

      1) Saflex, Eastman Chemical Co.
      2) Butacite, E. I. du Pont de Nemours & Co., Inc.

C. Laminating Process: Fabricate laminated glass to produce glass free of foreign substances and air or glass pockets as follows:

1. Laminate lites with polyvinyl butyral interlayer in autoclave with heat plus pressure.

2.6 ELASTOMERIC GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:

1. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials they will contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
2. Suitability: Comply with sealant and glass manufacturer's recommendations for selecting glazing sealants and tapes that are suitable for applications indicated and conditions existing at time of installation.
3. Colors: To be selected by Architect

2.7 GLAZING TAPES

A. Expanded Cellular Glazing Tape: Closed-cell, polyvinyl chloride foam tape, factory coated with adhesive on both surfaces, packaged on rolls with release liner protecting adhesive, and complying with AAMA 800 for product 810.5.

2.8 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials involved for glazing application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85 plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side-walking).

2.9 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

B. Clean cut and flat grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with indoor and outdoor faces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine glass framing, with glazier present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
2. Presence and functioning of weep system.
3. Minimum required face or edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Do not proceed with glazing until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

3.3 GLAZING, GENERAL

A. Comply with combined recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, except where more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions as indicated on Drawings provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass from edge damage during handling and installation as follows:

1. Use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass lites with flares or bevels on bottom horizontal edges so edges are located at top of opening, unless otherwise indicated by manufacturer's label.
2. Remove damaged glass from Project site and legally dispose of off site. Damaged glass is glass with edge damage or other imperfections that, when installed, weaken glass and impair performance and appearance.

D. Install elastomeric setting blocks in sill rabbets, sized and located to comply with referenced glazing standard, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass sizes larger than 50 united inches (length plus height) as follows:

1. Locate spacers inside, outside, and directly opposite each other. Install correct size and spacing to preserve required face clearances, except where gaskets and glazing tapes are used that have

demonstrated ability to maintain required face clearances and comply with system performance requirements.

2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking to comply with requirements of referenced glazing publications, unless otherwise required by glass manufacturer.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

J. Square cut wedge-shaped gaskets at corners and install gaskets in manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 PROTECTION AND CLEANING

A. Protect exterior glass from breakage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkali deposits, or stains, and remove as recommended by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents and vandalism, during construction period.

E. Wash glass on both faces in each area of Project not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

GLAZING SCHEDULE: See drawings

END OF SECTION 08800

SECTION 08840 – PLASTIC GLAZING

Part 1 - GENERAL

1.1 SECTION INCLUDES

A. Plastic Glazing

1.2 RELATED SECTIONS

A. Section 05500: Miscellaneous Metal

1.3 DESIGN REQUIREMENTS

A. Plastic shall be classified (CC2).

B. Plastic shall be tsted and be approved as a Class C material according to ASTM E84.

1.4 SUBMITTALS

A. Product Data:

1. Submit copies of:
   a. Catalogs showing Material Properties.
   b. Installation Guidelines
   c. Site Care and Handling Instructions.
   d. Cleaning and Maintenance Instructions.
   e. Data sheets on miscellaneous materials as required.

2. Submit copies of the following tests:
   a. ASTM D-635 describing Horizontal Burn Characteristics and Light Transmitting Plastic Classification.
   b. ASTM E-84 or ASTM D-2843 describing Smoke Density Rating.
   c. ASTM D-1929 describing the Self Ignition Properties.

B. Samples

1. Submit (2) 4" x 6" samples of the selected Type, Color and Gage.

C. Mockup

1. Before installing Guardrails construct mockups required to verify detail attachments made under Shop Drawing submittals and to demonstrate aesthetic effects and qualities of materials and execution. Coordinate this mock-up with installer of guard rail supports. Build mockups to comply with the following requirements, using materials indicated for completed Work.

   a. Locate mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
   b. Notify Architect 7 days in advance of the dates and times when mockups will be constructed.
   c. Demonstrate the proposed range of aesthetic effects and workmanship.
   d. Obtain Architect's approval of mockups before proceeding with final unit of Work.
   e. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
      1) Approved mockups in an undisturbed condition at time of Substantial Completion may become part of the completed work.

REGULATORY REQUIREMENTS

A. Approved Light Transmitting Plastic per SBC.

1.6 DELIVERY, STORAGE & HANDLING

A. Deliver sheets in Enclosed Wooden Crates.

B. Store in Dry, Shaded and Well Ventilated areas. Prevent moisture from coming into contact with bare plastic.

1.7 WARRANTY

A. Provide manufacturer's standard written warranty against material defects and delamination.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, those indicated below.

1. Plaskolite Inc., Columbus, Ohio 43216

2.2 MATERIAL

A. Handrail infill panels:

1. General: Basis of design: Acrylic See-Thru Mirror, Plaskolite, Inc.: A semi-transparent aluminum film deposited on the substrate allows a percentage of incident light to pass through while reflecting the remainder.

a. Thickness: as indicated in drawings.
b. Acrylic color: Clear
c. ASTM E84 rated Class C for thickness indicated.

2.3 FABRICATION

A. Cutting:

1. Cut glazing to dimension required for installation.
2. Cut so that no burrs, chips or other deformations are apparent.
3. Clean each sheet of all debris,chips, filings grease, oil or other materials.
4. Protect the surface of each sheet with a Removable Film.
5. Polish exposed edges with medium duty polishing compound prior to installation.

2.4 MISCELLANEOUS MATERIALS

A. Adhesive tape
1. 3M VHB Tape: #4910 – 40 mil Clear Acrylic with acrylic adhesive and 5 mil red polyethylene film liner.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Immediately upon delivery examine each crate for evidence of damage.

B. Prior to installation examine each panel for damage.

3.2 PREPARATION

A. Clean mounting surface and plastic panel with recommended cleaners.

B. Immediately prior to installation touch up any abraded polished edges.

C. Verify panels are of correct size.

3.3 INSTALLATION

A. Re-clean mounting surface and panel immeadiatly prior to application of adhesive tape..

B. Install the mirrored film side to floor opening.

C. Leave Protective Release Film in place until construction is completed to a point that damage will be minimized from on-going construction activities.,.

3.4 CLEANING

A. Upon removal of Protective Release Film clean all surfaces. For cleaning follow the Manufacturer's Cleaning Instructions.

3.5 PROTECTION

A. Protect finished installation under provisions of Section (01500) .

END OF SECTION 08840

SECTION 08920 - GLAZED ALUMINUM CURTAIN WALL

PART 1 - GENERAL

1.1 SUMMARY

A. Related Documents: Conditions of the Contract, Division 1 - General Requirements, and Drawings apply to Work of this Section.
B. Section Includes:
   1. Aluminum curtain wall systems, complete with reinforcing, shims, anchors, and attachment devices.
   2. Accessories necessary to complete Work.
C. Products Furnished But Not Installed Under this Section: Inserts and anchoring devices that are to be built into structure.
D. Related Sections:
   1. Section 01411 - Exterior Curtain Wall Testing.
   2. Section 01430 - Mock-Ups.
   3. Section 05500 - Metal Fabrications.
   4. Section 06100 - Rough Carpentry.
   5. Section 07211 - Batt and Blanket Insulation.
   6. Section 07270 - Firestopping.
   7. Section 07900 - Joint Sealers.
   8. Section 0841X - Aluminum Entrances and Storefronts.
   9. Section 08450 - All Glass Entrances.
   10. Section 08470 - Revolving Entrance Doors.
   11. Section 08490 - Sliding Mall Fronts.
   12. Section 08520 - Aluminum Windows.
   13. Section 08710 - Door Hardware.
   14. Section 08810 - Glass and Glazing.
   15. Section 08960 - Sloped Glazing System.
   16. Section 12511 - Horizontal Louver Blinds.

1.2 REFERENCES

A. Aluminum Association (AA):
   1. DAF-45 Designation System for Aluminum Finishes.
B. American Architectural Manufacturers Association (AAMA):
   1. CW-DG-1 Aluminum Curtain Wall Design Guide Manual.
   2. 501.2 Field Check of Metal Curtain Walls for Water Leakage.
   3. 2605 Voluntary Specification for High Performance Organic Coatings on Architectural Extrusions and Panels.
   4. 611 Voluntary Specification for Anodized Architectural Aluminum..
C. American National Standards Institute (ANSI):
   1. Z97.1 Specifications and Methods of Test for Safety Glazing Material Used in Buildings.
D. American Society for Testing and Materials (ASTM):
   1. A36 Structural Steel.
   2. A123 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   3. A525 General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
   4. A526 Sheet Steel, Zinc Coated (Galvanized) by the Hot-Dip Process, Commercial Quality.
   5. B209 Aluminum and Aluminum-Alloy Sheet and Plate.

6. B221 Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
7. B308 Aluminum-Alloy 6061-T6 Standard Structural Shapes, Rolled or Extruded.
8. C716 Installing Lock-Strip Gaskets and Infill Glazing Materials.
9. C920 Elastomeric Joint Sealants.
10. E283 Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors.
11. E330 Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
12. E331 Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
13. E773 Test Method for Seal Durability of Sealed Insulating Glass Units.
14. E774 Sealed Insulating Glass Units.

E. Consumer Product Safety Commission (CPSC):
1. 16 CFR 1201 Safety Standard for Architectural Glazing Materials.

F. Federal Specifications (FS):
1. TT-P-645A Primer, Paint, Zinc Chromate, Alkyd Type.

G. Glass Association of North America (GANA):
1. Glazing Manual.

H. Steel Structures Painting Council (SSPC):
1. SP2 Hand Tool Cleaning.
2. SP3 Power Tool Cleaning.
3. Paint 12 Cold-Applied Asphalt Mastic (Extra Thick Film).

1.3 SYSTEM REQUIREMENTS

A. General Standard: In addition to requirements shown or specified, comply with applicable provisions of Aluminum Curtain Wall Design Guide Manual for design, materials, fabrication and installation of component parts.

B. Design Requirements:
1. Metal stick framed systems with interior and exterior exposed metal framing.
2. Operable vent with sight line concealed from the exterior. Perimeter members to be integral with window wall framing.
3. System manufacturer shall provide low profile entrance frames as an integral part of the curtain wall system.
4. System manufacturer shall provide curtainwall systems, including necessary modifications to meet specified requirements and maintaining visual design concepts.
5. Fabricate glazing systems for exterior glazing at vision areas and exterior glazing at spandrel areas.
6. Perimeter conditions shall allow for installation tolerances, expansion and contraction of adjacent materials, and sealant manufacturer's recommended joint design.
7. Drawings are diagrammatic and do not purport to identify nor solve problems of thermal or structural movement, glazing, anchorage or moisture disposal.
8. Requirements shown by details are intended to establish basic dimension of unit, sight lines and profiles of members.
9. Do not assume glass, sealants, and interior finishes contribute to framing member strength, stiffness, or lateral stability.
10. Attachment considerations are to take into account site peculiarities and expansion and contraction movements so there is no possibility of loosening, weakening or fracturing connection between units and building structure or between units themselves.
11. Allow for expansion and contraction due to structural movement without detriment to appearance or performance.
12. System shall drain to exterior face of wall, water entering joints and condensation occurring within system by drain holes and gutters of adequate size to evacuate water without infiltration to interior or the top of lower lites of glass.

13. Provide concealed fastening.
14. Metal faces are required to be visually flat under all lighting conditions, subject to acceptance of Architect.
15. Use dense EPDM isolators to maintain adequate compression on glazing material.
16. Provide uniform color and profile appearance at components exposed to view.
17. Provide interior dense EPDM [closed cell EPDM sponge] gasket with sealed corners, with maximum 30% compression when glazed, to create a water and air seal. Provide exterior dense EPDM wedge gasket at the verticals and exterior EPDM gasket at the horizontals, with a maximum 30% compression when glazed, to create a water & air seal.
18. Provide pre-punched pressure plates to ensure correct quantity and spacing of fasteners.
19. Stresses placed on structural silicone sealants shall be kept within sealant manufacturer's recommended maximum.
20. Not Permitted: Vibration harmonics, wind whistles, noises caused by thermal movement, thermal movement transmitted to other building elements, loosening, weakening, or fracturing of attachments or components of system.
21. Provide two-piece split vertical mullions for screw spline assembly of frames that allows for assembly and sealing of bays in the shop.

C. Performance Requirements:
   1. Air infiltration: Air leakage shall not exceed 0.06 cfm per square foot of surface area when tested in accordance with ASTM E283 at differential static pressure of 6.24 psf.
   2. Water Resistance (static): No uncontrolled leakage when tested in accordance with ASTM E331 at test pressure of 15.0 psf as defined in AAMA 501.
   3. Water Resistance (dynamic): No uncontrolled leakage when tested in accordance with ASTM E331 at test pressure of 15.0 psf as defined in AAMA 501.
   4. Uniform Load: A static air design load of 40 psf shall be applied in a positive and negative direction in accordance with ASTM E 330. At structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.

D. Structural Requirements:
   1. Wind loading:
      a. Basic zones:
      b. Corner zones:
      [c. Parapet zones:]
   2. Deflection under uniform loading: When tested in accordance with ASTM E330 at design pressure, maximum deflection of exterior member shall not exceed L/175 for spans up to 13’-6” or L/240 + 1/4” for spans greater than 13’-6”.
   3. Parallel to wall and corner mullion deflections: 75% of glass edge bite or 3/8 inch, whichever is less.
   4. Compression flanges of flexural members may be assumed to receive effective lateral bracing only from:
      a. Anchors to building structure.
      b. Horizontal glazing rails or interior trim, which are in actual contact with compression flange.
   5. Do not regard points of contra-flexture as lateral braces or as end points of un-braced length; un-braced length is actual distance between effective lateral braces as defined above.
   6. Where framing member reaction is resisted by continuous element, maximum assumed effective length of the resisting element is 4 times bearing length, but not more than 12 inches.

E. Thermal Requirements: Framing systems shall accommodate expansion and contraction movement due to surface temperature differential of 180°F without causing buckling, stress on glass, failure of joint seals, excessive stress on structural elements, reduction of performance or other detrimental effects.

F. Thermal Transmittance (U-factor): When tested to AAMA Specification 1503, the thermal transmittance (U-Factor) shall not be more than .67 (with clear glass).

G. Condensation Resistance (CRF): When tested to AAMA Specification 1503, the condensation resistance factor shall not be less than 65 (for the frame).
H. Seismic: When tested to AAMA 501.4, system must meet design displacement of 0.010 x the story height and ultimate displacement of 1.5 x the design displacement, 0.015 x the story height, and 0.025 x the story height.
I. Sound Transmission: When tested to ASTM E90, the Sound Transmission Class (STC) shall not be less than 32 based upon 1" insulating glass (1/4", 1/2" AS, 1/4").
J. Laboratory Testing: Refer to Section 01411 for requirements.
K. Interface:
1. Furnish inserts and anchoring devices, which need to be preset and built into structure to appropriate trade.
2. Supply on timely basis to avoid delay in Work.
3. Instruct other trades of proper location and position.
4. Furnish setting drawings, diagrams, templates and installation instructions.

1.4 SUBMITTALS

A. General: Submit in accordance with Section 01300.
B. Product Data:
1. Submit manufacturer's descriptive literature for each manufactured products.
2. Include information for factory finishes, accessories and other required components.
C. Shop Drawings:
1. Submit drawings indicating elevations, detailed design, dimensions, member profiles, joint locations, arrangement of units, member connections, and thickness of various components.
2. Show following items:
a. Details of special shapes.
b. Reinforcing.
c. Drainage details and flow diagrams.
d. Anchorage system.
e. Interfacing with building construction.
f. Provisions for system expansion and contraction
g. Thermal breaks.
4. Indicate glazing details, methods, locations of various types and thickness of glass and internal sealant requirements.
5. Clearly indicate locations of exposed fasteners and joints for Architect's acceptance.
6. Clearly show where and how manufacturer's system deviates from Contract Drawings and these Specifications.
D. Samples:
1. Submit manufactures samples indicating quality of finish in required colors.
2. Where normal texture or color variations are expected, include additional samples illustrating range of variation.
3. Submit samples of structural glazing gaskets, 12 inch lengths.
4. Submit samples of sealants for color selection.
E. Certificates:
1. Submit manufacturer's certification stating that installed system is in compliance with specified requirements.
F. Manufacturer's Instructions: Submit manufacturer's printed installation instructions. Include detailed instructions describing each step of re-glazing procedures.
F. Warranty: Submit specified warranties.

1.5 QUALITY ASSURANCE

A. Single Source Responsibility:
   1. Provide curtainwall systems that are products of a single manufacturer.
B. Engineer Qualifications: Professional Structural Engineer registered in State where Project is located.
C. Installer Qualifications: Certified in writing by system manufacturer as qualified for specified systems.

1.6 PRE-INSTALLATION CONFERENCE
A. Conduct pre-installation conference in accordance with Section 01200.

1.7 DELIVERY, STORAGE, AND HANDLING
A. Comply with requirements of Section 01600.
B. Protect finished surfaces to prevent damage.
C. Do not use adhesive papers or sprayed coatings, which become firmly bonded when exposed to sun.
D. Do not leave coating residue on surfaces.

1.8 PROJECT CONDITIONS
A. Ensure ambient and surface temperatures and joint conditions are suitable for installation of materials.

1.9 WARRANTY
A. Provide warranties in accordance with Section 01700.
B. Provide written warranty in form acceptable to Owner jointly signed by manufacturer, installer and Contractor warranting work to be watertight, free from deflective materials, defective workmanship, glass breakage due to defective design, and agreeing to replace components which fail within 1 year from date of Substantial Completion.
C. Warranty shall cover following:
   1. Complete watertight and airtight system installation within specified tolerances.
   2. Glass and glazing gaskets will not break or "pop" from frames due to design wind, expansion or contraction movement or structural loading.
   3. Glazing sealants and gaskets will remain free from abnormal deterioration or dislocation due to sunlight, weather or oxidation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

A. Subject to compliance with requirements indicated, provide products by one of the following:
   1. Oldcastle BuildingEnvelope™, Terrell, TX.
B. Substitutions: Submit under provisions of Section 01630, a minimum of 10 days prior to bid date.
C. Basis of Design: Oldcastle BuildingEnvelope™ RELIANCE-SS WALL -
   1. 1” Glazing: 7-1/4" mullion profiles; pressure glazed with aluminum caps and stainless steel adhered covers at verticals, and structural silicone glazing (SSG) horizontals, front set, exterior glazed, stick wall system.
   2. Design intent as shown in drawings. Additional mullions, joints or other exposed members will not be permitted. System is to be engineered to supports indicated with any additional internal structural reinforcing provided as needed.

2.2 FRAMING MATERIALS AND ACCESSORIES
A. Aluminum:
   1. ASTM B221, alloy 6063-T5 for extrusions; ASTM B209, alloy 5005-H16 for sheets; or other alloys and temper recommended by manufacturer appropriate for specified finish.
B. Internal Reinforcing:
   1. ASTM A36 for carbon steel; or ASTM B308 for structural aluminum.
   2. Shapes and sizes to suit installation.

3. Shop coat steel components after fabrication with alkyd type zinc chromate primer complying with FS TT-P-645.

C. Inserts and Anchorage Devices:
1. Manufacturer's standard formed or fabricated assemblies, steel or aluminum, of shapes, plates, bars or tubes.
2. Hot-dip galvanize steel assemblies after fabrication, comply with ASTM A123, 2.0 ounce minimum coating.

D. Fasteners:
1. Non-magnetic stainless steel or cadmium plated steel coated with yellow or silver iridescence plating, compatible with materials being fastened.
2. Series 300 stainless steel for exposed locations. Cadmium plated steel with 0.0005 inch plating thickness and color chromate coated for concealed locations.
3. Provide nuts or washers of design having the means to prevent disengagement; deforming of fastener threads is not acceptable.
4. Provide concealed fasteners wherever possible.
5. For exposed locations, provide countersunk flathead fasteners with finish matching item fastened.

E. Expansion Anchor Devices: Lead-shield or toothed-steel, drilled-in, expansion bolt anchors.

F. Shims: Non-staining, non-ferrous, type as recommended by system manufacturer.

G. Protective Coatings: Cold applied asphalt mastic complying with SSPC-Paint 12, compounded for 30 mil thickness for each coat; or alkyd type zinc chromate primer complying with FS TT-P-645.

H. Glazing Gaskets:
1. Compression type design, exterior replaceable, extruded EPDM. Interior is a dense EPDM gasket.
2. Comply with ASTM C509 or C864.
3. Profile and hardness as necessary to maintain uniform pressure for watertight seal.
4. Manufacturer's standard black color.

I. Internal Sealants: Types recommended by system manufacturer to remain permanently non-hardening, non-migrating and weather-tight.

2.3 GLASS AND GLAZING ACCESSORIES

A. Refer to Section 08800.

2.4 SYSTEM FABRICATION

A. Take accurate field measurements to verify required dimensions prior to fabrication.

B. Location of exposed joints is subject to Architect's acceptance.

C. Provide dense EPDM continuous isolator to separate exterior pressure plates and interior framing members.

D. Fabricate components in accord with approved shop drawings. Remove burrs and ease edges. Shop fabricate to greatest extent practicable to minimize field cutting, splicing, and assembly. Disassemble only to extent necessary for shipping and handling limitations.

E. Steel Components:
1. Clean surfaces after fabrication and immediately prior to application of primer in accord with SSPC-SP2 or SSPC-SP3 at manufacturer's option.
2. Apply specified shop coat primer in accord with manufacturer's instructions to provide 2.0 minimum dry film thickness.

F. Fabricate components true to detail and free from defects impairing appearance, strength or durability.

G. Fabricate components to allow for accurate and rigid fit of joints and corners. Match components carefully ensuring continuity of line and design. Ensure joints and connections will be flush and weather-tight. Ensure slip joints make full, tight contact and are weather-tight.

H. Reinforce components as required at anchorage and support points, at joints, and at attachment points for interfacing work.

I. Provide structural reinforcing within framing members where required to maintain rigidity and

accommodate design loads.

J. System design and sealants to accommodate internal weep and drainage system not visible to the exterior.

K. Head and sill extrusions act as gutter and weep water to exterior; do not penetrate sections with fasteners.

L. Allow for adequate clearance around perimeter of system to enable proper installation and for thermal movement within system.

M. Separate dissimilar metals with protective coating or preformed separators to prevent contact and corrosion.

2.5 FINISH

A. Clear Anodized:
   1. Conforming to AA-M12C22A31 and AAMA 611.
   2. Architectural Class I, etched, medium matte, clear anodic coating, 0.7 mil minimum thickness.

B. Polished Stainless Steel:
   1. Polished finish 2BB

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions and proceed with Work in accordance with Section 01400.

B. Verify dimensions, tolerances, and method of attachment with other Work.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions and applicable provisions of AAMA Aluminum Curtain Wall Design Guide Manual.

B. Align assemblies plumb and level, free of warp or twist, aligning with adjacent Work.

C. Tolerances:
   1. Limit variations from plumb and level:
      a. 1/8 inch in 20'-0" vertically and horizontally.
      b. 1/4 inch in 40'-0" either direction.
   2. Limit offsets in theoretical end-to-end and edge-to-edge alignment:
      a. 1/16 inch where surfaces are flush or less than 1/2 inch out of flush and separated by not more than 2 inches.
      b. 1/8 inch for surfaces separated by more than 2 inches.
   3. Step in face: 1/16 inch maximum.
   4. Jog in alignment: 1/16 inch maximum.
   5. Location: 1/4 inch maximum deviation of any member at any location.
   6. Tolerances are not accumulative.

D. Provide attachments and shims to permanently fasten system to building structure.

E. Anchor securely in place, allowing for required movement, including expansion and contraction.

F. Separate dissimilar materials at contract points, including metal in contact with masonry or concrete surfaces, with protective coating or preformed separators to prevent contact and electrolytic action.

G. Set sill members in bed of sealant. Set other members with internal sealants and baffles to provide weather-tight construction.

H. Water Drainage: Each light of glass shall be compartmentalized using joint plugs and silicone sealant to divert water to the horizontal weep locations. Weep holes shall be located in the horizontal pressure plates and covers to divert water to the exterior of the building.

I. Do not apply mullion covers until building is closed in, roofing is installed and no alkaline substances can be washed from building onto curtain wall system.

K. Glazing:
1. Install glazing gaskets and sealants in accordance with manufacturer's instructions without exception; including surface preparations. Refer to Section 08800 for additional requirements.
2. Outside glazed and held in place with extruded aluminum pressure plates anchored to the mullion using Drill-Flex fasteners spaced no greater than 9” on center.

3.3 FIELD QUALITY CONTROL

A. Field Tests: Independent testing laboratory will perform air infiltration according to ASTM E 783, water infiltration ASTM E1105, and hose test; refer to Section 01411 for requirements.

3.4 CLEANING

A. Clean surfaces in compliance with manufacturer's recommendations; remove excess mastic, mastic smears, and other foreign materials.
B. Clean metal surfaces exercising care to avoid damage.

END OF SECTION

SECTION 09251 ACRYLIC PLASTERING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Installation of a cementitious acrylic basecoat, reinforcing mesh, primer, and finish installed on exterior soffits and walls.

1.2 RELATED SECTIONS

A. Section 03300 Concrete

B. Section 07901 Joint Sealants

C. Section 09255 Gypsum Board Assemblies

1.3 REFERENCES

A. ASTM B117 Test Method for Salt Spray (Fog) Testing

B. ASTM D2247 Practice for Testing Water Resistance of Coatings in 100 Percent Relative Humidity

C. ASTM E84 Test Method for Surface Burning Characteristics of Building Materials

D. ASTM E331 Test Method for Water Penetration by Uniform Static Air Pressure Difference

E. ASTM E695 Method for Measuring Relative Resistance to Impact Loading

F. ASTM E2485 Standard Test Method for Freeze/Thaw Resistance of Exterior Insulation and Finish Systems (EIFS) and Water Resistive Barrier Coatings

G. ASTM E2486 Standard Test Method for Impact Resistance of Class PB and PI Exterior Insulation and Finish Systems (EIFS)

H. ASTM G155 and G153 Accelerated Weathering for Exposure of Nonmetallic Materials

1.4 ASSEMBLY DESCRIPTION

A. An exterior coating system consisting of basecoat with embedded reinforcing fabric mesh, and finish coat over fiberglass mat gypsum sheathing board..

B. Functional Criteria

1. General:

a. Control joints shall be installed 30 ft. (9.1 m) on center maximum as per sheathing manufacturer's recommendations.

b. Building code conformance: The construction shall be acceptable for use under the building code in force in the jurisdiction of the project.

c. Prevent the accumulation of water behind the finish system, by proper design and detailing of the soffit and related construction.

2. Performance Requirements

a. Shall meet the testing requirements of the above referenced standards.

1.5 SUBMITTALS

A. Samples: Submit 12" square samples for approval. Samples shall be of materials specified as required to accurately represent each color and texture used on project. Prepare each sample using same tools and techniques for actual project application. Maintain and make available, at job site, approved samples.

B. Manufacturer's Warranty: Submit sample copies of Manufacturer's Warranty indicating Single Source Responsibility

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Shall have marketed EIFS assemblies in United States for at least ten years and shall have completed projects of same general scope and complexity.

2. Applicator: Shall be experienced and competent in installation of EIFS materials, and shall provide evidence of a minimum of five years experience in work similar to that required by this section.
3. Products manufactured under ISO 9001:2000 Quality System.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver products in original packaging with manufacturer's identification.

B. Storage: Store materials in a cool, dry location, out of sunlight, protected from weather and other harmful environment, and at a temperature above 40°F (4.4°C) and below 110°F (43°C) in accordance with manufacturer's instructions.

1.8 PROJECT / SITE CONDITIONS

A. Installation Ambient Air Temperature: Minimum of 40°F (4°C) and rising, and remain so for 24 hours thereafter.

B. Substrate Temperature: Do not apply materials to substrates whose temperature are below 40 °F (4.4 °C) or contain frost or ice.

C. Inclement Weather: Do not apply materials during inclement weather, unless appropriate protection is employed.

D. Sunlight Exposure: Avoid, when possible, installation of the materials in direct sunlight. Application of finishes in direct sunlight in hot weather may adversely affect aesthetics.

E. Parex materials shall not be applied if ambient temperature exceeds 120ºF (49ºC) or falls below 40°F (4.4°C) within 24 hours of application. Protect from uneven and excessive evaporation during hot, dry weather.

F. Prior to installation, the substrate shall be inspected for surface contamination, or other defects that may adversely affect the performance of the ACF materials and shall be free of residual moisture.

1.9 COORDINATION AND SCHEDULING:

A. Coordination: Coordinate Architectural Coatings and Finishes installation with other construction operations.

1.10 WARRANTY

A. Warranty: Upon request, at completion of installation, provide manufacturer’s Standard Limited Warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer, Basis of Design: Parex USA, Inc., Anaheim, CA 92807.

B. Components: Obtain components from authorized distributors.

C. No substitutions or additions of other materials are permitted without prior written approval in accordance with Division 1, Section 01631 – Substitutions.

2.2 MATERIALS

A. Basecoat:

1. 121 Dry Basecoat: 100% acrylic copolymer based, factory blend of cement and proprietary ingredients requiring addition of water.

B. Reinforcing Mesh (Impact resistance refers to installation of EPS trim):

1. 355 Standard Mesh: Weight 4.5 oz. per sq. yd. (153 g/sq m); coated for protection against alkali. Standard reinforcement or for use with High Impact 358.14 Mesh, or Ultra High Impact 358.20 Mesh.
2. 356 Short Detail Mesh: Reinforcing mesh used for back wrapping and details, and to embed in the Parex Base Coat & Adhesive 121 Dry.

C. Primer:

1. Parex USA Primer: 100% acrylic based coating to prepare surfaces for Parex finishes.

D. Finish:

1. Parex DPR Optimum Finish: Factory blended, 100% acrylic polymer based finish, integrally colored. Finish type, texture and color as selected by Project Designer

E. Water: Clean, potable water

F. Portland Cement: ASTM C150, Type I or Type I-II.

2.3 RELATED MATERIALS AND ACCESSORIES

A. Water-Resistive barrier, if required by local code official

B. Substrate Materials

1. Dens-Glass Gold by Georgia-Pacific Corp. minimum ½" (12.7 mm) thick.
2. Other approved equal acceptable to the finish system manufacturer.

C. Sealant System:

1. Sealant for perimeter seals around perimeter and other penetrations shall be low modulus, designed for minimum 50% elongation and minimum 25% compression, and as selected by Architect.
2. Sealants shall conform to ASTM C920, Grade NS.
3. Perimeter seal joints shall be a minimum width of 1/2 in (12.7 mm).
4. Sealant backer rod shall be closed-cell polyethylene foam.
5. Apply sealant to tracks or basecoat.
6. Refer to Parex USA current Technical Bulletin for listing of sealants which have been tested and found to be compatible with Parex materials.
7. Color shall be as selected by Architect.
8. Joint design, surface preparation, and sealant primer shall be based on sealant manufacturer's recommendations and project conditions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify project site conditions under provisions of Division 1.

B. Compliance: Comply with manufacturer's instructions for installation of all products.

C. Substrate Examination: Examine prior to basecoat installation as follows:

1. Substrate shall be free of dust, dirt, laitance, efflorescence, and other harmful contaminants.
2. Substrate construction in accordance with substrate material manufacturer's specifications and applicable building codes.
3. Maximum deflection of the substrate shall be limited to L/240. Screw heads shall be driven flush with face of sheathing substrate.
4. Sheathing substrate shall be butted tightly at all joints.

D. Advise Contractor of discrepancies preventing proper installation of the finish materials. Do not proceed with work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Protection: Protect surrounding material surfaces and areas during installation of system.

B. Clean surfaces thoroughly prior to installation.

C. Prepare surfaces using the methods recommended by the Manufacturer for achieving the best result for the substrate under the project conditions.

D. Water Resistive Barrier by others: Install in accordance with manufacturer's installation instructions.

E. Install Sheathing in accordance with manufacturer's installation instructions.

3.3 MIXING

A. Mix proprietary products in accordance with Manufacturer's instructions.

3.4 APPLICATION

A. General: Installation shall conform to this specification and manufacturer's written instructions and drawing details.

B. Base Coat: Apply base coat and fully embed mesh in base coat; include diagonal mesh patches at corners of openings and reinforcing mesh patches at joints of track sections.

C. Apply primer if specified to base coat after drying.

D. Finish Coat: Apply finish coat to match specified finish type, texture, and color. Do not apply finish coat to surfaces to receive sealant. Keep finish out of sealant joint gaps.

3.5 CLEAN-UP

A. Removal: Remove and legally dispose of debris material from the job site.

B. Clean ACF surfaces and work area of foreign materials resulting from application.

3.6 PROTECTION

A. Provide protection of installed materials from water infiltration into or behind them.

B. Provide protection of installed ACF from dust, dirt, precipitation, and freezing during installation.

C. Provide protection of installed finish from dust, dirt, precipitation, freezing and continuous high humidity until fully cured and dry.

D. Clean exposed surfaces using materials and methods recommended by the manufacturer of the material or product being cleaned. Remove and replace work that cannot be cleaned to the satisfaction of the Architect/Owner.

END OF SECTION 09251

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SECTION 09255 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Nonload-bearing steel framing members for gypsum board assemblies.
2. Gypsum board assemblies attached to steel framing.
3. Interior gypsum board.
4. Exterior gypsum board for ceilings and soffits.
5. Tile backing Panels.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 5 Section "Cold-Formed Metal Framing" for load-bearing steel framing.
2. Division 7 Section “Building Insulation” for batt insulation.

1.3 DEFINITIONS

A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA-505 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.4 ASSEMBLY PERFORMANCE REQUIREMENTS

A. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those of assemblies whose STC ratings were determined according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.

B. Fire Resistance: Provide gypsum board assemblies with fire-resistance ratings indicated.

1.5 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of product specified.

C. Product certificates signed by manufacturers of gypsum board assembly components certifying that their products comply with specified requirements.

D. LEED Submittals:

1. Credit MR C4: For products having recycled content, including postconsumer and pre-consumer recycled content. Provide the following information:
   a. Product Data
   b. Percent Content (post and pre-consumer)
   c. Invoices indicating cost of material (no labor included.)

2. Credit MR C5: For products and materials that comply with requirements for regional materials

based on location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Provide the following information:
a. Product Data
b. Fraction by weight of regional material
c. Invoices indicating cost of material (no labor included.)
d. Distance from Project

3. Credit IEQ 4.1: For adhesives and sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
a. Product Data
b. Laboratory Test Reports

1.6 QUALITY ASSURANCE

A. Single-Source Responsibility for Steel Framing: Obtain steel framing members for gypsum board assemblies from a single manufacturer, unless otherwise indicated.

B. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.

C. Single-Source Responsibility for Finishing Materials: Obtain finishing materials from either the same manufacturer that supplies gypsum board and other panel products or from a manufacturer acceptable to gypsum board manufacturer.

D. Fire-Test-Response Characteristics: Where fire-resistance-rated gypsum board assemblies are indicated, provide gypsum board assemblies that comply with the following requirements:

1. Fire-Resistance Ratings: As indicated by GA File Numbers in GA-600 "Fire Resistance Design Manual" or design designations in UL "Fire Resistance Directory" or in the listing of another testing and inspecting agency acceptable to authorities having jurisdiction.
2. Gypsum board assemblies indicated are identical to assemblies tested for fire resistance according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
3. Deflection and Firestop Track: Top runner provided in fire-resistance-rated assemblies indicated is labeled and listed by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum panels flat to prevent sagging.

1.8 PROJECT CONDITIONS

A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C 840 requirements or gypsum board manufacturer's recommendations, whichever are more stringent.

B. Room Temperatures: For nonadhesive attachment of gypsum board to framing, maintain not less than 40 deg F. For adhesive attachment and finishing of gypsum board, maintain not less than 50 deg F for 48 hours before application and continuously after until dry. Do not exceed 95 deg F when using temporary heat sources.

C. Ventilation: Ventilate building spaces as required to dry joint treatment materials. Avoid drafts during hot, dry weather to prevent finishing materials from drying too rapidly.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Steel Framing and Furring:

a. Clark Steel Framing, Inc.
b. Consolidated Systems, Inc.
c. Dale Industries, Inc.
d. Dietrich Industries, Inc.
e. Marino/Ware (formerly Marino Industries Corp.).
f. National Gypsum Co.; Gold Bond Building Products Division.
g. Unimast, Inc.

2. Gypsum Board and Related Products:

a. CertainTeed Corp.
b. Georgia-Pacific Corp.
c. National Gypsum Co.; Gold Bond Building Products Division.
d. United States Gypsum Co.

B. Products: Subject to compliance with requirements, provide one of the following products where proprietary gypsum wallboard is indicated:

1. Gyprock Fireguard C Gypsum Board; Domtar Gypsum.
2. Firestop Type C; Georgia-Pacific Corp.
3. Fire-Shield G; National Gypsum Co.; Gold Bond Building Products Division.
4. SHEETROCK Brand Gypsum Panels, FIRECODE C Core; United States Gypsum Co.
5. SHEETROCK Brand Gypsum Panels, ULTRACODE Core; United States Gypsum Co.

2.2 STEEL FRAMING COMPONENTS FOR FRAMED, SUSPENDED AND FURRED CEILINGS

A. General: Provide components complying with ASTM C 754 for conditions indicated.

B. Postinstalled Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials, with holes or loops for attaching hanger wires, and with capability to sustain, without failure, a load equal to 5 times that imposed by ceiling construction, as determined by testing according to ASTM E 488 conducted by a qualified independent testing agency.

1. Chemical anchor.
2. Expansion anchor.

C. Powder-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 according to ASTM E 1190 conducted by a qualified independent testing agency.

D. Wire Ties: ASTM A 641, Class 1 zinc coating, soft temper, 0.062 inch thick.

E. Wire Hangers: ASTM A 641, Class 1 zinc coating, soft temper, 0.162-inch diameter.

F. Hanger Rods: Mild steel and zinc coated or protected with rust-inhibitive paint.

G. Flat Hangers: Mild steel and zinc coated or protected with rust-inhibitive paint.

H. Angle-Type Hangers: Angles with legs not less than 7/8 inch wide, formed from 0.0635-inch-thick galvanized steel sheet complying with ASTM A 653, G 90 coating designation, with bolted connections and 5/16-inch diameter bolts.

I. Channels: Cold-rolled steel, 0.0598-inch minimum thickness of base (uncoated) metal and 7/16-inch-wide flanges, and as follows:

1. Carrying Channels: 1-1/2 inches deep, 475 lb/1000 feet, unless otherwise indicated.
2. Furring Channels: 3/4 inch deep, 300 lb/1000 feet, unless otherwise indicated.
3. Finish: Rust-inhibitive paint, unless otherwise indicated.
4. Finish: ASTM A 653, G 60 hot-dip galvanized coating for framing for exterior soffits and where indicated.

J. Steel Studs for Furring Channels: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch-wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:

1. Thickness: 20 gauge, Unless noted otherwise.
2. Depth: As indicated.
3. Protective Coating: Manufacturer's standard corrosion-resistant coating.

K. Steel Rigid Furring Channels: ASTM C 645, hat shaped, depth of 7/8 inch, and minimum thickness of base (uncoated) metal as follows:

1. Thickness: 20 gauge , unless otherwise noted.
2. Protective Coating: Manufacturer's standard corrosion-resistant coating.

L. Steel Resilient Furring Channels: Manufacturer's standard product designed to reduce sound transmission, fabricated from steel sheet complying with ASTM A 653 or ASTM A 568 to form 1/2-inch-deep channel of the following configuration:

1. Single- or Double-Leg Configuration: Asymmetric-shaped channel with face connected to a single flange by a single-slotted leg (web) or hat-shaped channel, with 1-1/2-inch-wide face connected to flanges by double-slotted or expanded-metal legs (webs).

M. Grid Suspension System for Interior Ceilings: ASTM C 645, manufacturer's standard direct-hung grid suspension system composed of main beams and cross-furring members that interlock to form a modular supporting network.

2.3 STEEL FRAMING FOR WALLS AND PARTITIONS

A. General: Provide steel framing members complying with the following requirements:

1. Protective Coating: Manufacturer's standard corrosion-resistant coating.

B. Steel Studs and Runners: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch-wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:

1. Thickness: minimum 20 gauge unless otherwise noted.
3. Depth: As indicated.

C. Steel Channel Bridging: Cold-rolled steel, 0.0598-inch minimum thickness of base (uncoated) metal and 7/16-inch-wide flanges, 1-1/2 inches deep, 475 lb/1000 feet, unless otherwise indicated.

D. Steel Flat Strap and Backing Plate: Steel sheet for blocking and bracing complying with ASTM A 653 or ASTM A 568, length and width as indicated, and with a minimum base metal (uncoated) thickness as follows:

1. Thickness: As indicated.

E. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated.

F. Deflection Track: Manufacturer's standard top runner designed to prevent cracking of gypsum board applied to interior partitions resulting from deflection of the structure above fabricated from steel sheet complying with ASTM A 653 or ASTM A 568. Thickness as indicated for studs, and width to accommodated depth of studs, and of the following configuration:

1. Top Runner with Slotted Flanges: 2-1/2-inch- (63.5-mm-) deep flanges with slots 1 inch (25.4 mm) o.c.

a. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

1) SLP-TRK; Metal-Lite, Inc.
2) SLP-TRK, Clark Dietrich

2.4 GYPSUM BOARD PRODUCTS

A. General: Provide gypsum board of types indicated in maximum lengths available that will minimize end-to-end butt joints in each area indicated to receive gypsum board application.

1. Widths: Provide gypsum board in widths of 48 inches.

B. Gypsum Wallboard: ASTM C 36 and as follows:

1. Type: Regular for vertical surfaces, unless otherwise indicated.
2. Type: Type X or C where required for fire-resistance-rated assemblies (Proprietary assemblies).
3. Type: Sag-resistant type for ceiling surfaces.
4. Edges: Tapered
5. Thickness: 5/8 inch where otherwise indicated.

C. Glass-Mat, Water-Resistant Gypsum Backing Board: ASTM C 1178, of type and thickness indicated below:
1. Type and Thickness: 5/8 inch thick, unless otherwise indicated.
2. Available Product: Subject to compliance with requirements, a product that may be incorporated in the Work includes, but is not limited to, "Dens-Shield Tile Backer" manufactured by Georgia-Pacific Corp.

D. Fiberglass-Mat, Water-Resistant Gypsum Sheathing: ASTM C 1178, of type and thickness indicated below:
1. Type and Thickness: 1/2 inch thick, unless otherwise indicated.
2. Available Product: Subject to compliance with requirements, a product that may be incorporated in the Work includes, but is not limited to, "DensGlass Sheathing" manufactured by Georgia-Pacific Corp.

2.5 TRIM ACCESSORIES

A. Accessories for Interior Installation: Cornerbead, edge trim, and control joints complying with ASTM C 1047 and requirements indicated below:

1. Material: Formed metal complying with the following requirement:

a. Steel sheet zinc coated by hot-dip or electrolytic process, or steel sheet coated with aluminum or rolled zinc.

2. Shapes indicated below by reference to Fig. 1 designations in ASTM C 1047:

a. Cornerbead on outside corners, unless otherwise indicated.

b. LC-bead with both face and back flanges; face flange formed to receive joint compound. Use LC-beads for edge trim, unless otherwise indicated.
c. L-bead with face flange only; face flange formed to receive joint compound. Use L-bead where indicated.
d. U-bead with face and back flanges; face flange formed to be left without application of joint compound. Use U-bead where indicated.
e. One-piece control joint formed with V-shaped slot and removable strip covering slot opening.

2.6 JOINT TREATMENT MATERIALS

A. General: Provide joint treatment materials complying with ASTM C 475 and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.

B. Joint Tape for Gypsum Board: Paper reinforcing tape, unless otherwise indicated.

1. Use pressure-sensitive or staple-attached, open-weave, glass-fiber reinforcing tape with compatible joint compound where recommended by manufacturer of gypsum board and joint treatment materials for application indicated.

C. Setting-Type Joint Compounds for Gypsum Board: Factory-packaged, job-mixed, chemical-hardening powder products formulated for uses indicated.

1. Where setting-type joint compounds are indicated as a taping compound only or for taping and filling only, use formulation that is compatible with other joint compounds applied over it.
2. For prefilling gypsum board joints, use formulation recommended by gypsum board manufacturer.
3. For filling joints and treating fasteners of water-resistant gypsum backing board behind base for ceramic tile, use formulation recommended by gypsum board manufacturer.
4. For topping compound, use sandable formulation.

D. Drying-Type Joint Compounds for Gypsum Board: Factory-packaged vinyl-based products complying with the following requirements for formulation and intended use.

1. Ready-Mixed Formulation: Factory-mixed product.

a. Taping compound formulated for embedding tape and for first coat over fasteners and face flanges of trim accessories.
b. Topping compound formulated for fill (second) and finish (third) coats.
c. All-purpose compound formulated for both taping and topping compounds.

E. Joint Compound for Cementitious Backer Units: Material recommended by cementitious backer unit manufacturer.

2.7 ACOUSTICAL SEALANT

A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following requirements:

1. Product is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

B. Available Products: Subject to compliance with requirements, acoustical sealants that may be incorporated in the Work include, but are not limited to, the following:

1. Acoustical Sealant for Exposed and Concealed Joints:

a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant
b. Pecora Corp.,AC-20 FTR Acoustical and Insulation Sealant;
c. United States Gypsum Co.,SHEETROCK Acoustical Sealant;

2.8 MISCELLANEOUS MATERIALS

A. General: Provide auxiliary materials for gypsum board construction that comply with referenced standards and recommendations of gypsum board manufacturer.

B. Laminating Adhesive: Special adhesive or joint compound recommended for laminating gypsum panels.

C. Spot Grout: ASTM C 475, setting-type joint compound recommended for spot-grouting hollow metal door frames.

D. Fastening Adhesive for Metal: Special adhesive recommended for laminating gypsum panels to steel framing.

E. Steel drill screws complying with ASTM C 1002 for the following applications:

1. Fastening gypsum board to steel members less than 0.033 inch thick.
2. Fastening gypsum board to gypsum board.

F. Steel drill screws complying with ASTM C 954 for fastening gypsum board to steel members from 0.033 to 0.112 inch thick.

G. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
1. Fire Resistance Rated Assemblies: Comply with mineral fiber requirements of assembly.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to which gypsum board assemblies attach or abut, installed hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Ceiling Anchorages: Coordinate installation of ceiling suspension systems with installation of overhead structural assemblies to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers that will develop their full strength and at spacing required to support ceilings.

1. Furnish concrete inserts and other devices indicated to other trades for installation well in advance of time needed for coordination with other construction.

3.3 INSTALLING STEEL FRAMING, GENERAL

A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.

B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with United States Gypsum Co.'s "Gypsum Construction Handbook."

C. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement.

1. Where building structure abuts ceiling perimeter or penetrates ceiling.
2. Where partition framing and wall furring abut structure, except at floor.

a. Install deflection track top runner to attain lateral support and avoid axial loading.

D. Do not bridge building control and expansion joints with steel framing or furring members. Independently frame both sides of joints with framing or furring members as indicated.

3.4 INSTALLING STEEL FRAMING FOR WALLS AND PARTITIONS

A. Install runners (tracks) at floors, ceilings, and structural walls and columns where gypsum board stud assemblies abut other construction.

1. Where studs are installed directly against exterior walls, install asphalt felt strips or foam gaskets between studs and wall.

B. Installation Tolerances: Install each steel framing and furring member so that fastening surfaces do not vary more than 1/8 inch from the plane formed by the faces of adjacent framing.

C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.

1. Cut studs 1/2 inch short of full height to provide perimeter relief.
2. For STC-rated and fire-resistance-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid structural surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed, to support gypsum board closures needed to make partitions continuous from floor to underside of solid structure.

D. Terminate partition framing at suspended ceilings where indicated.

E. Install steel studs and furring in sizes and at spacings indicated.

1. Single-Layer Construction: Space studs 16 inches o.c., unless otherwise indicated.

F. Install steel studs so flanges point in the same direction and leading edge or end of each gypsum board panel can be attached to open (unsupported) edges of stud flanges first.

G. Frame door openings to comply with GA-219, and with applicable published recommendations of gypsum board manufacturer, unless otherwise indicated. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

1. Install 2 studs at each jamb, unless otherwise indicated.
2. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint.
3. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.

H. Frame openings other than door openings to comply with details indicated or, if none indicated, as required for door openings. Install framing below sills of openings to match framing required above door heads.

3.6 APPLYING AND FINISHING GYPSUM BOARD, GENERAL

A. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C 840 and GA-216.

B. Install sound-attenuation blankets, where indicated, prior to installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

D. Install gypsum panels with face side out. Do not install imperfect, damaged, or damp panels. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

E. Locate both edge or end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Avoid joints other than control joints at corners of framed openings where possible.

F. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

G. Attach gypsum panels to framing provided at openings and cutouts.

H. Spot grout hollow metal door frames for solid-core wood doors, hollow metal doors, and doors over 32 inches wide. Apply spot grout at each jamb anchor clip and immediately insert gypsum panels into frames.

I. Form control and expansion joints at locations indicated and as detailed, with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels.

J. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases that are braced internally.

1. Except where concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.

K. Isolate perimeter of nonload-bearing gypsum board partitions at structural abutments, except floors, as detailed. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

L. Where STC-rated gypsum board assemblies are indicated, seal construction at perimeters, behind control and expansion joints, openings, and penetrations with a continuous bead of acoustical sealant including a bead at both faces of the partitions. Comply with ASTM C 919 and manufacturer's recommendations for location of edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.

M. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.

1. Space screws a maximum of 12 inches o.c. for vertical applications.

N. Space fasteners in panels that are tile substrates a maximum of 8 inches o.c.

3.7 GYPSUM BOARD APPLICATION METHODS

A. Single-Layer Application: Install gypsum wallboard panels as follows:

1. On ceilings, apply gypsum panels prior to wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless parallel application is required for fire-resistance-rated assemblies. Use maximum-length panels to minimize end joints.

a. Stagger abutting end joints not less than one framing member in alternate courses of board.
b. At stairwells and other high walls, install panels horizontally.

B. Fastening Methods: Apply gypsum panels to supports as follows:

1. Fasten with screws.

3.8 APPLYING EXTERIOR GYPSUM PANELS FOR CEILINGS AND SOFFITS

A. Apply panels perpendicular to supports, with end joints staggered and located over supports.

1. Install with 1/4-inch (6.4-mm) open space where panels abut other construction or structural penetrations.
2. Fasten with corrosion-resistant screws.

3.9 APPLYING TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.

3.10 INSTALLING TRIM ACCESSORIES

A. General: For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.

B. Install cornerbead at external corners.

C. Install edge trim where edge of gypsum panels would otherwise be exposed. Provide edge trim type with face flange formed to receive joint compound, except where other types are indicated.

1. Install L-bead where edge trim can only be installed after gypsum panels are installed.

3.11 FINISHING GYPSUM BOARD ASSEMBLIES

A. General: Treat gypsum board joints, interior angles, flanges of cornerbead, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.

B. Prefill open joints, rounded or beveled edges, and damaged areas using setting-type joint compound.

C. Apply joint tape over gypsum board joints, except those with trim accessories having flanges not requiring tape.

D. Apply joint tape over gypsum board joints and to flanges of trim accessories as recommended by trim accessory manufacturer.

E. Levels of Gypsum Board Finish: Provide the following levels of gypsum board finish per GA-214.

1. Level 4 for gypsum board “Light orange peel texture” for painted walls unless noted otherwise.
2. Level 5 for gypsum board smooth wall surface for walls with adhered decoration or display or tackboard surfaces.

F. Use one of the following joint compound combinations as applicable to the finish levels specified:

1. Embedding and First Coat: Setting-type joint compound. Fill (Second) Coat: Setting-type joint compound. Finish (Third) Coat: Sandable, setting-type joint compound.

G. For Level 4 gypsum board finish, embed tape in joint compound and apply first, fill (second), and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories. Touch up and sand

between coats and after last coat as needed to produce a surface free of visual defects and ready for decoration.

3.12 FIELD QUALITY CONTROL

A. Above-Ceiling Observation: Architect will conduct an above-ceiling observation prior to installation of gypsum board ceilings and report any 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 one week in advance of the date and the time when the Project, or part of the Project, will be ready for an above-ceiling observation.
2. Prior to 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, and leak and pressure testing of water piping systems.
c. Installation of air duct systems.
d. Installation of air devices.
e. Installation of mechanical system control wiring/tubing.
f. Installation of ceiling support framing.

3.13 CLEANING AND PROTECTION

A. Promptly remove any residual joint compound from adjacent surfaces.

B. Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure gypsum board assemblies are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 09255

SECTION 09300 - CERAMIC TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
1. Waterproof membrane for thin-set tile installations.
2. Porcelain tile.
3. Setting mortar.
4. Grout.

B. Related Sections include the following:
1. Division 7 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
2. Division 9 Section "Gypsum Board Assemblies" for tile underlayment board units installed in wall assemblies.

1.3 DEFINITIONS

A. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.

B. Facial Dimension: Nominal tile size as defined in ANSI A137.1.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data: For each type of tile, mortar, grout, and other products specified.

C. Mock-up (in the field):
1. Contractor to provide at minimum a 6'x6' wall area as an approved control sample. This will demonstrate craftsmanship, widths, details, and control joints in tile substrates and finished tile surfaces.

D. Grout Samples for Initial Selection: Manufacturer's color sample box consisting of actual sections of grout showing the full range of colors available for each type of grout indicated.

E. Samples for Verification: Of each item listed below, prepared on Samples of size and construction indicated. Where products involve normal color and texture variations, include Sample sets showing the full range of variations expected.
1. Each type and composition of tile and for each color and texture required, at least 16 inches square, mounted on specified backing unit, and with grouted joints using product complying with specified requirements and approved for completed work in color or colors selected by Architect.
2. Full-size units of each type of trim and accessory for each color required.

F. Product Certificates: Signed by manufacturers certifying that the products furnished comply with requirements.

G. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names of architects and owners, and other information specified.

H. Tile Test Reports: Indicate and interpret test results for compliance of special-purpose tile with specified requirements.

I. Setting Material Test Reports: Indicate and interpret test results for compliance of tile-setting and -grouting products with specified requirements.

J. LEED Submittals:
1. Credit IEQ 4.1: For adhesives and sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
    a. Product Data
    b. Laboratory Test Reports
2. Credit IEQ 4.3: For all flooring elements installed in the building interior, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
    a. Product Data
    b. Laboratory Test Reports

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed tile installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Source Limitations for Tile: Obtain each color, grade, finish, type, composition, and variety of tile from one source with resources to provide products from the same production run for each contiguous area of consistent quality in appearance and physical properties without delaying the Work.

C. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

D. Source Limitations for Other Products: Obtain each of the following products specified in this Section from one source and by a single manufacturer for each product:
1. Joint sealants.
2. Waterproofing.

E. Mockups: Before installing tile, construct mockups for each form of construction and finish required to verify selections made under Sample submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for completed Work.
1. Locate mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
2. Notify Architect 7 days in advance of the dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Architect's approval of mockups before proceeding with final unit of Work.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
    a. Approved mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.

B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

C. Handle tile with temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is completed and ambient temperature and humidity conditions are being maintained to comply with referenced standards and manufacturer's written instructions.

1.8 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Tile Products: As specified in room finish plans A9.0 series, or equal.
2. Tile-Setting and Grouting Materials: Provide setting and grouting materials to comply with one or more of the following methods. Follow the guidelines for use as established by the materials manufacturers and the NTCA (National Tile Contractors Association) P.O. Box 13629, Jackson, MS. 39236, ph: 601-939-2071.

A. Latex Portland Cement method: ANSI A118.4

B. Grout Releases & Sealers: Provide grout releases and grout sealers from major national suppliers. Follow manufacturer’s directions exactly.

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.
1. Provide tile complying with Standard Grade requirements, unless otherwise indicated.
2. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting Materials" and "Grouting Materials" articles.

C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
1. Match requirements in finish schedule.

2.3 TILE PRODUCTS

A. Wall and Floor Tile: As Scheduled in Finish Drawings.
B. Marble Threshold: As Scheduled in Finish Drawings.

2.4 SETTING MATERIALS

A. Polymer Modified-Portland Cement Mortar: ANSI A118.4, composed as follows:
1. Prepackaged Dry-Mortar Mix: Factory-prepared mixture of portland cement; dry, redispersible, polymer additive; and other ingredients to which only water needs to be added at Project site.

a. For wall applications, provide nonsagging, modified portland cement mortar complying with ANSI A118.4 for mortar of this type.
b. Mapei Ultraflex LFT or equal

2.5 GROUTING MATERIALS

A. Non sanded grout, color to be selected from manufacturers full range of standard colors.

D. Modified Portland Cement Grout: ANSI A118.6 for materials described above, composed as follows:
1. Mixture of Dry-Grout Mix and Polymer Additive: Mixture of factory-prepared, dry-grout mix and polymer additive complying with the following requirements:
a. Unsanded Dry-Grout Mix: Dry-set grout complying with ANSI A118.6 for joints 1/8 inch and narrower.
b. Mapei Keracolor or equal.

2.6 ELASTOMERIC SEALANTS

A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements of Division 7 Section "Joint Sealants."

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.

C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and temperature extremes.

D. Products: Subject to compliance with requirements, provide one of the following:
1. One-Part, Mildew-Resistant Silicone Sealants:
a. Dow Corning 786; Dow Corning Corporation.
b. Sanitary 1700; GE Silicones.
c. Pecora 898 Sanitary Silicone Sealant; Pecora Corp.
d. Rhodorsil 6B White; Rhone-Poulenc, Inc.
e. Tremsil 600 White; Tremco, Inc.

2.7 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Metal Edge Strips: White-zinc-alloy terrazzo strips, 1/8 inch wide at top edge with integral provision for anchorage to mortar bed or substrate, unless otherwise indicated.

C. Temporary Protective Coating: Provide product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; is compatible with tile, mortar, and grout products; and is easily removable after grouting is completed without damaging grout or tile.
1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F per ASTM D 87.
2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as a temporary protective coating for tile.

D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

E. Silicone grout sealer: Seal all grout per sealer manufacturer’s instruction.

2.8 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
   1. Verify that substrates for setting tile are firm; dry; clean; free from oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 series of tile installation standards for installations indicated.
   2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
   3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust latter in consultation with Architect.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove coatings, including curing compounds, and other substances that contain soap, wax, oil, or silicone and are incompatible with tile-setting materials by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.

B. Provide concrete substrates for tile floors installed with dry-set or latex-portland cement mortars that comply with flatness tolerances specified in referenced ANSI A108 series of tile installation standards for installations indicated.
   1. Use trowelable leveling and patching compounds per tile-setting material manufacturer's written instructions to fill cracks, holes, and depressions.
   2. Remove protrusions, bumps, and ridges by sanding or grinding.

C. Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, verify that tile has been blended in the factory and packaged so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

D. Field-Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent adhesion or staining of exposed tile surfaces by grout, protect exposed surfaces of tile against adherence of mortar and grout by precoating them with a continuous film of temporary protective coating indicated below, taking care not to coat unexposed tile surfaces:
   1. Petroleum paraffin wax, applied hot.
   2. Grout release.
   3. Petroleum paraffin wax or grout release.

3.3 INSTALLATION, GENERAL

A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 series of tile installation standards in "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.

B. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Jointing Pattern: Lay tile in pattern indicated. Align joints when adjoining tiles on floor, base, walls, and trim are the same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
   1. Reference elevation drawings for specific tile layout.

E. Lay out tile wainscots to next full tile beyond dimensions indicated.

F. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
   1. Locate joints in tile surfaces directly above joints in concrete substrates.
   2. Prepare joints and apply sealants to comply with requirements of Division 7 Section "Joint Sealants."

G. Grout tile to comply with the requirements of the following tile installation standards:
   1. For ceramic tile grouts (sand-portland cement, dry-set, commercial portland cement, and latex-portland cement grouts), comply with ANSI A108.10.

3.4 WATERPROOFING INSTALLATION

A. Install waterproofing to comply with waterproofing manufacturer's written instructions to produce a waterproof membrane of uniform thickness bonded securely to substrate.

B. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.5 FLOOR TILE INSTALLATION

A. General: Install tile to comply with requirements of TCNA-F122 & F122A installation methods and ANSI A108 series of tile installation standards.

B. Joint Widths: Install tile on floors with the following joint widths:
   1. Ceramic Tile: 1/16 inch

C. Back Buttering: For installations indicated, obtain 100 percent mortar coverage by complying with applicable special requirements for back buttering of tile in referenced ANSI A108 series of tile installation standards:

D. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.

3.6 WALL TILE INSTALLATION

A. Install types of tile designated for wall installations to comply with requirements in the Ceramic Tile Wall Installation Schedule, including those referencing TCNA W248 installation methods and ANSI setting-bed standards.

B. Joint Widths: Install tile on walls with the following joint widths:
   1. Wall Tile: 1/16 inch.

C. Back Buttering: For all wall installations, obtain 100 percent mortar coverage by complying with applicable special requirements for back buttering of tile in referenced ANSI A108 series of tile installation standards:

E. Caulk all connections to doors and frames.

3.7 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove latex-portland cement grout residue from tile as soon as possible.
2. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.
3. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent it from clogging drains.

B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.

C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure tile is without damage or deterioration at the time of Substantial Completion.

1. When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
2. Prohibit foot and wheel traffic from tiled floors for at least 7 days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

E. Seal all grout and tile just prior to substantial completion.

END OF SECTION 0930

SECTION 09512 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general conditions of Contract, including General and Supplementary Conditions and Divisions-1 Specification sections apply to work of this section.

1.2 SUMMARY

A. Section Includes:
   1. Acoustical ceiling panels.
   2. Light emitting plastic panels.
   3. Exposed grid suspension system.
   4. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.
B. Related Sections:
   1. Section 09250 - Gypsum Board
   2. Division 15 Sections - Mechanical Work
   3. Division 16 Sections - Electrical Work
C. Alternates
   1. Prior Approval: Unless otherwise provided for in the Contract documents, proposed product substitutions may be submitted no later than TEN (10) working days prior to the date established for receipt of bids. Acceptability of a proposed substitution is contingent upon the Architect's review of the proposal for acceptability and approved products will be set forth by the Addenda. If included in a Bid are substitute products which have not been approved by Addenda, the specified products shall be provided without additional compensation.
   2. Submittals which do not provide adequate data for the product evaluation will not be considered. The proposed substitution must meet all requirements of this section, including but not necessarily limited to, the following: Single source materials suppliers (if specified in Section 1.5); Underwriters' Laboratories Classified Acoustical performance; Panel design, size, composition, color, and finish; Suspension system component profiles and sizes; Compliance with the referenced standards.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
   2. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
   3. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
   4. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
   5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
   6. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
   7. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
   8. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.
   9. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems.
   10. ASTM E 1264 Classification for Acoustical Ceiling Products.
   11. ASTM E 1477 Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.
   12. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
   13. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material.
B. ASHRAE Standard 62.1-2004, "Ventilation for Acceptable Indoor Air Quality"

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.
B. Samples: Minimum 6 inch x 6 inch samples of specified acoustical panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees.
C. Shop Drawings: Layout and details of acoustical ceilings. Show locations of items which are to be coordinated with, or supported by the ceilings.
D. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC, and AC.
E. If the material supplied by the acoustical subcontractor does not have an Underwriter's Laboratory classification of acoustical performance on every carton, subcontractor shall be required to send material from every production run appearing on the job to an independent or NVLAP approved laboratory for testing, at the architect's or owner's discretion. All products not conforming to manufacturer's current published values must be removed, disposed of and replaced with complying product at the expense of the Contractor performing the work.
F. LEED Submittals:

    1. Credit MR C4: For products having recycled content, including postconsumer and pre-consumer recycled content. Provide the following information:
    2. Product Data
    3. Percent Content (post and pre-consumer)
    4. Invoices indicating cost of material (no labor included.)

1.5 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.
B. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
    1. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.
        a. Flame Spread: 25 or less
        b. Smoke Developed: 50 or less
C. Light Transmitting Plastic Tile: Comply with ASTM D 2843 CC2 with a flame spread rating of 200 or less when tested in accordance with ASTM E84.
D. Before installing plastic panels construct mockups required to verify detail installation and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for completed Work.
    1. Locate mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
    2. Notify Architect 7 days in advance of the dates and times when mockups will be constructed.
    3. Demonstrate the proposed range of aesthetic effects and workmanship.
    4. Obtain Architect's approval of mockups before proceeding with final unit of Work.
    5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
        a. Approved mockups in an undisturbed condition at time of Substantial Completion may become part of the completed work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.
C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.7 PROJECT CONDITIONS

A. Space Enclosure:

All ceiling products and suspension systems must be installed and maintained in accordance with Armstrong written installation instructions for that product in effect at the time of installation and best industry practice. Prior to installation, the ceiling product must be kept clean and dry, in an environment that is between 32°F (0°C) and 120°F (49°C) and not subject to Abnormal Conditions. Abnormal conditions include exposure to chemical fumes, vibrations, moisture from conditions such as building leaks or condensation, excessive humidity, or excessive dirt or dust buildup.

1.8 WARRANTY

A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace acoustical panels that fail within the warranty period. Failures include, but are not limited to:
   1. Acoustical Panels: Sagging and warping as a result of defects in materials or factory workmanship.
   2. Grid System: Rusting and manufacturer's defects
   3. Acoustical Panels with BioBlock Plus or designated as inherently resistive to the growth of micro-organisms installed with Armstrong suspension systems: Visible sag and will resist the growth of mold/mildew and gram positive and gram negative odor and stain causing bacteria.

B. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.9 MAINTENANCE

A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
   1. Acoustical Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.
   2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

Part 2-PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, those indicated for each designation in the Reflected Ceiling Plans - Ceiling Schedule.

   1. Armstrong World Industries, Inc.

2.2 ACOUSTICAL CEILING UNITS

A. Panel Types:

   1. Cirrus Second Look Tegular edge.

      a) Manufacturer: Armstrong World Industries
      b) Color: White
      c) Size: 48in X 24in
      d) Edge Profile: Tegular edge for interface with Prelude XL 15/16" Exposed Tee.

   1. Ultima Plank

      a) Manufacturer: Armstrong World Industries

b) Color: White
c) Size: 96” X 24”, cut to fit.
d) Edge Profile: Square

2. Light Transmitting Plastic Tile:
   a) Approved manufacturer: Evonic, Inc.
   b) Type: Acrylite Satinice
   c) Color:White WD008.

2.3 SUSPENSION SYSTEMS

A. Components: All main beams and cross tees shall be commercial quality hot-dipped galvanized (galvanized steel, aluminum, or stainless steel) as per ASTM A 653. Main beams and cross tees are double-web steel construction with type exposed flange design. Exposed surfaces chemically cleansed, capping pre-finished galvanized steel (aluminum or stainless steel) in baked polyester paint. Main beams and cross tees shall have rotary stitching (exception: extruded aluminum or stainless steel).
   1. Structural Classification: ASTM C 635 HD.
   2. Color: White.
   3. Acceptable Product: Prelude XL 15/16" Exposed Tee as manufactured by Armstrong World Industries, Inc.
B. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
C. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least time three design load, but not less than 12 gauge.
D. Edge Moldings and Trim: Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations, including light fixtures, that fit type of edge detail and suspension system indicated. Provide moldings with exposed flange of the same width as exposed runner.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling using the drawings as the basis for the layout. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.
B. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.
   1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.3 INSTALLATION

A. Install suspension system and panels in accordance with the manufacturer's instructions, and in compliance with ASTM C 636 and with the authorities having jurisdiction.
B. Suspend main beam from overhead construction with hanger wires spaced 4-0 on center along the length of the main runner. Install hanger wires plumb and straight.
C. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.
D. For reveal edge (Tegular) panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.

E. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings unless otherwise indicated.

3.4 ADJUSTING AND CLEANING

A. Replace damaged and broken panels.
B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage.
    1. Ceiling Touch-Up Paint, Use manufacturer’s recommended " white" latex paint to hide minor scratches and nicks in the surface and to cover field tegularized edges that are exposed to view.
C. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09512

SECTION 09651 - RESILIENT TILE FLOORING

PART 1 GENERAL

1.01 THIS SECTION INCLUDES

A. Flooring and accessories as shown on the drawings and schedules and as indicated by the requirements of this section.

1.02 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract (including General and Supplementary Conditions and Division 1 sections) apply to the work of this section.

1.03 RELATED SECTIONS

A. Other Division 9 sections for floor finishes related to this section but not the work of this section.

B. Division 6 Wood and Plastics; not the work of this section.

1.04 QUALITY ASSURANCE AND REGULATORY REQUIREMENTS

A. Select an installer who is competent in the installation of resilient tile flooring.

B. If required, provide types of flooring and accessories supplied by one manufacturer, including leveling and patching compounds, and adhesives.

C. If required, provide flooring material to meet the following fire test performance criteria as tested by a recognized independent testing laboratory:

a. ASTM E 648 Critical Radiant Flux of 0.45 watts per sq. cm. or greater, Class I.

b. ASTM E 662 (Smoke Generation) Maximum Specific Optical Density of 450 or less.

1.05 SUBMITTALS

A. Manufacturer's technical data, installation and maintenance instructions.

B. Submit the manufacturer's standard samples showing the required colors for flooring and applicable accessories.

C. If required, submit the manufacturer's certification that the flooring has been tested by an independent laboratory and complies with the required fire tests.

1.06 ENVIRONMENTAL CONDITIONS

A. Deliver materials in good condition to the jobsite in the manufacturer's original unopened containers that bear the name and brand of the manufacturer, project identification, and shipping and handling instructions.

B. Store materials in a clean, dry, enclosed space off the ground, and protected from the weather and from extremes of heat and cold. Protect adhesives from freezing. Store flooring, adhesives and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.

C. Maintain a minimum temperature in the spaces to receive the flooring and accessories of 65ºF (18ºC) and a maximum temperature of 100ºF (38ºC) for at least 48 hours before, during, and for not less than 48 hours after installation. Thereafter, maintain a minimum temperature of 55ºF (13ºC) in areas where work is completed. Protect all materials from the direct flow of heat from hot-air registers, radiators, or other heating fixtures and appliances.

D. Install flooring and accessories after the other finishing operations, including painting, have been completed. Close spaces to traffic during the installation of the flooring. Do not install flooring over concrete slabs until they are sufficiently dry to achieve a bond with the adhesive, in accordance with the manufacturer's recommended bond and moisture tests.

PART 2 PRODUCTS

2.01 RESILIENT TILE FLOORING MATERIALS

A. Provide STRIATIONS BBT® with BioStride BioBased Tile™ Flooring manufactured by Armstrong World Industries, Inc., in [color selected from the range currently available from Armstrong World

Industries, Inc., having a nominal total thickness of 1/8"/0.125in. (3.2mm), 12 in. x 24 in. (304.8 mm x 609.6 mm), composed of polyester resin binder, fillers and pigments with colors and pattern dispersed uniformly throughout its thickness. STRIATIONS BBT with BioStride Tile shall conform to the size, squareness, thickness, indentation, static load limit, impact, deflection, resistance to chemicals and resistance to heat and light requirements of ASTM F2982 "Standard Specification for Polyester Composition Floor Tile"

B. Note: STRIATIONS BBT's unique binder system does not contain polyvinyl chloride resins and plasticizers.

2.02 ADHESIVES

A. For Tile Installation System, Full Spread: Provide Armstrong S-525 Resilient Tile Adhesive under the tile as recommended by the flooring manufacturer.

2.04 ACCESSORIES

A. Provide transition/reducing strips tapered to meet abutting materials.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine subfloors prior to installation to determine that surfaces are smooth and free from cracks, holes, ridges, and other defects that might prevent adhesive bond or impair durability or appearance of the flooring material.

B. Inspect subfloors prior to installation to determine that surfaces are free from curing, sealing, parting and hardening compounds; residual adhesives; adhesive removers; and other foreign materials that might prevent adhesive bond. Visually inspect for evidence of moisture, alkaline salts, carbonation, dusting, mold, or mildew.

C. Report conditions contrary to contract requirements that would prevent a proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.

D. Failure to call attention to defects or imperfections will be construed as acceptance and approval of the subfloor. Installation indicates acceptance of substrates with regard to conditions existing at the time of installation.

3.02 PREPARATION

A. Vacuum or broom-clean surfaces to be covered immediately before the application of flooring. Make subfloor free from dust, dirt, grease, and all foreign materials.

3.03 INSTALLATION OF TILE FLOORING

A. Install flooring in strict accordance with the procedures found in the BioBased Tile Installation System by Armstrong. Scribe, cut, and fit to walls.

B. Install flooring with adhesives, tools, and procedures in strict accordance with the manufacturer's written instructions. Observe the recommended adhesive trowel notching, open times, and working times.

3.04 INSTALLATION OF ACCESSORIES

A. Place resilient edge strips tightly butted to flooring, and secure with adhesive recommended by the edge strip manufacturer. Install edge strips at edges of flooring that would otherwise be exposed.

3.05 CLEANING AND PROTECTION

A. Perform initial maintenance according to the latest edition of the Armstrong Commercial Maintenance Booklet, F-8663.

B. Protect installed flooring as recommended by the flooring manufacturer against damage from rolling loads, other trades, or the placement of fixtures and furnishings.

END OF SECTION 09651

SECTION 09653 - RESILIENT WALL BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Resilient wall base.

1.3 SUBMITTALS

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

B. Samples for Initial Selection: Manufacturer's standard sample sets consisting of sections of units showing the full range of colors and patterns available for each type of product indicated.

C. Product Certificates: Signed by manufacturers of resilient wall base and accessories certifying that each product furnished complies with requirements.

D. LEED Submittals:
1. Credit IEQ 4.1: For adhesives and sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
    a. Product Data
    b. Laboratory Test Reports
2. Credit IEQ 4.3: For all flooring elements installed in the building interior, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
    a. Product Data
    b. Laboratory Test Reports
3. Credit MR C4: For products having recycled content, including postconsumer and pre-consumer recycled content. Provide the following information:
    a. Product Data
    b. Percent Content (post and pre-consumer)
    c. Invoices indicating cost of material (no labor included.)

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing resilient products similar to those required for this Project and with a record of successful in-service performance.

B. Source Limitations: Obtain each type and color of product specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

C. Fire-Test-Response Characteristics: Provide products with the following fire-test-response characteristics as determined by testing identical products per test method indicated below by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Critical Radiant Flux: 0.45 W/sq. cm or greater when tested per ASTM E 648.
2. Smoke Density: Maximum specific optical density of 450 or less when tested per ASTM E 662.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project site in manufacturer's original, unopened cartons and containers, each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.

B. Store products in dry spaces protected from the weather, with ambient temperatures maintained between 50 and 90 deg F (10 and 32 deg C).

C. Move products into spaces where they will be installed at least 48 hours before installation, unless longer conditioning period is recommended in writing by manufacturer.

1.6 PROJECT CONDITIONS

A. Maintain a temperature of not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C) in spaces to receive resilient products for at least 48 hours before installation, during installation, and for at least 48 hours after installation, unless manufacturer's written recommendations specify longer time periods. After postinstallation period, maintain a temperature of not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

B. Do not install products until they are at the same temperature as the space where they are to be installed.

C. For resilient products installed on traffic surfaces, close spaces to traffic during installation and for time period after installation recommended in writing by manufacturer.

D. Coordinate resilient product installation with other construction to minimize possibility of damage and soiling during remainder of construction period. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, those indicated in the Finish Schedule Drawing series A9.0.

2.2 RESILIENT WALL BASE

A. Rubber Wall Base: Products complying with FS SS-W-40, Type I and with those indicated in the Finish Schedule Drawing series A9.0 or approved equal.

2.3 INSTALLATION ACCESSORIES

A. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where installation of resilient products will occur, with Installer present, for compliance with manufacturer's requirements, including those for maximum moisture content. Verify that substrates and conditions are satisfactory for resilient product installation and comply with requirements specified. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with manufacturer's written installation instructions for preparing substrates indicated to receive resilient products.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.

C. Remove coatings, including curing compounds, 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.

D. Broom and vacuum clean substrates to be covered immediately before installing resilient products. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. General: Install resilient products according to manufacturer's written installation instructions.

B. Apply resilient wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

1. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
2. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
3. Do not stretch base during installation.
4. On irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
5. Install premolded outside corners before installing straight pieces.
6. Form inside corners on job, from straight pieces of maximum lengths possible, by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

3.4 CLEANING AND PROTECTING

A. Perform the following operations immediately after installing resilient products:

1. Remove adhesive and other surface blemishes using cleaner recommended by resilient product manufacturers.
2. Do not wash resilient products until after time period recommended by resilient product manufacturer.
4. Damp-mop or sponge resilient products to remove marks and soil.

B. Protect resilient products against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by resilient product manufacturer.

C. Clean resilient products not more than 4 days before dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean products according to manufacturer's written recommendations.

3.5 RESILIENT WALL BASE

A. Rubber Wall Base: Provide rubber wall base product complying with the following:

1. Manufacturers: One of the following:

a. Johnsonite
b. Armstrong
c. Roppe

2. Color and Pattern: As selected by Architect from manufacturer's full range of colors and patterns produced for rubber wall base complying with requirements indicated.
3. Style:

a. Straight where indicated.
b. Coved where indicated.

4. Minimum Thickness: 1/8 inch (3.2 mm).

5. Height: 4” as scheduled.
6. Lengths: Coils in lengths standard with manufacturer, but not less than 96 feet (29.26 m).
7. Outside Corners: Premolded.
8. Inside Corners: Premolded or formed on job.
9. Ends: Premolded.
10. Surface: Smooth.

END OF SECTION 09653

SECTION 09671- RESINOUS FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Industrial resinous flooring systems.

B. Related Sections:
   1. Section 079200 "Joint Sealants" for sealants installed at joints in resinous flooring systems.
   2. Section 096623 "Resinous Matrix Terrazzo Flooring" for thin-set, resinous matrix terrazzo.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.

B. LEED Submittals:
   1. Credit IEQ 4.1: For adhesives and sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
      a. Product Data
      b. Laboratory Test Reports
   2. Credit IEQ 4.2: For paints and coatings, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
      a. Product Data
      b. Laboratory Test Reports
   3. Credit IEQ 4.3: For all flooring elements installed in the building interior, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
      a. Product Data
      b. Laboratory Test Reports

C. Samples for Verification: For each resinous flooring system required, 6 inches square, applied to a rigid backing by Installer for this Project.

D. Product Schedule: List each distinct type of resinous flooring.

1.4 INFORMATIONAL SUBMITTALS

A. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

B. Material Certificates: For each resinous flooring component, from manufacturer.

C. Material Test Reports: For each resinous flooring system.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of flooring systems required for this Project.
   1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.

B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.

C. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Apply full-thickness mockups on 48-inch- square floor area selected by Architect.
      a. Include 48-inch length of integral cove base with inside and outside corner.
   2. Simulate finished lighting conditions for Architect's review of mockups.
   3. Approved mockups may become part of the completed Work if undisturbed at time ofSubstantial Completion.

D. Preinstallation Conference: Conduct conference at Project site.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.

C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application unless manufacturer recommends a longer period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide DUDICK Inc. Polymer Alloy 1000 with urethane finish coat or comparable product by one of the following:
   1. Crawford Laboratories Inc.; Florock.
   2. Crossfield Products Corp.; Dex-O-Tex.
   3. DUDICK Inc.
   4. Dur-A-Flex, Inc.
   5. Key Resin Company.
   6. NEOGARD; Division of JONES-BLAIR.
   7. Nox-Crete Products Group.
   8. Pacific Polymers, Inc.
   9. Polymerica, Incorporated.
   10. PPG Industries, Inc.
   11. Rust-Oleum Corporation.
   12. Sherwin-Williams Company; General Polymers.
   13. Tamms Industries, Inc.; a division of The Euclid Chemical Company.
   14. Tnemec Company, Inc.

2.2 MATERIALS

A. VOC Content of Liquid-Applied Flooring Components: Not more than 100 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

B. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 INDUSTRIAL RESINOUS FLOORING

A. Resinous Flooring: Abrasion-, impact- and chemical-resistant, resin based, monolithic floor surfacing designed to produce a seamless floor and integral cove base.

B. System Characteristics:
1. Color: As selected by Architect from manufacturer's full range of standard colors
2. Wearing Surface:
   a. Seeded with aluminum oxide where indicated for slip resistance.
3. Overall System Thickness: 1/8 inch

C. Body Coats:
1. Resin: Epoxy.
2. Formulation Description: 100 percent solids.
3. Application Method: Semi-self-leveling slurry.
   a. Thickness of Coats: 1/16 inch.
   b. Number of Coats: Two for total thickness of 1/8".
4. Aggregates: Aluminum oxide

D. Topcoat: Sealing coat.
1. Resin: Two component nano enhances hybrid urethane fluorpolymer.
2. Formulation Description: High solids.
3. Type: Pigmented.
4. Finish: Gloss.
5. Number of Coats: One.
6. Non slip areas with 3% beads

E. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

1.	Compressive Strength:	6,000 PSI per ASTM C 579.
2.	Tensile Strength:	2,200 PSI per ASTM C 307.
3.	Flexural Modulus of Elasticity:	1,800 PSI per ASTM C 580.
4.	Taber Abrasion Resistance:	33mg per ASTM D 4060.
5.	Flammability:	Self-extinguishing per ASTM D 635.
6.	Shore D Hardness:	80-90 per ASTM D 2240.
7.	Bond Strength:	Cohesive failure of concrete per ASTM D-4541

F. Sealer Impact and Chemical Resistance:
1. Impact: Direct or Indirect: >160 inch pounds.
2. Chemical Resistance:
   a. Betadine
   b. Oils
   c. Gasoline
   d. Sodium hydroxide – 50%
   e. Bleach solutions
   f. Solvents
   g. Sulfuric acid
   h. Hydrogen peroxide

2.5 ACCESSORIES

A. Primer: Primer 67 as recommended by manufacturer for substrate and body coats indicated.
1. Formulation Description: Two component, High solids.

B. Reinforcing Membrane: Provide fiberglass scrim embedded in body coat at cracks, non-moving joints and cove base locations.

C. Patching and Fill Material: Resinous caulking product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for resinous flooring application.

B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
   1. Concrete substrate must be mechanically prepared to remove surface laitance. Surface texture shall be similar to 60-80 grit sandpaper or the visual standard CSP-3 from International Concrete Repair Institute.
      a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
      b. Comply with ASTM C 811 requirements unless manufacturer's written instructions are more stringent.
   2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.
   3. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
      a. Perform plastic sheet test, ASTM D 4263. Proceed with application only after testing indicates absence of moisture in substrates.
      b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum percent relative humidity level measurement required by manufacturer.
   4. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

D. Use patching and fill material (Dudick Scratch Coat 300) to fill holes and depressions in substrates according to manufacturer's written instructions.

E. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.

3.2 APPLICATION

A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
   1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
   2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
   3. At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.

B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Apply reinforcing membrane to substrate cracks and non-moving joints.

D. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Round internal and external corners.
   1. Integral Cove Base: 4 inches high.

E. Apply self-leveling slurry body coats in thickness indicated for flooring system.

F. Apply troweled or screeded body coats in thickness indicated for flooring system. Hand or power trowel and grout to fill voids. When cured, remove trowel marks and roughness using method recommended by manufacturer.

G. Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer.

3.3 FIELD QUALITY CONTROL

A. Core Sampling: At the direction of Owner and at locations designated by Owner, take one core sample per 1000 sq. ft. of resinous flooring, or portion of, to verify thickness. For each sample that fails to comply with requirements, take two additional samples. Repair damage caused by coring and correct deficiencies.

B. Material Sampling: Owner may at any time and any number of times during resinous flooring application require material samples for testing for compliance with requirements.
   1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
   2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.
   3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.

3.4 PROTECTION

A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

END OF SECTION

SECTION 09690 - CARPET TILE

PART 1 - GENERAL

1.1 SCOPE

A. Per each installation, comply with and provide all labor, materials, equipment, and services necessary to furnish and install all Carpet Tiles and related items as indicated and specified.

1.2 SUMMARY

A. This Section includes the following:

1. Carpet Tiles
2. Adhesives
3. Related accessories
4. Bond and moisture testing

B. Related Documents - See:

1. Section 09653 Resilient Wall Base and Accessories.
2. Finish Plans: Contractor shall be responsible for all measurements. If drawings are provided, they are only to indicate spaces to receive carpeting. They are not to be scaled.

1.3 DEFINITIONS

A. Carpet Tile: 24" x 24" square

B. Scraps: Carpet Tile remaining from regularly scheduled installation.

C. Maintenance Materials: additional Carpet Tiles designated for future use. The quantity shall be called out on the order as an additional percentage and/or square yardage.

1.4 SUBMITTALS

A. General: All respondents must submit the following information along with their bids:

1. Demonstrate that the carpet tile submitted in response to this solicitation is equal to or better than the specified product.
2. Attach Manufacturer Certification on corporate letterhead and signed by an officer of the corporation that the proposed carpet tile meets or exceeds the required criteria of these specifications.
3. Provide samples of carpet tiles showing the full range of colors, patterns, and construction for each product being bid.

B. The successful bidder shall submit the following information upon notification of intent to award:

1. Certificates signed by the floor covering Manufacturer certifying that installers comply with requirements.
2. Product data and tile binder of selected product.
3. Full size tile samples of selected product.

C. The successful bidder shall submit the following information prior to shipment of the product:

1. A seaming diagram for each carpet tile type/color that reflects field conditions.
2. Product availability and projected delivery time.
3. Manufacturer's installation data.
4. Bond and Moisture testing data.
5. Lot numbers and other information which will enable identification of the certified carpet tile.

D. LEED Submittals:

1. Credit IEQ 4.1: For adhesives and sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
    a. Product Data
    b. Laboratory Test Reports
2. Credit IEQ 4.3: For all flooring elements installed in the building interior, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
    a. Product Data
    b. Laboratory Test Reports
3. Credit MR C4: For products having recycled content, including postconsumer and pre-consumer recycled content. Provide the following information:
    a. Product Data
    b. Percent Content (post and pre-consumer)
    c. Invoices indicating cost of material (no labor included.)

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage installer that is certified by floor covering manufacturer as competent in the installation of carpet tiles. Installer to have a minimum of five (5) continual years experience with the installation of carpet tiles.

B. Manufacturer Qualifications and Requirements: Shall be an established carpet tile manufacturer for no less than ten (10) continual years.

C. Successful Bidder(s) shall provide the following Vendor qualifications.

1. Shall be approved by the manufacturer as an established flooring company for not less than five (5) continual years.
2. Must be insured and bondable.
3. Guarantee full value of replacement and installation of carpet tiles for at least THREE (3) YEARS.
4. Advise installer in proper procedures of installation.
5. Inspect all carpet tiles after manufacture for manufacturing defects.
6. Inspect all surfaces to receive carpet tiles and recommend accessories.

D. Single-Source Responsibility for Carpet Tiles: Obtain each type, color, and pattern of carpet tiles from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the work.

E. Special Project Guarantee: Submit a written guarantee, executed by contractor, installer and manufacturer, agreeing to repair or replace units which fail in materials or workmanship.

F. Concrete Slab Test Methods:

1. Delmhorst test Method as a preliminary test to determine moisture. Perform one test per every 1000 square feet. If this preliminary testing indicates more than five (5) percent moisture then provide to the Owner written documentation and await instructions before proceeding with further moisture tests.

2. Calcium Chloride Test method to determine moisture (on a case by case basis)

    a. Perform one test per 1000 square feet.
    b. Send samples to independent testing laboratory for results.
    c. Provide written documentation on test results to the Owner.

3. Litmus Paper test method to determine Alkalinity:

a. Perform one test per 1000 square feet.
b. Provide written documentation on test results and submit to Owner.
c. Acceptable conditions should test in the range of 6.0 to 8.0.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver all product in factory sealed cartons with identification of the manufacturer, brand name, quality or grade, fire hazard classifications, and lot number. Re-packed and re-sealed cartons must remain clearly labeled with identification of the manufacturer, brand name, quality or grade, fire hazard classifications, and lot number.

B. Inspect products upon delivery to ensure compliance with Contract Documents, and to ensure that products are undamaged and properly protected.

C. Store products in their undamaged cartons from weather, moisture, soiling, extreme temperatures, humidity, laid flat and blocked off ground. Maintain temperature in storage area above 40 degrees Fahrenheit.

D. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.

E. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.

F. Coordinate delivery with installation time to ensure minimum holding time and for items that are flammable, hazardous, easily damaged or sensitive to deterioration, theft, and other losses.

1.7 PROJECT CONDITIONS

A. Maintain a minimum temperature of 60 degrees Fahrenheit for 48 hours prior to installation, during installation, and 48 hours after installation.

B. Do not install carpet tiles until they are at the same temperature as the space where they are to be installed.

C. Do not install Carpet Tiles over concrete slabs until slabs, patches, and/or floated areas have cured and are sufficiently dried to bond with adhesives as determined by the floor covering manufacturer's bond and moisture test and/or as directed by Owner.

1.8 SEQUENCING AND SCHEDULING

A. Wherever possible, install carpet tiles and accessories after other finishing operations, including painting, have been completed.

1.9 EXTRA MATERIALS

A. Maintenance materials of Carpet Tiles: (no scraps or pieces), exclusive of materials required to properly complete installation. When product arrives, it shall be separated form the shipment, checked, re-sealed, and re-tagged with original labels identifying the manufacturer, brand name, quality, or grade, color, dye lot, pattern and fire hazard information. Maintenance materials will be no less than full carpet tiles. Quantity to be 2% of each color/style, but not less than two cartons.

1.10 GUARANTEES

A. Within the THREE (3) year period if Owner has reasonable cause to doubt the performance of the installed goods, a sample of the questionable materials will be sent to an accredited and industry approved testing facility. If any part of the goods are found to be of lower than acceptable industry and manufacturer's tolerances, or were not installed as per manufacturer's standards, monetary compensation or replacement will be made by the vendor/manufacturer to the Owner, including cost of testing.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. These specifications are not intended to be proprietary, but are intended to demonstrate **MINIMUM APPEARANCE, PERFORMANCE, AND HEALTH AND SAFETY STANDARDS** in order to be considered for acceptance. The product identified in paragraph 2.3 below represents the minimum qualities and performance requirements for the carpet tile. Any alternative product will be evaluated by the Architect in comparison to the product identified for all qualities including aesthetics and appearance and the Architect's determination shall be final.

1. Pre-Approved Manufacturers of Carpet Tiles include but are not limited to the following. However, all Manufacturers must still demonstrate that the product which they propose to provide in response to this solicitation has been tested as a complete assembly, and that it meets or exceeds the minimum criteria that follow.

a. Shaw
b. Masland
c. Milliken

2. Adhesive: As per Manufacturer's requirements.

2,2 SPECIFICATION DEVIATIONS

A. Not permitted.

2.3 MATERIALS

A.	CPT 1:	Manufacturer:	Masland Contract
		Style No.	T502 Resonate
		Color Name	Torrent
		Color No.	50207
		Primary Backing:	Synthetic
		Secondary Backing:	Vinyl
		Fiber Content:	EarthSmart Refresh Type 6,6 Nylon
		Construction	Pattern Loop
		Dye Method	Solution Dyed
		Gauge:	1/12
		Tufted Weight:	16 oz./Sq. Yd.
		Finished pile height:	.188"/.125"
		Total Weight	130 oz./Sq. Yd.
B.	CPT 2:	Manufacturer:	Masland Contract
		Style No.	T504 Echo
		Color Name	Gunsmoke
		Color No.	50424
		Primary Backing:	Synthetic
		Secondary Backing:	Vinyl
		Fiber Content:	EarthSmart Refresh Type 6,6 Nylon
		Construction	Pattern Loop
		Dye Method	Solution Dyed
		Gauge:	1/12
		Tufted Weight:	16 oz./Sq. Yd.
		Finished pile height:	.188"/.125"
		Total Weight	130 oz./Sq. Yd.

2.4 INSTALLATION ACCESSORIES

A. Concrete Slab Primer: Allow one bag Ardex Featheredge Floor Preparation per 100 square yards of carpet tiles.

B. Trowelable Underlayments and Patching Compounds: Cementitious coating by Ardex or approved equal..

PART 3 - EXECUTION

3.1 EXAMINATION

A. General: Examine areas where installation of carpet tiles will occur, with installer present, to verify that substrates and conditions are satisfactory for installation and comply with floor covering manufacturer's requirements and those specified in this section. Subfloor to be free from cracks, holes, ridges, and other defects impairing performance or appearance.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following.

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials whose presence would interfere with bonding adhesive. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by floor covering manufacturer. Refer to Section 1.05 Quality Assurance, Item J 1-3.

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

3.2 PREPARATION

A. General: Comply with manufacturer's installation specification to prepare substrates indicated to receive carpet tiles.

B. Clean floors of dust, dirt, solvents, oil, grease, paint, plaster, and other substrates detrimental to proper performance of adhesive and carpet tiles. Allow floors to dry thoroughly.

C. Broom or vacuum clean substrates to be covered by carpet tiles immediately before installation. Following cleaning, examine substrates to determine if there is visually any evidence of moisture, alkaline salts, carbonation, or dust.

D. Perform successful bond and moisture test prior to installation as outlined in Section 1.

E. Use trowelable leveling and patching compounds per floor covering manufacturer's direction to fill cracks, holes, and depressions in substrates.

F. Ensure floors are level, with maximum surface variation of 1/4" in ten (10) feet, noncumulative (on a case-by-case basis).

G. Ensure floors are level with a maximum surface variation of 1/8" where Carpet Tiles terminates at other flooring materials.

3.3 INSTALLATION

A. Maintain on site a copy of the Manufacturer's installation instructions. Comply with carpet manufacturer's installation instructions and other requirements indicated that are applicable to this project.

B. During new construction or remodel, sequence carpet tile installation with other work to minimize the possibility of damage and soiling during the remainder of the construction period.

C. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish floor as marked on subfloor. Use chalk or other non-permanent marking devices.

D. Following preparation spread adhesive in quantity and manner as per manufacturer's recommended installation instructions.

E. Lay carpet tiles in the direction as indicated on the back of the tiles and as per manufacturer's installation instructions for layout type specified in drawings.

F. Cut and fir carpet tiles neatly around projections through floor and to walls and other vertical surfaces and leaving no gaps.

G. Refer to Architectural and Electrical drawings for telephone and electrical devices.

H. Entire carpet tile installation is to be laid tight and flat to subfloor, presenting a uniform, pleasing appearance.

I. Insure seams are straight, not overlapped or peaked and free of gaps.

J. Install reducers and threshold strips in a manner limiting surface variation to a maximum of 1/8" between accessories and flooring materials. Use full pieces only. No seams are allowed within the area of a threshold.

3.4 CLEANING AND PROTECTION

A. Keep carpet tiles clean during installation. Upon completion of wok, clean up dirt and debris and clean carpet of all spots with proper spot remover. Remove all loose threads with sharp scissors, then clean entire carpet installation with vacuum cleaner.

B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended by floor covering manufacturer.

C. Owner shall view all carpet tile scraps and retain any he chooses for future repairs before they are removed form the job site. Entire area of project shall be left clean and ready for Owner's occupancy. Flooring Contractor shall remove remainder of project scraps to Contractor's trash container.

D. Neatly box any scraps selected by the Owner and leave at the project site. These scraps will not be considered part of the maintenance product.

END OF SECTION 09690

SECTION 09900 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes surface preparation and field painting of the following:

1. Exposed exterior items and surfaces.
2. Exposed interior items and surfaces.
3. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.

1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

1. Prefinished items include and are not limited to the following factory-finished components:

a. Finished mechanical and electrical equipment.
b. Light fixtures.
c. Distribution cabinets.

2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:

a. Foundation spaces.
b. Furred areas.
c. Ceiling plenums.
d. Utility tunnels.
e. Pipe spaces.
f. Duct shafts.

3. Finished metal surfaces include the following:

a. Anodized aluminum.
b. Stainless steel.
c. Chromium plate.
d. Copper.
e. Bronze and brass.

4. Operating parts include moving parts of operating equipment and the following:

a. Valve and damper operators.
b. Linkages.
c. Sensing devices.
d. Motor and fan shafts.

5. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

D. Related Sections include the following:

1. Division 2 for traffic-marking paint.
2. Division 5 Section "Structural Steel" for shop priming structural steel.
3. Division 9 Section "Gypsum Board Assemblies" for surface preparation for gypsum board.
4. Divisions 15 and 16: Painting of mechanical and electrical work is specified in Divisions 15 and 16, respectively.

1.3 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.

1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
3. Satin refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.
4. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
5. Full gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

1.4 SUBMITTALS

A. Product Data: For each paint system specified. Include block fillers and primers.

1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.
3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).

B. Samples for Verification: Of each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.

1. Provide a list of materials and applications for each coat of each sample. Label each sample for location and application.
2. Submit Samples on the following substrates for the Architect's review of color and texture only:

a. Ferrous Metal: Provide two 4-inch-square samples of flat metal and two 8-inch-long samples of solid metal for each color and finish.
b. Painted Gypboard: Provide Four (8 x 10) drawdown samples of each color to match Architect’s color selection. Provide a color match sample in each finish type indicated.
c. Concrete Masonry: Provide two 4-inch-square samples of CMU face for each color indicated.

C. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

D. LEED Submittals:

1. Credit IEQ 4.2: For paints and coatings, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

a. Product Data
b. Laboratory Test Reports

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:

1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.
8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.7 PROJECT CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90 deg F.

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 deg F.

C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.8 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied in the quantities described below. Package paint materials in unopened, factory-sealed containers for storage and identify with labels describing contents. Deliver extra materials to the Owner.

1. Quantity: Furnish the Owner with one gallon (un-opened) extra paint materials for each type and color utilized on the project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products in the paint schedules.

B. Manufacturers Names: The following manufacturers may be referred to in the paint schedules by use of shortened versions of their names, which are shown in parentheses:

1. Dunn Edwards (DE).
2. Sherwin-Williams Co. (S-W).
3. Frazzee (FR)
4. IdeaPaint

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

C. Colors: Provide colors of the finished paint systems to match the Architect's listed color selections. Refer to Construction Document drawings for finish and color distribution.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.

1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.

1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime.

2. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.

    a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
    b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
    c. When transparent finish is required, backprime with spar varnish.
    d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on backside.
    e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.

3. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations.

    a. Blast steel surfaces clean as recommended by paint system manufacturer and according to requirements of SSPC-SP 10.
    b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
    c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.

4. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

5. Cementitious Materials: Prepare concrete masonry block, and cement plaster to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

    a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
    b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's written instructions.

D. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of the same material are applied.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Paint colors, surface treatments, and finishes are indicated in the schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.

4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
9. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
10. Sand lightly between each succeeding enamel or varnish coat.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer on metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in in occupied spaces and/or visible from occupied spaces. Prefinished equipment shall be primed as required for adhesion and all coatings shall be spray applied.

F. Mechanical items to be painted include, but are not limited to, the following:

1. Piping, pipe hangers, and supports.
2. Heat exchangers.
3. Tanks.
4. Ductwork.
5. Insulation.
6. Motors and mechanical equipment.
7. Accessory items.

G. Electrical items to be painted include, but are not limited to, the following:

1. Conduit and fittings.

H. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by

others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.

I. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

J. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 FIELD QUALITY CONTROL

A. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary during the period when paint is being applied:

1. The Owner will engage the services of an independent testing agency to sample the paint material being used. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.
2. The testing agency will perform appropriate tests for the following characteristics as required by the Owner:

a. Quantitative material analysis.
b. Abrasion resistance.
c. Apparent reflectivity.
d. Flexibility.
e. Washability.
f. Absorption.
g. Accelerated weathering.
h. Dry opacity.
i. Accelerated yellowness.
j. Recoating.
k. Skinning.
l. Color retention.
m. Alkali and mildew resistance.

3. The Owner may direct the Contractor to stop painting if test results show material being used does not comply with specified requirements. The Contractor shall remove noncomplying paint from the site, pay for testing, and repaint surfaces previously coated with the rejected paint. If necessary, the Contractor may be required to remove rejected paint from previously painted surfaces if, on repainting with specified paint, the 2 coatings are incompatible.

3.5 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.6 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.7 EXTERIOR PAINT SCHEDULE

A. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.

1. Gloss Finish (P-MET)

   1st Coat: S-W KEM AQUA Wash Primer E61G520
   2nd Coat: S-W KEM AQUA 280 F78S500
   3rd Coat: S-W KEM AQUA 280 F78S500
   (5.0 mils wet, 1.25 mils dry per coat)

B. Acrylic Plaster: Provide the following finish systems over exterior acrylic plaster:

1. Flat Finish:

   1st Coat: S-W Loxon Concrete and Masonry Primer Sealer, A24W8300
   (8 mils wet, 3.2 mils dry)
   2nd Coat: S-W A-100 Exterior Latex Flat, A6 Series
   3rd Coat: S-W A-100 Exterior Latex Flat, A6 Series
   (4 mils wet, 1.2 mils dry per coat)

3.8 INTERIOR PAINT SCHEDULE

A. New Gypsum Board Surfaces: Provide the following finish systems over interior gypsum board surfaces:

1. Eg-Shel Finish (Walls)

   1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W2600
   (4 mils wet, 1.5 mils dry)
   2nd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series
   3rd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series
   (4 mils wet, 1.7 mils dry per coat)

2. Flat Finish (Ceilings)

   1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W2600
   (4 mils wet, 1.5 mils dry)
   2nd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series
   3rd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series
   (4 mils wet, 1.6 mils dry per coat)

3. Epoxy Finish (Walls)

   1st Coat: S-W Preprite 200 Latex Primer, B28W2600
   (4 mils wet, 1.4 mils dry)
   2nd Coat: S-W Waterbased Tile-Clad Epoxy Finish
   3rd Coat: S-W Waterbased Tile-Clad Epoxy Finish
   (3.0 mils dry per coat)

4. Idea Paint Dry Erase Paint (Walls)

   1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W2600
   (4 mils wet, 1.5 mils dry)
   2nd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series
   3rd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series
   (4 mils wet, 1.7 mils dry per coat)
   4th Coat IdeaPaint PRO (mils per MFR recommendation coveereage rate)

B. Ferrous Metal: Provide the following finish systems over interior ferrous metal. Primer is not required on shop-primed items.

1. Semigloss: 2 finish coats over a rust-inhibitive primer. Primer is not required on shop- primed items.

   1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series
   (5-10 mils wet, 2-4 mils dry)

2nd Coat: S-W Pro Industrial Acrylic Semi-Gloss, B66-650 Series
3rd Coat: S-W Pro Industrial Acrylic Semi-Gloss, B66-650 Series
(6.0 mils wet, 2.5 mils dry per coat)

2. Gloss (P-MET) : 2 finish coats over primer

1st Coat: S-W KEM AQUA 70P Water Reducible Metal Primer
2nd Coat: S-W KEM AQUA 280 F78S500(White), F78S513(Silver)
3rd Coat: S-W KEM AQUA 280 F78S500(White), F78S513(Silver)
(5.0 mils wet, 1.25 mils dry per coat)

END OF SECTION 09900

SECTION 10155 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes toilet compartments and screens as follows:

1. Type: Solid Plastic HDPE Toilet Compartments and Urinal Screens
2. Compartment Style: Floor anchored overhead braced.
3. Screen Style: Wall hung.

B. Related Sections include the following:

1. Division 10 "Toilet and Bath Accessories" for toilet paper holders, grab bars, purse shelves, and similar accessories.

1.3 REFERENCES (including, but not limited to)

A. *National Fire Protection Association 101 Life Safety Code 2006 Edition*, Chapter 10.

B. *ANSI A117.1-1998 Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People*.

C. ADA, *Accessibility Guidelines for Buildings and Facilities,* Federal Register Volume 56, Number 144, Rules and Regulations.

D. American Society for Testing and Materials Standards:

1. ASTM E84-01 Standard Test Method for Surface Burning Characteristics of Building Material.
2. ASTM-167 – Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
3. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating units without field measurements. Coordinate supports, adjacent construction, and fixture locations to ensure actual dimensions correspond to established dimensions.

1.6 SUBMITTALS

A. Comply with requirements of Section regarding submittals.

B. Manufacturer’s Data

1. Provide required number copies of:
   a. Product data sheets.
   b. Installation instructions.

c. Cleaning and maintenance instructions.
d. Replacement parts information.

C. Shop Drawings

1. Provide required number of copies of all shop drawings.
2. Show fabrication and erection of compartment assemblies, to extent not fully described by manufacturer's data sheets.
3. Show anchorage, accessory items and finishes.
4. Provide location drawings for bolt hole locations in supporting members for attachment of compartments.

D. Samples

1. Furnish scale model of compartments, including stile, shoe, door, door hardware, divider panel, and mounting brackets.
2. Furnish sections showing stile anchoring and leveling devices, concealed threaded inserts, panel, stile, and edge construction.

E. LEED Submittals:

1. Credit MR C4: For products having recycled content, including postconsumer and pre-consumer recycled content. Provide the following information:
   a. Product Data
   b. Percent Content (post and pre-consumer)
   c. Invoices indicating cost of material (no labor included.)
2. Credit MR C5: For products and materials that comply with requirements for regional materials based on location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Provide the following information:
   a. Product Data
   b. Fraction by weight of regional material
   c. Invoices indicating cost of material (no labor included.)
   d. Distance from Project

1.7 PRODUCT DELIVERY, STORAGE, AND HANDELING

A. Deliver items in manufacturer's original unopened protective packaging.

B. Store materials in original protective packaging to prevent physical damage or wetting.

C. Handle so as to prevent damage to finished surfaces.

1.8 WARRANTY

A. Furnish twenty-five year limited warranty for panels, doors, and stiles against breakage, corrosion, delamination, and defects in factory workmanship.

B. Furnish two-year guarantee against defects in material and workmanship for stainless steel door hardware and mounting brackets.

PART 2 – PRODUCTS

2.1 MANUFACTURER'S

A. Model numbers for toilet partitions manufactured by Scranton Products. are listed to establish a standard of quality for design, function, materials, workmanship, and appearance. Other manufacturers may be submitted for evaluation by the architect by following the conditions of the Substitutions section 01631. Unless approval is obtained ten days prior to the bid date, all bids shall be based on the standard of quality. The architect shall be the sole judge as to the acceptability of all products submitted for substitution.

B. Toilet partitions shall be the product(s) of a single manufacturer.

2.2 MATERIALS

A. Doors, Panels and Pilasters:
1. High density polyethylene (HDPE), fabricated from polymer resins compounded under high pressure, forming single thickness panel.
2. Waterproof and nonabsorbent, with self-lubricating surface, resistant to marks by pens, pencils, markers, and other writing instruments.
3. 1 inch thick with edges rounded to 1/4 inch radius.
4. Recycled content: Minimum 25 percent.
5. Color: White
6. Texture: OP

B. Aluminum Extrusions: ASTM B221, 6463-T5 alloy and temper.

C. Stainless Steel: ASTM A167, Type 304.

2.3 HARDWARE

A. Hinges: 54” Continuous Stainless Steel Spring Loaded.

B. Door Strike and Keeper:
1. 6 inches long, Stainless Steel
2. Bumper: Extruded black vinyl.

C. Latch and Housing:
1. Heavy-duty extruded aluminum.
2. Latch housing: Bright dip anodized finish.
3. Slide latch and paddle.

D. Coat Hook/Bumper:
1. Combination type, chrome plated Zamak.
2. Equip outswing handicapped doors with second door pull and door stop.

E. Door Pulls: Aluminum

1.2 COMPONENTS

A. Doors and Dividing Panels: 55 inches high, mounted 14 inches above finished floor, with aluminum heat-sinc fastened to bottom edges.

B. Pilasters: 82 inches high, fastened to pilaster sleeves with stainless steel tamper resistant Torx head sex bolt.

C. Pilaster Sleeves: 3 inches high,20 gage stainless steel, secured to pilaster with stainless steel tamper resistant Torx head sex bolt.

D. Wall Brackets: 54 inches long,stainless steel fastened to pilasters and panels with stainless steel tamper resistant Torx head sex bolts.

E. Headrail: Heavy-duty extruded aluminum, anti-grip design, clear anodized finish, fastened to headrail bracket with stainless steel tamper resistant Torx head sex bolt and at top of pilaster with stainless steel tamper resistant Torx head screws.

F. Headrail Brackets: 20 gage stainless steel, satin finish, secured to wall with stainless steel tamper resistant Torx head screws.

PART 3 – EXECUTION

3.1 INSPECTION

A. Check areas scheduled to receive compartments for correct dimensions, plumbness of walls, and soundness of surfaces that would affect installation of mounting brackets.

B. Verify spacing of plumbing fixtures to assure compatibility with installation of compartments.

C. Do not begin installation of compartments until conditions are satisfactory.

3.2 ERECTION

A. Install compartments rigidly, straight, plumb, and level and in accordance with manufacturer's installation instructions.

B. Installation methods shall conform to manufacturer's recommendation for backing and proper support.

C. Conceal evidence of drilling, cutting, and fitting to room finish.

D. Maintain uniform clearance at vertical edge of doors.

3.3 ADJUSTMENT AND CLEANING

A. Adjust hardware for proper operation after installation.

B. Set hinge cam on inswinging doors to hold doors open when unlatched.

C. Set hinge cam on outswinging doors to hold unlatched doors in closed position.

D. Clean exposed surfaces of compartments, hardware, and fittings.

3.4 Contractor to provide all cleaning and maintenance information.

END OF SECTION 10155

SECTION 10195 – LASER BLOCKING CURTAIN TRACK SYSTEMS AND CURTAINS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Curtain tracks and curtain carriers.
2. Laser blocking fabric curtains.

B. Related Sections include the following:

1. Division 6 Section "Rough Carpentry."
2. Division 9 Section "Gypsum Board Assemblies, Acoustical Panel Ceilings, Acoustical Tile Ceilings."

1.3 PERFORMANCE REQUIREMENTS

A. Curtains: Provide laser blocking curtain fabrics with the following characteristics:

1. Fabric to confine stray laser plume and indicate stray laser beam by non-hazardous smoke and/or fabric may glow. Fabric to provide Class 3B and Class 4 laser protection.
2. Fabrics are flame resistant and are identical to those that have passed NFPA 701 when tested by a testing and inspecting agency acceptable to authorities having jurisdiction.

1.4 SUBMITTALS

A. Product Data: Submit copies of manufacturer’s detailed technical data for materials, fabrication and installation of cubicle curtain tracks and curtains specified herein. Include catalog cuts of fittings, anchors, fastenings and accessories.

B. Shop Drawings: Show layout, sizes of curtains, number of carriers, and conditions requiring accessories.

C. Samples for Verification: Full-size units of each type of the following products:

1. Curtain Fabric: 12-inch square swatch.
2. Curtain Track: Not less than 4 inches long.
3. Curtain Carrier: Full-size unit.

D. Curtain Schedule: Use same room designations as indicated on Drawings.

E. Product Certificates: Signed by manufacturers of tracks and curtains certifying that products furnished comply with requirements.

F. Maintenance Data: For tracks and curtains to include in maintenance manuals specified in Division 1.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install curtains 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 the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where curtains are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following or equal:

1. Kentek Corporation, 1 Elm Street, Pittsfield, NH 03263
2. Rockwell Laser Industries, 7745 Camargo Road, Cincinnati, OH 45243
3. RT Technologies Inc., 2391 Briarleigh Way, Atlanta, GA 30338

2.2 CURTAIN TRACKS

A. Galvanized Steel Track: 1.45 inches wide by 1.25 inches high, factory painted non-reflective black.

B. Track Accessories: End caps, connectors, end gates, coupling and joining sleeves, wall brackets, ceiling flanges, and other accessories to match track for complete installation in configuration indicated.

C. Curtain Carriers: Dual nylon rollers, steel truck with swivel stem black coated plated steel hook.

2.3 CURTAINS

A. Curtain Fabric: Custom fabric as follows:

1. Extra heavy duty permanently flame resistant non-fraying and chemical resistant fabric.
2. Products: Black face one side, white side opposite.

B. Valance: Same fabric as curtain.

C. Curtain Grommets: Two-piece, rolled-edge, rustproof, non-reflecting black; spaced not more than 6 inches o.c.; machined into top hem.

D. #10 Nylon heavy duty zippers with locking rings at openings.

E. Velcro Brand 1" black hook and loop fasteners to attach to walls.

2.4 CURTAIN FABRICATION

A. Fabricate curtains to comply with the following requirements:

1. Width: Equal to track length from which curtain is hung plus 10 percent added fullness, but not less than 12 inches added fullness.
2. Length: Equal to floor-to-ceiling height plus two inches (2").
3. Top Hem: Not less than 1 inch and not more than 1-1/2 inches wide, triple thickness, reinforced with integral web, and double lock stitched.
4. Bottom Hem: 1 inch double thickness and single lock stitched.
5. Side Hems: Not less than 1 inch and not more than 1-1/4 inches wide, with double turned edges, and single lock stitched.
6. Vertical Seams: Not less than 1/2 inch wide, double turned and double stitched.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install tracks level and plumb, according to manufacturer's written instructions. Provide track fabricated from one continuous length up to 16 feet.

1. Curtain Track Mounting. Surface carrier as indicated.

B. Surface Track Mounting: Fasten surface-mounted tracks at intervals of not less than 24 inches. Fasten support at each side of each splice. Center fasteners in track to ensure unencumbered carrier operation. Attach track to structure as follows:

1. Mechanically fasten to steel rail (Unistrut) provided by others.

C. Track Accessories: Install end caps, connectors, end gates, coupling and joining sleeves, and other accessories as required for a secure and operational installation.

D. Curtain Carriers: Provide curtain carriers adequate for 6-inch spacing along the full length of the curtain.

E. Curtains: Hang curtains on each curtain track.

F. Install continuous valance from ceiling to overlap curtain minimum 4 inches. At protrusions through valence slit valence with razor overlap and seal with Velcro. Install continuous valance from ceiling to overlap curtain minimum 8 inches. Field verify site conditions before fabrication and provide necessary cut-outs where utilities are routed through valance. Where cutouts are necessary provide a vertical relief cut to the top of the valance with Velcro connections on each side.

3.2 DEMONSTRATION

A. Train Owner's personnel to adjust, operate, and maintain safety of curtain units.

END OF SECTION 10190

SECTION 10522 - FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Fire extinguisher cabinets.
2. Fire extinguishers.
3. Fire extinguisher mounting brackets.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 9 Section "Gypsum Wall Assemblies'

1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for cabinets include rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.

C. Samples for initial selection purposes in the form of manufacturer's color charts consisting of actual units or sections of units showing full range of colors, textures, and patterns available for each type of cabinet finish indicated or exposed to view.

D. Samples for verification purposes in full-size units of each type of cabinet finish indicated, and in sets for each color, texture, and pattern specified, showing the full range of variations.

E. LEED Submittals:

1. Credit MR C4: For products having recycled content, including postconsumer and pre-consumer recycled content. Provide the following information:
    a. Product Data
    b. Percent Content (post and pre-consumer)
    c. Invoices indicating cost of material (no labor included.)

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain extinguishers and cabinets from one source from a single manufacturer.

B. UL-Listed Products: Fire extinguishers shall be UL listed with UL listing mark for type, rating, and classification of extinguisher.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. American Specialties Inc.
2. Lyon Metal Products.

3. J.L. Industries.
4. Larsen's Manufacturing Co.

2.2 CABINETS

A. Construction: Manufacturer's standard box, with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames. Design based on Larsen’s Occult Series as indicated.

B. Fire-Rated Cabinets: UL listed with UL listing mark with fire-resistance rating of wall where it is installed.

C. Cabinet Type: Suitable for containing the following:

1. Fire extinguisher. (MP10)

D. Cabinet Mounting: Suitable for the following mounting conditions:

1. Recessed: Cabinet box (tub) fully recessed in walls of sufficient depth to suit style of trim indicated.

E. Trim Style: Fabricate trim in one piece with corners mitered, welded, and ground smooth.

1. Trimless with hidden flange of same metal and finish as box (tub) that overlaps surrounding wall finish and concealed from view by an overlapping door.

F. Door Material and Construction: Manufacturer's standard door construction, of material indicated, coordinated with cabinet types and trim styles selected.

G. Identify fire extinguisher in cabinet with FIRE EXTINGUISHER lettering applied to door. Provide lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location.

1. Application Process: Die cut..

H. Door Style: Manufacturer's standard design.

1. Solid Panel: Full flush stainless steel panel.

I. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide “Larsen-Loc” friction latch with door pull. Provide concealed or continuous-type hinge permitting door to open 180 deg.

2.3 FIRE EXTINGUISHERS

A. General: Provide fire extinguishers for each cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard, that comply with authorities having jurisdiction.

B. Multipurpose Dry Chemical Type: MP-10, UL-rated 4-A:80:B:C, 10-lb nominal capacity, in enameled steel container.

C. Multipurpose Dry Chemical Type: MP-5, UL-rated 2-A:10:B:C, 10-lb nominal capacity, in enameled steel container with bracket..

2.4 MOUNTING BRACKETS

A. Brackets: Designed to prevent accidentally dislodging extinguisher, of sizes required for type and capacity of extinguisher indicated, in plated finish.

1. Provide brackets for extinguishers not located in cabinets.

2.5 FINISHES FOR CABINETS, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying temporary strippable protective covering prior to shipping.

2.6 STAINLESS STEEL CABINET FINISHES

A. Remove or blend tool and die marks and stretch lines into finish.

B. Grind and polish surfaces to produce uniform-directional, textured polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

1. Bright, Directional Polish: AISI No. 4 finish.

C. Passivate and rinse surfaces after polishing. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for thickness and framing for cabinets to verify cabinet depth and mounting prior to cabinet installation.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Follow manufacturer's printed instructions for installation.

B. Install in locations and at mounting heights indicated or, if not indicated, at heights to comply with applicable regulations of governing authorities.

1. Prepare recesses in walls for cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.
2. Fasten mounting brackets and cabinets to structure, square and plumb.

END OF SECTION 10522

SECTION 10800 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes toilet and bath accessory items as scheduled.

B. Toilet compartments and related accessories are specified in Division 10.

1.3 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specifications Sections.

B. Product data for each toilet accessory item specified, including construction details relative to materials, dimensions, gages, profiles, mounting method, specified options, and finishes.

C. Schedule indicating types, quantities, sizes, and installation locations (by room) for each toilet accessory item to be provided for project.

D. Maintenance instructions including replaceable parts and service recommendations.

E. LEED Submittals:

1. Credit MR C4: For products having recycled content, including postconsumer and pre-consumer recycled content. Provide the following information:
    a. Product Data
    b. Percent Content (post and pre-consumer)
    c. Invoices indicating cost of material (no labor included.)

1.4 QUALITY ASSURANCE

A. Inserts and Anchorages: Furnish accessory manufacturers' standard inserts and anchoring devices that must be set in concrete or built into masonry. Coordinate delivery with other work to avoid delay.

B. Single-Source Responsibility: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise acceptable to Architect.

1.5 PROJECT CONDITIONS

A. Coordination: Coordinate accessory locations, installation, and sequencing with other work to avoid interference with and ensure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

1.6 WARRANTY

A. Warranty: Submit a written warranty executed by mirror manufacturer, agreeing to replace any mirrors that develop visible silver spoilage defects within warranty period.

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

C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

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

1. A & J Washroom Accessories.
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation.
5. General Accessory Manufacturing Co.
6. McKinney/Parker.

2.2 MATERIALS, GENERAL

A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 0.034 inch (0.9 mm) minimum thickness.

B. Brass: Leaded and unleaded, flat products, ASTM B 19; rods, shapes, forgings, and flat products with finished edges, ASTM B 16 (ASTM B 16M); Castings, ASTM B 30.

C. Sheet Steel: Cold-rolled, commercial quality ASTM A 366 (ASTM A 366M), 0.04 inch (1.0 mm) minimum. Surface preparation and metal pretreatment as required for applied finish.

D. Galvanized Steel Sheet: ASTM A 527 G60 (ASTM A 527M Z180).

E. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.

F. Mirror Glass: Nominal 6.0 mm thick, conforming to ASTM C 1036, Type I, Class 1, Quality q2, and with silvering, electro- plated copper coating, and protective organic coating.

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

H. Fasteners: Screws, bolts, and other devices of same material as accessory unit, or of galvanized steel where concealed.

2.3 PRODUCTS

A. See drawings for Toilet and Bath specialties schedule.

2.4 FABRICATION

A. General: No names or labels are permitted on exposed faces of toilet and bath accessory units. On either interior surface not exposed to view or on back surface, provide identification of each accessory item either by a printed, waterproof label or a stamped nameplate indicating manufacturer's name and product model number.

B. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.

C. Recessed Toilet Accessories, General: Except where otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors or access panels with full-length, stainless steel piano hinge. Provide anchorage that is fully concealed when unit is closed.

D. Framed Mirror Units, General: Fabricate frames for glass mirror units to accommodate wood, felt, plastic, or other glass edge protection material. Provide mirror backing and support system that will permit rigid, tamperproof glass installation and prevent moisture accumulation, as follows:

1. Provide galvanized-steel backing sheet, not less than 0.034 inch (0.9 mm) and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not an acceptable filler material.

E. Mirror Unit Hangers: Provide system for mounting mirror units that will permit rigid, tamperproof, and theftproof installation, as follows:

1. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.

F. Keys: Provide universal keys for access to toilet accessory units requiring internal access for servicing, resupply, etc. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install toilet accessory units according to manufacturers' instructions, using fasteners appropriate to substrate as recommended by unit manufacturer. Install units plumb and level, firmly anchored in locations and at heights indicated.

B. Secure mirrors to walls in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square at locations indicated, according to manufacturer's instructions for type of substrate involved.

C. Install grab bars to withstand a downward load of at least 250 lbf (1100 N), complying with ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Clean and polish all exposed surfaces strictly according to manufacturer's recommendations after removing temporary labels and protective coatings.

END OF SECTION 10800

SECTION 11132 - PROJECTION SCREENS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrically operated, surface mounted, front projection screens.

1.2 RELATED SECTIONS

A. Section 09 21 16 - Gypsum Board Assemblies: Wall mounted screen installation.

B. Division 16 for electrical wiring, connections, and installation of remote control switches for electrically operated projection screens.

1.3 REFERENCES

A. NFPA 70 - National Electrical Code.

B. NFPA 701-99 - Fire Tests for Flame-Resistant Textiles and Films.

C. GREENGUARD Environmental Institute Children & Schools.

D. US Green Building Council.

E. Cradle to Cradle Certified - Cradle to Cradle Products Innovation Institute.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Wiring diagram for electrically operated units.

D. Shop Drawings: Shop drawings showing layout and types of projection screens. Show the following:
1. Location of screen centerline.
2. Location of wiring connections.
3. Anchorage details.
4. Accessories.
5. Frame details.

E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

1.5 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain each type of projection screen required from a single manufacturer as a complete unit, including necessary mounting hardware and accessories.

B. Coordination of Work: Coordinate layout and installation of projection screens with other construction supported by, or penetrating through, ceilings, including light fixtures, HVAC equipment, fire-suppression system, and partitions.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver projection screens until building is enclosed and other construction where screens will be installed is substantially complete.

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Protect screens from damage during delivery, handling, storage, and installation.

1.7 COORDINATION

A. Coordinate work with installation of ceilings, walls, electric service power characteristics, and location.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Draper, Inc., which is located at: 411 S. Pearl P. O. Box 425 ; Spiceland, IN 47385-0425; Toll Free Tel: 800-238-7999; Tel: 765-987-7999; Fax: 866-637-5611; Email: request info (drapercontract@draperinc.com); Web: www.draperinc.com

B. Requests for substitutions will be considered in accordance with provisions of Section 01631.

2.2 MOTORIZED, SURFACE MOUNTED, FRONT PROJECTION SCREENS

A. Silhouette/Series V: Electric motor operated, extruded aluminum case, tab tensioned. Wall mounted. Contoured aluminum case with removable front cover, which conceals all mounting devices and fasteners including viewing surfaces that retract completely inside the case.
   1. Quiet Motor mounted inside screen roller on rubber isolation insulators. Motor operates at 44db and is UL certified, rated 110-120V AC, 60 Hz, three wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches.
   2. Motor Screen Controls, UL certified.
      a. Single station control rated 115V AC, 60 Hz with 3-position rocker switch with cover plate to stop or reverse screen at any point.

   3. System Options:
      a. Contoured aluminum case finished in a white color.
      b. Projected Mounting Brackets with a 6 inch (152 mm) clearance from wall.
      c. Projected mounting brackets shall have a white finish.

   4. Projection Viewing Surface:
      a. Matt White XT1000V – On Axis gain of 1.0. 180 degree viewing cone. GREENGUARD for Children and Schools certified.

   5. Tab-Tensioning System:
      a. Viewing surface with integrated tabs and cable on each side of fabric to provide tension and ensure flat viewing surface. Viewing surface and tabs CNC cut as a single piece. Tabs RF welded to the back of viewing surface to prevent tab separation. Tab adhesives are not acceptable. Viewing surface inserted into aluminum bottom dowel.
   6. Viewing Area H x W.
      a. Audio Visual Format.
         1) 96 inches x 96 inches (2438 mm x 2438 mm).

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Verify rough-in openings are properly prepared.

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. Install front projection screens with screen cases in position and relationship to adjoining construction as indicated, securely anchored to supporting substrate, and in manner that produces a smoothly operating screen with plumb and straight vertical edges and plumb and flat viewing surfaces when screen is lowered.

C. Test electrically operated units to verify that screen, controls, limit switches, closure and other operating components are in optimum functioning condition.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 11132

SECTION 11610 - LABORATORY FUME HOODS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes The Following:

1. Bench-top laboratory fume hoods.
2. Finish requirements.
3. Fume hood liner test.
4. Cup sinks in fume hoods.
5. Water, laboratory gas, and electrical service fittings in fume hoods.
6. Piping and wiring within fume hoods for service fittings, light fixtures, receptacles, and other electrical devices.
7. Fume hood signage.

1.2 SYSTEM DESCRIPTION

A. Provide equipment complete with accessories as described herein and shown on Drawings.

B. Provide factory pre-piped and pre-wired junction box at top of fume hood for single point connection of 120V AC power to supply receptacles, light switch and fixture, along with other control or accessories requiring electrical supply.

1. Factory pre-install and pre-wire transformers required to step voltage down for fume hood controls or accessories.
2. 120V AC circuit is provided to junction box as work of Division 16.

C. Pre-pipe service fittings to single point connection for each service at 6 inches above top of hood or as otherwise shown. See Division 15 "Plumbing" for piping requirements.

1. Refer to Division 15 "Plumbing" for providing P-trap and waste piping for sinks.

D. Refer to Division 12, "Laboratory Casework" for base cabinets, hardware, work surface materials, service fittings and accessories. Refer to details on Drawings for locations & configuration.

1.03 SUBMITTALS

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

1. Submit Product data for the complete materials list, including catalog data of materials, equipment, alarm devices, blower devices (if provided) and products for Work specified in this Section.

B. Shop Drawings for Laboratory Fume Hoods: Include plans, elevations, sections, details, and attachments to other work.

1. Shop Drawings shall be in the form of reproducible drawings or bond photocopies not to exceed 11 x 17 inches in size; blue or black line prints are not acceptable.
2. Indicate details for anchoring fume hoods to permanent building construction including locations of blocking and other supports. Indicate seismic restraints.
3. Indicate locations and types of service fittings together with associated service supply connection required.
4. Indicate duct connections, electrical connections, and locations of access panels.
5. Include roughing-in information for mechanical, plumbing, and electrical connections.
6. Show adjacent walls, doors, windows, other building components, laboratory casework, and other

laboratory equipment. Indicate clearances from above items and filler panels and trim required to close spaces between fume hoods and adjacent construction.

7. Include layout of fume hoods in relation to lighting fixtures and air-conditioning registers and grilles.
8. Indicate base cabinets, knee space, venting and supports. Coordinate and indicate plumbing drain piping from cup sinks, adjacent fume hood cup sinks and adjacent lab sinks.
9. Include coordinated dimensions for laboratory equipment specified in other Sections.

C. Samples for Initial Selection: For each factory-applied finish indicating available color range.

D. Qualification Data: For following:

1. Manufacturer: Submit names descriptions, locations, contact name with telephone number for reference projects.
2. Installer. Submit names descriptions, locations, contact name with telephone number for reference projects.

E. Fume Hood Sound Level Certifications: Provide certification of fume hood compliance with design criteria.

F. Product Factory Test Reports: Provide certification of fume hood compliance with design criteria and quality control testing.

1. Submit testing reports as indicated in Part 2: Source Quality Control
2. Sound level tests for hoods operating with 70 feet per minute face velocity, sound pressure level octave bands measured 36 inches away from, and perpendicular to, face of fume hood.
3. Provide certified test reports for each style and size of fume hood before delivery to Project site.

G. Manufacturer's Certificates: Certify installer is trained and approved by manufacturer for installation of specified products.

H. Operation and Maintenance Data: For fume hoods to include in emergency, operation, and maintenance manuals.

1. Include complete operating and maintenance manuals describing proper operating procedures, maintenance and replacement schedules, component parts list, and closest factory representative for components and service.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and certified by manufacturer for installation of units required for this Project.

1. Firm with an established organization and production facilities including tools, equipment and special machinery necessary for specializing in installation of the type of equipment specified.

2. Personnel: Skilled, factory trained workmen, each with the demonstrated knowledge, ability and the proven capability to produce required quality and proven capacity to complete work of this Project within the required time limits.

B. Manufacturer Qualifications: Qualified manufacturer specializing in fabrication of type of equipment specified with service center capable of providing training, parts, and emergency maintenance repairs.

1. Personnel: Experienced engineering department; each with demonstrated knowledge, ability and proven capability to produce specified equipment of required quality and proven capacity to complete work of this Project within required time limits.

2. Document five projects of equal or greater size within last five years. Document ten years or more of experience in manufacturer of casework and fume hoods.

C. Source Limitations: Obtain laboratory fume hoods through one source from single manufacturer.

D. Product Designations: Drawings indicate sizes, types, and configurations of fume hoods. Other manufacturers' hoods of similar sizes, types, and configurations, and complying with Specifications may be considered. Refer to Division 01 Section "Product Requirements."

E. Product Standards:

1. Comply with SEFA 1, "Laboratory Fume Hoods-Recommended Practices."

2. Provide fume hoods classified according to Underwriters Laboratories Standard 1805, "Laboratory Hoods and Cabinets." Affix labeling to face of each fume hood indicating classification to UL 1805.

3. Applicable Fume hood standards:

a. OSHA Laboratory Standard Guidelines.
b. NFPA 45, "Standard for Fire Protection for Laboratories Using Chemicals."
c. SEFA 8, "Laboratory Furniture."
d. ACGIH "Industrial Ventilation Manual," 23rd edition.

F. Safety Glass: Products complying with testing requirements in 16 CFR 1201 for Category II materials.

1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.

G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.

H. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.

B. Replace, repair or restore damaged products to original condition to satisfaction of Architect at no additional cost or inconvenience to Owner.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install fume hoods until building is enclosed, wet work and utility roughing-in are complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

1. Minimum Work Area Temperature: 65 degrees F.

2. Finishes: Do not install fume hoods until adjacent painted walls and partitions have received their primer and finish coats.

3. Overhead Work: Do not install fume hoods until overhead soffits, ceilings and lighting have been installed.

4. Finished Flooring: Do not install fume hoods until finished flooring under hoods has been installed.

1.07 COORDINATION

A. Work of this Section requires close coordination with Work of Divisions 12, 15 and 16, as well as installation of Owner furnished components and Work specified in other Sections. Sequence Work to ensure orderly progress in project without removal of previously installed Work and so as to prevent damage to finishes and products.

B. Coordinate installation of fume hoods with laboratory casework, fume hood exhaust ducts, plumbing and electrical work, and other related Work specified in other Sections.

C. Coordinate installation of blocking specified in Division 09 Section "Gypsum Board" required to secure or support fume hood components attached to framed partitions.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include:

1. Waldner, Secuflow

2. Kewaunee

3. Lab Crafters

4. Labconco

2.02 PERFORMANCE REQUIREMENTS

A. Function as ventilated, enclosed work spaces, designed to capture, confine and exhaust fumes and vapors produced or generated within enclosure in accordance with indicated performance requirements.

B. Constant Volume, bench-type fume hood:

1. Maintain essentially constant exhaust volume without regard for sash position.

2. The building automated control system will vary fume hood airflow volumes. The BAS will vary the airflow control device to maintain a constant volume of air (as scheduled below) whenever the sash is sensed open by the sash positioning sensor.

C. Sash:

1. Performance is for vertical sash openings.

D. Base cabinet exhaust:

1. Hood shall be capable of exhausting chemical storage cabinets (not flammables) which will be installed underneath the fumehood. Acid cabinet exhaust shall duct directly into the fume hood .

E. Base cabinet and plumbing coordination

1. Plumbing drainage piping from cup sinks, adjacent fume hood cup sinks and adjacent sinks will run behind fume hood base cabinets. Allow space for plumbing drain piping to run along wall behind the base cabinets.

F. Performance characteristics: Fume hoods to comply with indicated CFM requirements stated below when tested in accordance with the ASHRAE 110 test procedure as described in Quality Control Testing section of this specification. Air quantities are approximately equal to maintaining 50 fpm when the sash is fully open

1. 5 foot Fume hood

Sash Position	Face Velocity (see note 1)	Air flow (CFM)
Full Open	50 FPM	480 CFM
18"	75 FPM	480 CFM

Note 1: Face velocity assumes sash width of 51" and a ~1" bypass.

2. 6 foot Fume hood

Sash Position	Face Velocity (see note 1)	Air flow (CFM)
Full Open	50FPM	590 CFM
18"	75 FPM	590 CFM

Note 1: Face velocity assumes sash width of 63" and a ~1" bypass.

3. 8 foot Fume hood

Sash Position	Face Velocity (see note 1)	Air flow (CFM)
Full Open	50 FPM	820 FPM
18"	66 FPM	820 CFM

Note 1: Face velocity assumes sash width of 87" and a ~1" bypass.

4. Face Velocity Variation: Maximum 10 percent of average face velocity.

5. Factory Test: As-Manufactured (AM) Rating: 4 AM 0.05

6. Field Test: 4 AI 0.10. (Refer to Part 3 of specifications)

G. Design fume hood to minimize static pressure drop through hood.

1. Maximum Average Static Pressure Loss: 0.4 inches water column with sash in full open position at design face velocity.

H. Standard Fume Hood Widths: 4, 6, and 8, as indicated on Drawings or Laboratory Equipment Schedule.

I. Fume Hood Sound Level: For hoods operating with 75 fpm face velocity (18 inch sash height), maximum 60 dBA measured at 36 inches distance from, and perpendicular to, face of fume hood.

J. Fume Hood Lighting: Provide average 90 foot candles illumination level measured at work surface inside hood.

K. Provide specified fume hoods in sizes scheduled on Drawings, test facility, and ventilation equipment

necessary to perform Quality Control Testing as described below.

2.03 QUALITY CONTROL TESTING

A. Demonstrate fume hood performance by providing fume hood test reports for each of the hood types specified (size). Test should be according to an ASHRAE 110 test similar to what is described in this section. Testing to be performed at or below the CFMs and face velocities listed in the Performance section of this specification.

B. Test reports shall be from a certified 3rd party testing agency. If the manufacturer does not have published test results from an independent 3rd party at (or below) the values (flows and face velocities) specified here, the manufacturer shall engage a testing agency to perform the necessary tests and submit these reports for AE approval prior to biding on this project. Tests shall be performed at both the 18 inch and full sash open positions

C. Tracer Gas:

1. Tracer gas shall be sulfur hexafluoride.
2. Tracer gas release rate shall be 4.0 l/s.
3. Injector system as described in ASHRAE 110-1995

D. Testing Equipment:

1. Detector equipment and calibration of equipment shall be as described in ASHRAE 110-1995. Orifice sized to provide tracer gas at 4.0 l/s.
2. Manikin: As described in ASHRAE 110-1995.
3. Face velocity measurement equipment shall be electric anemometer as described in ASHRAE 110-1995. Calibration shall be within the last 6 months by a certified facility.
4. Smoke

a. Smoke bombs, machines and sticks as required for local and large volume generation as described in ASHRAE 110-1995.

E. Manufacturer's/Testing Agent's Facility:

1. Test facility shall be of sufficient size to provide similar conditions that the fume hood will experience in normal as-used operating conditions.
2. Test facility shall have hood volumetric flow measurements and room pressurization control as described in ASHRAE 110-1995.
3. Preliminary sketch: Provide sketch of test room indicating room layout, hood and door locations.

F. Flow visualization:

1. Provide local and large-volume visualization challenge as described in ASHRAE 110-1995.

G. Face velocity grid/measurements

1. Provide face velocity measurement as described in ASHRAE 110-1995.

H. Tracer Gas Containment Testing:

1. Perform containment tests using ANSI/ASHRAE-110 method of testing performance of laboratory fume hoods. Include Periphery tracer gas test and sash movement effect test.

2. Maximum Spill from Fume Hood: 0.05 PPM at 4.0 liter/minute tracer gas release. a. Fume

hoods exceeding this spillage rate during test procedure fail test.

3. Conduct containment tests at full 27-3/4 and 18 inch vertically open sash, at CFM and FPM criteria listed in the Performance Requirements section for mannequin and ejector positions as described in ASHRAE
110-1995

2.04 INTEGRAL FUMEHOOD ALARM, MONITORING AND CONTROLS

A. Airflow measurement:

1. Fumehood monitoring system shall measure pressure/airflow at the exhaust collar or face velocity at the sash face.

B. Visual / Audio display.

1. Alarm system shall provide visual and audio alarm during unsafe operation of fumehood. Visual alarms shall be as follows:

a. Fumehood sash height above 18"
b. Low airflow
c. Unoccupied / nighttime setting

2. An audio alarm shall activate upon either alarm condition described above. Audio shall be capable of being deactivated.

3. An alarm on/off switch shall not be included.

C. Sash position: System shall be capable of measuring sash position. D.Control

1. Fumehoods shall be capable of being operated at a sash closed or a nighttime setting. Fumehood alarm controller shall receive an input from the BAS signal when this second airflow mode is in operation and adjust the airflow alarm settings accordingly.

2. The fumehood monitoring shall be capable of outputting alarm status signals and sash position to the BAS.

E. All sensors, alarms and other devices to be painted to match the exterior fume hood finish.

F. Provide color finish options for fume hood alarm panel. Color to be selected by Architect.

2.05 MATERIALS

A. Steel Sheet: Cold-rolled mild steel sheet, complying with ASTM A 366.

B. Superstructure: Rigid, self-supporting assembly of double wall construction, maximum 4-7/8” thick. Wall consists of sheet steel exterior shell and corrosion resistant inner liner, and houses and conceals steel framing members, attaching brackets and remote operating service fixture mechanisms and services.

C. Finish with electrostatically applied, reagent resistant urethane powder coat, 1.2 mil minimum dry film thickness, matte finish; suitable for exposed applications.

D. Stainless-Steel Sheet: ASTM A 666, Type 304; stretcher-leveled standard of flatness.

E. Inner Liner: Poly-resin reinforced polyester panel; smooth finish and white color in final appearance. Flexural strength: 14,000 psi. Flame spread: 15 or less in accordance with UL 723 and ASTM E84. Seal and caulk interior seams.

F. Provide exterior, removable, gasketed, access panels for access to fixture valves concealed in wall panels on the inside liner walls, or through removable front posts.

G. Gaskets: White 70 durometer PVC for interior access panels. Gasket interior access panels to eliminate air leakage and to retain liquids inside hood.

H. Epoxy: Factory molded of modified epoxy-resin formulation complying with Division 12 Section Laboratory Casework and Furnishings" and having a flame-spread index of 25 or less per ASTM E 84.

I. Laminated Safety Glass: ASTM C 1172, Kind LT, Condition A, Type I, Class I, Quality q3 with clear, polyvinyl butyral interlayer.

J. Provide hoods with electrical service and utilities as shown Drawings.

K. Liner: White polyresin, press-molded, heat-converted catalyzed, glass polyester sheet; minimum thickness 3/16 inch. Liner performance characteristics as indicated in this Section.

L. Work Surface:

1. 1-1/4" thick epoxy resin, dished minimum 1/2 inch to retain spills. Color: Grey.

2. Provide rabbeted cutout for cup sink so that cup sink rim is flush with dished work surface. Raised cup sink rims are not acceptable.

M. Service Fittings: Front loaded in the side panel of the fume hood, remote operated, as shown on Drawings and specified in Division 12 Section "Lab Sinks and Fittings," installed, complete with gaskets, grommets, sleeves and remote vacuum breakers. Concealed vacuum breaker shall be accessible at top of fume hood. Verify that concealed vacuum breaker is acceptable with the Authority Having Jurisdiction.

N. Cup Sink: Oval 3 X 6 inch overall size unless otherwise indicated, epoxy resin, complete with screen, strainer and outlet tailpiece, as shown on Drawings.

1. Drain Outlet: 1-1/2 inch.

2. Color: Black

3. Refer to Division 15 "Plumbing" sections for trap and connection to drainage system.

4. Locate cup sink in front half of work surface, under water faucet, right or left side as indicated on Drawings or as selected. Coordinate installation with acid storage base cabinets beneath cup sink.

5. Provide penetration through acid storage base cabinet for cup sink and drain.

O. Directed Airflow Chamber

1. Provide airflow chamber to assist fume hood containment by directing room air between operator and hood from above sash opening.

2. Fabricate chamber for low resistance, from 18 gauge steel with integral distribution media and polycarbonate honeycomb flow straightener at outlet.

3. Optional: Include blower as integral part of chamber with dual forward curved wheels.

a. Blower Motor: Shaded pole, low horsepower, rated for 30,000 hour duty cycle.
b. Fabricate housing with powder-coat finished and vibration isolation.
c. Provide controls to automatically activate blower when combination sash is raised above 18 inch open position.

P. Baffle: Fabricate removable, non-adjustable baffle providing controlled air vectors into and through fume hood of same material as the liner of the baffle.

1. Provide high performance, 2-piece baffle.

2. Incorporate exhaust slots located to purge upper and lower area of hood.

3. Minimum Baffle Thickness: 1/4 inch.

Q. Bottom Horizontal Air Foil: Triple vaned design to minimize reverse flows and eddy currents at work surface.

1. Fabricate from steel with urethane powder coating.

2. Air foil and Sill: Maximum 1/2 inch above work surface.

3. Provide air foil with **one** inch bypass when sash is in closed position, with area between vanes sufficient in size to pass through electrical plugs.

4. Provide fixed air foil that is not removable without use of special tools.

R. Provide non-removable steel safety bar with urethane powder coating across full width of bottom air flow positioned to prevent users from directly blocking air foil with their body.

1. Locate safety bar approximately 4 inches from front edge of bottom air foil.

2. Provide safety bar that is not removable without special tools.

S. Fastenings:

1. Exterior Structural Member Attachments: Sheet metal screws, zinc plated, blunt nose. No sharp edges on screw points.

2. Conceal interior fastening devices.

a. Exposed screws are not acceptable.
b. Screw head caps are not acceptable.

3. Exterior Side Access Panel Member Fastening Devices: Exposed, corrosion resistant, non-metallic material, creating positive mechanical flush latch.

a. Exposed screw or Velcro type fasteners are not acceptable.

T. Sash Design:

1. Vertical rising framed sash with 7/32 inch thick laminated safety glass, and with formed full width flush pull.

2. Provide vertical rising sash with 27-3/4 inch high access opening along with fixed top viewing panel to provide a 35 inch high overall sight line.

3. Sash frame on bottom and sides: Maximum 1-1/2 inch wide, corrosion resistant steel with chemical resistant powder coating.

4. Provide extruded PVC sash guides.

5. Form bottom edge of sash frame to minimize air flow turbulence into hood.

6. Fixed Top Viewing Panel:

   a. Minimum 3/8 inch thick laminated safety glass.
   b. Provide stainless steel or black plastic trim at exposed glass edges of viewing panels and sash panes.

7. Provide sash counter balance system with sprocket and chain drive and single weight for self-leveling.

   a. Prevent sash tilting, and permit ease of operation at any point along full width pull.
   b. Maximum pull required to raise or lower sash throughout its full length of opening: 7 pounds.

U. Sash chain and pulley assembly: ANSI #35 steel chain, single strand with average tensile strength of 2,400 pounds, and maximum working load of 480 pounds.

1. Pulley Assembly for Sash Chain:

   a. Finished bored steel drive sprockets and keyed drive, 1/2 inch diameter; front connector shaft; rear idler sprockets; double sealed, lubricated ball bearings.
   b. Sprockets: Steel with zinc dichromate finish.

V. Auto-Sash Mechanism: Design to promote usage of sash as upper body and face shield.

1. Base sash operating position on sash fully lowered with horizontal panels opened to desired configuration of user.

2. Provide sash with capability to be raised to 27-3/4 inches vertical opening for loading, unloading and setup of large apparatus.

3. Provide lock-open lever.

4. Provide sash that lowers automatically to nominal 18 inch open position, when lock-open is not engaged and sash is released.

5. Life cycle test auto-sash function. Do not incorporate need for motor drives to restore sash position. Open and close sash against rubber bumper stops

W. Provide sash stop with manual override and automatic reset to 18 inch sash opening.

X. Ceiling Closure Panels: Not required.

Y. Trim: Provide and install matching steel trim to finish openings around hoods. Finish to match superstructure exterior.

Z. Exhaust Collar and Transition: Provide contoured Type 316 stainless steel exhaust collar with transition piece fabricated to receive a circular exhaust duct connection by Division 23 "HVAC."

AA. Coordinate piping for exhaust connection from flammable storage cabinet piped through exhaust hood side wall and connection to hood exhaust system.

BB. Electrical Outlets: UL listed, flush mounted, prewired, 20Amp rated, 120 volt duplex GFCI type, one on each side of hood typical; at ADA designated accessible hoods, provide, one receptacle only and replace the other receptacle with light switch.

1. Electrical requirements:

a. Connect both duplex receptacles to same circuit; prewire that circuit to top mounted junction box for field connection to building branch power circuit.
b. Circuit will be connected to building emergency power system as work of Division 16, "Electrical."

2. Finishes:

a. Outlet color: Red.
b. Cover Plate: steel, painted to match fume hood exterior metal finish.

CC. Interior Hood Lighting: Provide protected fluorescent lighting fixture with two lamp, 32W T8, electronic ballast rapid start. Wire fixture for 120V, single phase power and prewire to top mounted junction box, separate from receptacle junction box. Circuit will be connected to the building normal power as work of Division 16, "Electrical."

1. Lighting Control: Provide exterior mounted switch.

a. Color: Grey.
b. Cover Plate: steel, painted to match fume hood exterior metal finish.

2. Lamp Protection: Provide safety glass panel cemented and sealed to the hood roof.

3. Fixture shall be chemical resistant and rated for exposure to chemicals and fumes as indicated in this Section.

DD. Exterior Color: Match the metal cabinet finish specified in 12345 LABORATORY CASEWORK. Color to be as indicated on drawings.

EE. Lattice Support Rod Socket(s): Refer to Division 12 Section "Laboratory Casework" for lattice rod assemblies. Provide 6 sockets per hood mounted at the back face of fume hood; 3 located 24 inches above work surface and 3 located 6 inches above work surface, directly below upper 3.

1. Provide each socket with rod clamp and Allen set screws with Allen head wrench, to fit screw heads.

FF. Airfoil: Flush with work surface and hinged to allow for passage of electrical cords and connectors.

1. Airfoil finish: Manufacturer's standard urethane, baked on powder coat.
2. Provide nominal 1 inch minimum bypass when sash is fully closed.

2.06 FABRICATION

A. General: Preassemble fume hoods in factory to greatest extent possible. Disassemble fume hoods only as necessary for shipping and handling limitations. Allow for fume hoods to be partly disassembled as necessary to permit movement through a 35-by-79-inch clear door opening.

B. Steel Exterior: Fabricate from steel sheet, with component parts screwed together to allow removal of end panels, front fascia, and airfoil and to allow access to plumbing lines and service fittings. Apply chemical-resistant finish to interior and exterior surfaces of component parts before assembly.

C. Ends: Fabricate with double-wall end panels without projecting corner posts or other obstructions to interfere with smooth, even airflow. Close area between double walls at front of fume hood and as needed to house sash counterbalance weights, utility lines, and remote-control valves.

D. Overall Depth of Fume Hood: **37-1/2-**inches maximum.

E. Overall height of Fume Hood: Per drawings

F. Base Cabinets: Comply with Division 12 Section "Laboratory Casework."

G. Filler Strips: Provide as needed to close spaces between fume hoods and adjacent building construction. Fabricate from same material and with same finish as fume hoods.

H. Comply with requirements in Divisions 15, 16 and 17 Sections for installing water and laboratory gas service fittings, piping, electrical devices, and wiring. Install according to approved submittals. Securely anchor fittings, piping, and conduit to fume hoods.

2.07 CHEMICAL-RESISTANT FINISH

A. Preparation:

1. After units have been completely welded together and before finishing, apply pre-paint treatment to provide excellent adhesion of finish to metal, and to aid in prevention of corrosion. Physically and chemically clean metal by washing with alkaline cleaner, followed by spray treatment with heated cleaner/phosphate solution and pretreated with iron phosphate spray followed by neutral final seal prior to application of final finish. Monitor strength of each solution by filtration, to ensure consistent quality.

2. Immediately dry treated parts in heated ovens and gradually cool before application of finish. Clean and properly prepare treated metal parts to provide optimum adhesion of finish and resistance to corrosion.

B. Application: Electrostatically apply powder coat of selected color and bake in controlled high temperature oven to assure a smooth, hard satin finish. Apply chemical resistant, high grade laboratory furniture quality finish of following thicknesses:

1. Surfaces, Exterior or Interior, Exposed to View: Sufficient powder coat to achieve average 1.2 mil film thickness, with smooth satin luster.

2. Backs of Cabinets and Other Surfaces Not Exposed to View: Sufficient powder coat to achieve an average 1.0 mil film thickness.

3. Concealed Interior Parts: Apply corrosion resistant treatment.

C. Chemical Resistance Finish Performance Requirements:

1. Finish complies with acceptance levels of cabinet surface finish tests in SEFA 8.

2. Match the metal cabinet finish specified in 123553 LABORATORY CASEWORK.

2.08 FUME HOOD LINER TEST: POLYRESIN

A. Test No. 1 - Spills and Splashes:

1. Suspend 42 inches x 12 inches panel, 42 inch dimension horizontal, in position to expose surface to be tested in vertical plane. Divide panel vertically into 3/4 inch spaces.

2. With eye dropper, apply five drops of each reagent as listed.

3. Apply liquid reagents at top of panel and permit to flow down full panel height. a.

CAUTION! After test, flush away reagent drops.

B. Test No. 2 - Fumes and Gases:

1. Prepare panel 24 inches x 12 inches by dividing panel into 2 inch squares. With 100 ml beakers, place 25 ml, approximately 1/2 inch of reagent, into each beaker. Place beakers in position so that test panel may be placed over beaker tops in proper sequence. Place panel over beakers.

   a. Beaker pouring lip permits atmospheric oxygen to enter and participate in reaction of reagent fumes.

2. After 24 hour time period has elapsed, remove panel, flush off with water, clean with naphtha and detergent, rinse and wipe dry. Evaluate.

C. Evaluating Ratings:

1. No Effect - No detectable change in surface material.

2. Excellent - Slight detectable change in color or gloss, but no change to the function of life or the surface material.

3. Good - Clearly discernible change in color or gloss, but no significant impairment of surface function or life.

4. Fair - Objectionable change in appearance due to surface discoloration or etch, possibly resulting in deterioration of function over an extended period of time.

5. Failure - Pitting, cratering or erosion of surface material. Obvious and significant deterioration.

D. Performance:

1. Test results shall equal or exceed the following:

Reagent	% by wt.	Spills	Fumes
Hydrochloric Acid	48%	Excellent	Excellent
Sulfuric Acid	33%	Excellent	No Effect
Sulfuric Acid	77%	Excellent	No Effect
Sulfuric Acid	93%	Excellent	No Effect
Formic Acid	88%	No Effect	No Effect
Nitric Acid	20%	No Effect	No Effect
Nitric Acid	30%	No Effect	No Effect
Nitric Acid	70%	No Effect	No Effect
Hydrofluoric Acid	37%	No Effect	No Effect
Phosphoric Acid	85%	Excellent	No Effect
Chromic Acid, saturated		Fair	No Effect
Acetic Acid, glacial		No Effect	No Effect
Sulfuric Acid / Nitric Acid Equal Parts	77%/70	No Effect	Excellent
Ammonium Hydroxide	28%	No Effect	No Effect
Sodium Hydroxide	10%	Excellent	No Effect
Sodium Hydroxide	20%	Excellent	No Effect
Sodium Hydroxide	40%	Excellent	No Effect
Sodium Hydroxide Flake		No Effect	No Effect
Sodium Sulfide, saturated		Good	Excellent
Zinc Chloride		No Effect	No Effect
Tincture of Iodine		No Effect	Good
Silver Nitrate	10%	Excellent	No Effect
Methyl Alcohol		No Effect	No Effect
Ethyl Alcohol		No Effect	No Effect
Butyl Alcohol		No Effect	No Effect
Benzene		No Effect	No Effect
Xylene		No Effect	No Effect
Gasoline		No Effect	No Effect
Dichloro Acetic Acid	93%	No Effect	No Effect
Di Methyl Formamide		No Effect	No Effect
Ethyl Acetate		No Effect	No Effect
Amyl Acetate		No Effect	No Effect
Acetone		No Effect	No Effect
Chloroform		No Effect	No Effect
Phenol	85%	No Effect	Excellent
Cresol		No Effect	No Effect
Formaldehyde	37%	No Effect	No Effect
Trichloroethylene		No Effect	No Effect
Ethyl Ether		No Effect	No Effect
Furfural		Good	No Effect
Monochlorobenzene		No Effect	No Effect
Dioxane		No Effect	No Effect
Methyl Ethyl Ketone		No Effect	No Effect
Acid Dichromate		Excellent	Excellent
Hydrogen Peroxide	30%	No Effect	No Effect
Naphthalene		No Effect	No Effect
Methylene Chloride		No Effect	No Effect
Carbon Tetrachloride		No Effect	No Effect
Toluene		No Effect	No Effect

E. Note: Apply maximum concentration unless lower concentration is shown in table.

2.09 ACCESSORIES

A. Lattice Rod Assemblies: Refer to Division 12, Section 12345 "Laboratory Casework."

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of fume hoods.

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

3.02 SITE CONDITIONS

A. Prior to installation of Work of this Section, carefully inspect installed Work specified in other sections and verify that all such Work is complete to point where this installation may properly commence.

B. Verify that Work has been installed in complete accordance with original design, received submittals, and the manufacturer's recommendations.

C. In event of discrepancy, immediately notify Architect. Do not proceed with installation in areas of discrepancy until each discrepancy has been fully resolved.

3.03 INSTALLATION

A. General: Install fume hoods according to Shop Drawings and manufacturer's written instructions. Install level, plumb, and true; shim as required, using concealed shims, and securely anchor to building and adjacent laboratory casework. Securely attach access panels, but provide for easy removal and secure reattachment. Where fume hoods abut other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.

B. Comply with requirements in Division 12 Section "Laboratory Casework" for installing fume hood base cabinets, countertops, and sinks.

C. Comply with requirements in Divisions 15, 16 and 17 Sections for installing water and laboratory gas service fittings, piping, electrical devices, and wiring. Install according to Shop Drawings and manufacturer's written instructions. Securely anchor fittings, piping, and conduit to fume hoods, unless otherwise indicated.

D. Set cup sinks in work surfaces with manufacturer's recommended black, chemical resistant caulk. E.

Install accessories and fittings in accordance with manufacturer's published recommendations.

3.04 FIELD TESTING

A. After hoods are installed and the mechanical systems are balanced as specified in Division 15, field test and certify 100 percent of the fume hoods installed in the project in accordance with ASHRAE 110 Flow Visualization, Face Velocity, and Tracer Gas Containment Testing Requirements. Fume hood field tests shall be performed by a qualified independent testing company to determine face velocity and air flow patterns. The cost of field test shall be broken out as a separate line item in manufacturers bid. The owner may choose to perform field testing with their own testing agent at owner's expense.

1. Testing Agent Qualifications: Independent agency that is nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and is qualified to perform testing in accordance with UL 1805 and ASHRAE 110 for as-installed conditions.

B. Notify Architect and Owner minimum 14 days before conducting tests to permit witnessing of tests.

C. Fume hood shall conform to the ASHRAE 110-95 with a maximum spill from fume hood of 0.10 PPM at 4 liter/minute tracer gas: 4 AI 0.10 (field test)

3.05 TRAINING

A. Furnish services of fume hood manufacturer's representative to present minimum 4 hour of training for Owner's designated personnel in operation and maintenance of fume hoods. Include demonstration on procedures for testing and calibration of fume hood monitors, alarms and control devices.

B. Provide Owner with professional quality CD, minimum 15 minutes in length, on proper hood operation.

1. The CD shall convey:

a. Basic concept of fume hood and how it serves to protect users.
b. Function of sash and its proper use.
c. Safety rules for proper movement in work zone.
d. Safety rules for fume hood loading.
e. High volume smoke demonstration on hood's containment potential and how improper use can compromise containment.
f. Fume hood alarm features and how user should respond to them.

3.06 REPLACEMENT AND PROTECTION

A. Repair or remove and replace defective work as approved by the Architect upon completion of installation.

B. Protect all units before, during, and after installation. Damaged materials due to improper protection shall be cause for rejection.

3.07 ADJUSTING AND CLEANING

A. Adjust moving parts for smooth, near silent, accurate sash operation with one hand. Adjust sashes for uniform contact of rubber bumpers. Verify that counterbalances operate without interference.

B. Adjust moving or operating parts to function within their design parameters.

C. Clean finished surfaces, including those surfaces not exposed to view, clean both sides of glass; remove labels, not require for product identification or operational characteristics or requirements.

D. Refinish or touch up damaged or abraded surfaces to "factory finish condition", items or surfaces that cannot be repaired or restored to satisfaction of Architect will be removed and replaced in kind.

E. Protect units before, during, and after installation. Architect will reject units and materials damaged due to improper protection.

END OF SECTION 11610

SECTION 12310 - LABORATORY SINKS, MECHANICAL AND ELECTRICAL FIXTURES

GENERAL

1.1 DESCRIPTION OF WORK

All laboratory fittings, fixtures and emergency fixtures specified herein and shown on the drawings, shall be furnished and delivered for installation under Division 15 and Division 16.

1.2 SECTION INCLUDES

A. Laboratory fixtures, fittings, valves and related components
B. Laboratory emergency safety fixtures
C. Electrical fixtures and wire raceways
D. Laboratory sinks.
E. Extraction Snorkels
F. Gas cylinder cabinets

1.3 RELATED SECTIONS

A. Section 12345 - Laboratory Casework System & Steel Casework components
B. Section 11610 - Laboratory Fume Hoods
C. Division 15 - Mechanical
D. Division 16 - Electrical

1.4 DELIVERIES, STORAGE AND HANDLING

A. Schedule delivery of all fittings and fixtures and electrical fixtures to Divisions 15 and 16 Subcontractor so installation can begin immediately after laboratory bench top installation.
B. All mechanical and electrical fittings and fixtures shall be packaged and clearly labeled for inventory and acceptance by Division 15 and 16.
C. Replacements: In the event of damage, immediately make all repairs and replacements necessary for the approval of the owner's representative at no additional cost to the owner.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's data for each fitting and fixture. Include component dimensions, configurations, details and attachments. Indicate location, size and service requirement for each fitting or fixture. See Specification Division 1 for additional general requirements.

1.6 QUALITY ASSURANCE

A. Single Source Responsibility: Laboratory sinks, mechanical and electrical fixtures included in this section and specification sections listed below shall be manufactured or furnished by a single laboratory supplier. Proposals from brokers or multiple suppliers will not be accepted.

   1. Section 11601 - Laboratory Fume Hoods
   2. Section 12345 - Laboratory Casework System & Steel Casework components

B. Manufacturers for work specified in this section shall have an established organization and production facility with ten years documented experience specializing in the manufacture of the type of equipment specified, with an experienced Engineering Department. Each shall have demonstrated ability to produce the specified equipment of the required quality and quantity for complete installation in a project of this type and size within the required time limits.

1.7 REFERENCES

A. SEFA (Current version)
B. ANSI/ASME A112.18.1M (water valves)

C. ASSE 1001 and 1035 (vacuum breakers)
D. ANSI 221.15 (gas valves)
E. ANSI Z358.1 1998 (emergency fixtures)
F. ANSI A117.1 - 1992 (ADA clearance requirements)
G. UL approved and NEMA 6-20R and 520R (electrical components)

PART 2 – PRODUCTS

2.1 GENERAL

A. All service fittings and emergency plumbing fixtures shall be specifically designed for laboratory use.

B. Service fittings, emergency fixtures, sinks, etc. specified in this Section shall be furnished and delivered to point of use for installation as specified in Division 15.

C. All service fittings shall be factory pre-assembled including the assembly of valves to turrets, mounting shanks to turrets, etc., and individually factory tested.

D. All laboratory service fittings shall be the product of one service fitting manufacturer to assure ease of replacement and maintenance.

E. All service valves, fittings, and accessories shall be of cast brass with a minimum copper content of 85%, except for items which are to be brass forging or bar stock.

F. Provide fittings as shown in laboratory fitting details for all laboratory equipment at locations shown on the Laboratory Furnishings drawings. See Service Fitting Schedule.

G. Assembly components and operating parts such as valve stems, renewable units, packing nuts, outlet nozzles and straight serrated hose ends shall be made from solid brass stock.

H. Replaceable seats, needle cones, valve disc screws and other accessories shall be Monel or stainless steel alloys especially selected for use intended.

I. Fittings shall be factory tested and shall be supplied with nipples, lock nuts, shanks, etc.

J. Serrated tip fittings shall have 3/8 inch. ((9.525 mm)) IPS thread with the hose end being tapered. Diameter of orifice in serrated tip shall be 1/8 inch (3.2 mm), except where otherwise specified.

K. Turrets shall be brass drop forging of design indicated in details shown elsewhere in the Section and shall be one or two-way, as required, with 3/8 inch ((9.525 mm)) IPS female inlet thread for connections. Units shall be furnished with brass shanks, brass locknuts, and washers.

L. Fittings located on the same plane shall have their handles project the same distance from the plane of reference to present a uniform related appearance, regardless of valve type construction.

M. Flanges shall be brass forging of approved design with 3/8 inch ((9.525 mm)) IPS female inlet and outlet.

N. All goosenecks shall provide full thread for attachment of anti-splash outlet fittings, serrated tips, and filter pumps.

O. Hot water/cold water gooseneck mixers and wall-mounted cold water goosenecks shall swivel. Swivel point shall be at turret or at valve level if wall mounted. Swing joints shall have heavy Teflon type packings; "0" rings will not be permitted. Cold water goosenecks at cup sinks shall be rigid.

P. All fittings shall have plastic colored service index buttons as specified in this Section.

Q. Provide in-line vacuum breakers at hand held drench hoses, see details on Laboratory Furnishings drawings.

R. Provide durable 1inch x 3 inch (25 x 75 mm) sign “CAUTION: NONPOTABLE WATER, DO NOT DRINK” at each bench mounted industrial water fitting, see details on Laboratory Furnishings drawings.

S. Fittings and fixtures designated to be accessible to the disabled (ADA) with operable parts shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate operable parts shall be 5 pounds (22.2 N), maximum.

2.2 LABORATORY SERVICE FITTINGS, FIXTURES, AND EMERGENCY EYE WASH AND SHOWERS

A. Manufacturers:

1. Products, which comply with this specification section as judged and approved by the Architect, may be provided by the following manufacturers. All products specified in this section shall be provided by a single manufacturer.

a. Water Saver Faucet Co.

b. T&S Brass and Bronze Works, Inc.

c. Broen represented by Laboratory Enterprises

d. Movex Inc.

e. Approved substitution.

B. Pattern: All service fittings shall have cylindrical profiles.

C. Handles:

1. Faucets designated to be accessible to the disabled (ADA): provide “wrist-blade” handles with screw on index (identification) discs.

2. Laboratory gas, air and vacuum valves at workstations indicated to be accessible to the disabled (ADA): Provide valves fitted with lever-type handles and screw on index (identification) discs.

3. Other fittings shall be fitted with four arm handles with screw-on index discs.

D. Finish: Polished chrome, with clear, acid-resistant coating.

E. Water Valves:

1. Water valves shall include a renewable unit containing all the working parts which are subject to wear, including stainless steel or Monel seat, Monel screw and heavy duty seat disk and Teflon packing, and an integral adjustable volume control.

2. Unit shall be capable of being readily converted from compression to self-closing, and vice versa, without disturbing faucet body proper and shall also be capable of being readily converted from water construction to needle valve or steam valve construction having outside packing gland without disturbing faucet body.

3. Unit shall be sealed in valve body with special composition gasket. Metal-to-metal or ground joint type of sealing is not acceptable.

4. Water fixtures shall be fully assembled and factory tested at 80 psi (0.55 MPa) water pressure.

F. Needle Valves: Fully assembled and factory tested at 225 psi (1.55 MPa) air pressure. Gas, air, vacuum and steam needle valve fittings shall have stainless steel replaceable floating cone that is precision ground and self-centering which shall seat against a stainless steel or Monel renewable valve seat. Action of valve shall be slow compression for fine control under pressure up to 150 psi (1.03 MPa) and shall have subject-to-wear parts easily replaceable. Provide pressure regulators designed for use with the appropriate service at locations indicated on the Laboratory Furnishing drawings. Needle valves for natural (laboratory) gas service shall be certified for use with natural gas by the Canadian Standards Association under ANSI Z21.15-1997/CGA9.1-M97. Needle valves in fume hoods shall be mounted on the front panel of the fume hood, with all components subject to wear accessible from the exterior face of the hood.
1. Provide needle valve for Nitrogen gas valve locations.

G. Laboratory Ball Valves: Suitable for laboratory gas, air and vacuum and be supplied fully assembled and factory tested at 125 psi (0.86 MPa) air pressure. Ball valves shall be of quarter-turn (closed to fully open) design, be fitted with lever handle requiring less than 5 lbf (22 N) force to operate, and shall have subject-to-wear parts easily replaceable. Ball valves for natural (laboratory) gas service shall be certified for use with natural gas by the Canadian Standards Association under ANSI Z21.15-1997/CGA9.1-M97.

H. High Purity Water Valves: Suitable for purified water and provided with polypropylene liner. Valve stem and bonnet shall be brass.

I. All goosenecks shall have a separate outlet coupling with a 3/8" IPS female thread securely brazed to the gooseneck for attachment of serrated hose ends. Provide in line vacuum breaker on each gooseneck.

J. Service Fitting Color Index:

Service Name	Disc Color	Letters	Letter Color
Lab Air	Orange	AIR	Black
Compressed Air	Orange	AIR60,90,100	White
Gas	Dark Blue	GAS	White
Vacuum	Yellow	VAC	Black
Industrial Cold Water	Dark Green	ICW	White
Industrial Hot Water	Red	IHW	White
Cold Water (Potable)	Dark Green	CW	White
Hot Water (Potable)	Red	HW	White
High Purity Water	White	DI	Black
Argon	Violet	AR	White
Nitrogen	Brown	N2	White
Carbon Dioxide	Pink	CO2	Black
Helium	Black	HE	White
Oxygen	Light Green	O2	Black
CWS/R	Green	CWS/CWR	Black
Steam	Black	STM	White
Sea Water	Dark Green	SEAWAT	White
Cylinder Gas	Light Blue	CYL GAS	Black

K. Service wall box locations in labs to have turret style valves. See Plumbing drawings for type and location.

L. Safety Shower/Eye Station:

1. Safety shower/eye wash compliant with the requirements of the Americans with Disabilities Act. Provide barrier free safety station. This station is a combination eye/face wash and stay open drench shower unit. The spray-type outlet heads shall deliver a soft, wide, high volume spray of water. Barrier free recessed wall mounted station. Stainless steel cabinet with coated lever.

2. Provide Bradley Safety Shower #S19-315BF or approved equal.

   a. Emergency Shower
      1) Shower must provide 20 gallons of water per minute.
      2) At 60 inches above the floor the water pattern must be 20 inches in diameter.
      3) A 1-inch IPS chrome plated brass ball valve shall provide a minimum of 20 GPM flow. A stay open feature must be provided to permit hands-free operation to allow the user to disrobe while flushing contaminants.
      4) The actuating device must be sized and easily located and grasped during an emergency. Maximum height for forward reach is 48 inches. Components shall be corrosion resistant.
      5) Head room clearance for all other traffic shall be 80 inches minimum.
      6) A safety green emergency shower sign must be included with this unit. The sign shall comply with ANSI Z535.1-535.5.

M. Deck Mounted Eye Wash:

1. Deck mounted Eye/Face wash for mounting on deck. Spray heads swing down from storage position activating water flow. Mount to deck at counter sink as indicated. Provide head configuration to minimize obstructions at sink. Each spray head to have flip top dust cover. Spray head assembly to be ½" IPS plug type valve with Teflon coated O-ring seals. Supply is ½" NPT male inlet. Construction is to be polished chrome plated brass.

2. Provide Watersaver FE779.

2.3 ELECTRICAL FIXTURES

A. Electrical Pedestal Boxes:

1. Electrical pedestal boxes, similar to Watersaver E800, shall be cast aluminum with an integral base. Pedestal boxes shall be machined for both standard and ground fault receptacles, and shall be furnished complete with a grounding screw, mounting shank, locknut and washer. Underwriter's Laboratories (UL) shall certify all electrical pedestal boxes under Standard UL514A.
2. Outlets to be black.
3. Surfaces to have a:
   a. Satin aluminum finish.

B. Electrical Raceway:

1. The raceway, similar to Wiremold Series 3000 two compartment style for electrical and data distribution, shall be a two piece design with a metal base and a snap-on metal cover. The base and cover sections shall be a minimum of 0.040 inches wall thickness. Assembled base and cover shall be nominal 2.75 inches wide by 1.53 inches high with a cross sectional area of nominal 3.51 square inches. The base section shall be available in 10 foot lengths and the cover section in 5 foot and 10 foot lengths, or custom lengths as required on drawings.
2. Color shall be:

   a. Color to match steel components of laboratory casework.

3. Raceway fittings: A full compliment of fittings must be available including but not limited to flat, internal and external elbows, tees, entrance fittings, wire clips, cover clips, couplings, support clips, c-hangers and end caps. The fittings shall be color to match the raceway. All fittings shall be supplied with a base where applicable to eliminate mitering.
4. Device brackets and plates: Device brackets shall be available for mounting standard single or two gang devices within the raceway. Devices shall have the capacity of mounting flush or in conjunction with standard faceplates. Circuit breaker housings shall be available to mount from one to three pole circuit breakers inline to the raceway.
5. Device and utility boxes: A two gang device box shall be available to accommodate extra deep devices. The device box shall be a total height of 2.75 inches. A 6.38 inches square by .88 inches high utility box shall be available and may be used as a tee, cross, junction box, or for branch circuit extensions.
6. Provide as shown on drawings.

2.4 SINKS

A. Epoxy Sinks:

1. Manufacturers: Laboratory Tops, Inc.; The Durcon Company; Epoxyn Products; or equal. Provide as shown on drawings.

2. Description: Integrally molded from modified thermosetting epoxy resin, and oven cured, .75 radius for under mount. Nominal wall thickness of 1/2 inch (12mm) with all interior corners coved to 1-1/2 inch (36mm) drop in, radius and bottoms pitched to the outlet opening. Drop in has 1-1/2 radius, under mount has 3/4 radius.
3. Undermount sinks: Provide as shown on drawings.

   a. Sink drains will be located in the rear corner of the sink unless designated otherwise on drawings.

b. Sink shall be installed from underside of countertop.

c. Sink Supports: Provide to support sinks.

1) Cabinet sinks: Support sinks on 11 gauge, adjustable 1 inch x 2 inch x 1 inch channel with reagent resistant finish. Provide two channels across width of cabinet, attached to 3/8" diameter threaded hanger rods.

2) Table sinks: Support sinks on 2 inches wide, U-shaped steel straps screwed to cross rails. Straps shall be 1/4 inch thick; 1/2 inch thick for sinks over 250 sq. in. Area. Straps shall have reagent resistant finish.

3) Joint to be caulked between top and sink with non-hardening mastic.

d. Sink installation by Division 15.

4. Sink Color: black
5. Sink outlets:

a. Sink outlets shall accommodate a plastic disc strainer. Provide outlet with 1.42 inch outlet opening and open-end overflow standpipe. Outlet flange to be sloped and radiused to the opening for proper outlet drainage. Overflow to be at least 2 inches shorter than depth of sink. Installation and traps by Division 15.

b. Tailpiece and Strainer: Provide with tailpiece and perforated strainer. Traps by Division 15.

c. Installation by Division 15.

2.5 SNORKLE EXHAUST EXRACTOR

A. Extractor:

1. Ceiling mounted extractor by Movex, Inc. or equal.
2. Model: “Standard” MET with polypropylene joints and aluminum tubes.
3. Surfaces to have a Satin aluminum finish.
4. Ceiling mounting bracket consisting of square anodized aluminum tube that acts as duct to above ceiling.
5. Dome hood MEK-350-75 PP
6. Connect to exhaust provided as part of Division 15 work.

2.6 GAS SAFETY CABINET

A. Manufacturers: Products which comply with this specification may be provided by one of the following manufacturers.

1. Spectra Gases, Inc.
2. Applied Energy Systems, Inc.
3. Praxair, Inc.
4. Scott Specialty Gases, Inc.

B. Gas Safety Cabinet:

1. Purpose designed cylinder gas system cabinet with space for systems that provide precise control and purge gas cylinder for total purging capability.

2. Fire protection:

a. UL approved sprinkler system components.
b. UV/IR detector for automatic shutdown controller (Flammable and Pyrophoric gases only.)

3. Door: Full-height, self-closing and self-latching door with louvered air intake located at bottom.
4. Window: 1-hour fire rated approved, 1/4-inch wire reinforced safety glass.
5. Cabinet shall be seismically braced. Individual cylinders shall be braced to cabinet.

6. Door Lock: Cabinet shall be equipped with a keyed lock. All gas safety cabinets shall be keyed alike. Furnish two sets of keys for each cabinet.
7. Codes and standards: Cabinet shall comply with national and local building and fire codes and OSHA, NFPA, and SEMI standard requirements for the safe handling of hazardous gases.
8. Venting: Provide 6-inch diameter duct exhaust collar for connection to exhaust duct system. Connection to exhaust duct system shall be by Division 15 contractor.

PART 3 - EXECUTION

3.1 PACKAGING AND DELIVERY

A. Delivery all fittings and fixtures to jobsite in recommended packaging, with each fitting individually packaged, marked and scheduled for point of use.

B. Inventory fittings, at jobsite, verify that type and quantity are correct prior to distributing to the appropriate trade/subcontractor for storage and installation.

C. Store in clean, dry location.

END OF SECTION 12310

SECTION 12345 – STEEL LABORATORY CASEWORK AND RELATED PRODUCTS

PART 1 — GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY AND SCOPE

A. Section Includes:

1. Kewaunee Scientific Corporation, RESEARCH COLLECTION Laboratory Furniture - Furnish all cabinets and casework, including tops, ledges, supporting structures. Include delivery to the building, set in place, level, and scribe to walls and floors as required. Furnish and install all filler panels, knee space panels and scribes as shown on drawings.

2. Furnish and deliver all utility service outlet accessory fittings, electrical receptacles and switches identified on drawings as mounted on the laboratory furniture. All plumbing and electrical fittings, not preinstalled in equipment, will be packaged separately and properly marked for delivery to the appropriate contractor.

3. Furnish and deliver, for installation by the mechanical contractor, all laboratory sinks, cup sinks or drains, drain troughs, overflows and sink outlets with integral tailpieces, which occur above the floor, and where these items are part of the equipment. All tailpieces shall be furnished less the couplings required to connect them to the drain piping system.

4. Furnish service strip supports where specified, and setting in place service tunnels, service turrets, supporting structures and reagent racks of the type shown on the drawings.

5. Removal of all debris, dirt and rubbish accumulated as a result of the installation of the laboratory furniture to an onsite container provided by others, leaving the premises broom clean and orderly.

B. Related Divisions:
1. Divisions 5, 6, &9: Behind-the-Wall Blocking and Studs
2. Division 9: Base Molding
3. Division 11: Chemical Fume Hoods
4. Division 15: Plumbing
5. Division 16: Electrical Fittings and Connections

C. Related Publications:
1. SEFA 3 – Scientific Equipment and Furniture Association
2. SEFA 8 - Scientific Equipment and Furniture Association
3. NFPA 30 - National Fire Protection Association
4. NFPA-45 - National Fire Protection Association
5. UL - Underwriters Laboratories
6. ASTM D522 - Bending Test

1.3 BASIS OF WORK

A. It is the intent of this specification to use Kewaunee Scientific Corporation, RESEARCH COLLECTION Laboratory Furniture as the standard of construction for steel laboratory furniture. The construction standards of this product line shall provide the basis for quality and functional installation.

B. Supply all equipment in accordance with this specification. The offering of a product differing in materials and construction from this specification requires written approval from the owner/architect. This approval must be obtained in accordance with requirements of Division 0 and Division 1 in this Specification. Procedures for

obtaining approval for an alternate manufacturer are defined in Section 00445 – Substitution Request in this specification. In addition to the requirements of Section 00445 any alternative manufacturer shall provide the following materials for evaluation by the Architect/Owner for consideration:

1. Samples: Samples from non-specified manufacturers will be required and reviewed per specification. Samples shall be delivered, at no cost to the architect or owner to a destination set forth by the architect or owner. This must be done seven (7) days before quotation deadline as a condition of approval of each bidder. Samples shall be full size, production type samples. Miniature, or "Show Room" type samples are not acceptable. Furnish the following:
    1. One 18” combination (1) drawer and (1) cupboard base unit showing complete construction details, including (1) shelf.
    2. One 36” acid storage base cabinet typical of specified elevations.
    3. One sample of all top materials shown or called for, of sufficient size to perform finish requirement tests.
    4. Sample of all mechanical service fittings, locks, door pulls, hinges, and interior hardware.

C. Any additional manufacturers that are approved based upon a submittal as part of a Substitution Request will be listed in an Addendum issued prior to receipt of bids or proposals. Any proposal including a manufacturer that is not listed herein or added by Addendum shall be considered non-responsive and will not be considered.

D. Participants in the quotation process have the option of clarifying deviations to the specified design, construction, or materials. Without such clarifications, sealed quotations to the owner or owner representative will be construed as being in total conformance to the requirements of the specification.

E. The owner / owner representative reserves the right to reject qualified or alternate proposals and to award based on product value where such action assures the owner greater integrity of product.

1.4 QUALITY ASSURANCE

A. The steel laboratory furniture contractor shall also provide worktops and fume hoods all manufactured or shipped from the same geographic location to assure proper staging, shipment and single source responsibility.

B. General Performance: Provide certification that furniture shall meet the performance requirements described in SEFA 8.

1.5 SUBMITTALS

A. Manufacturer's Data: Submit manufacturer's data and installation instructions for each type of casework. Provide data indicating compliance with SEFA 8.

B. Samples: Samples shall be delivered, at no cost to the architect or owner to a destination set forth by the architect or owner. Samples shall be full size, production type samples. Miniature, or "Show Room" type samples are not acceptable. Furnish the following:
    1. One 18” combination (1) drawer and (1) cupboard base unit and upper cabinet showing complete construction details, including (1) shelf.
    2. One 36” acid storage base cabinet typical of specified elevations.
    3. One sample of all top materials shown or called for, of sufficient size to perform finish requirement tests.
    4. Sample of all mechanical service fittings, locks, door pulls, hinges, and interior hardware.

C. Shop Drawings: Submit shop drawings for furniture assemblies showing plans, elevations, ends, cross-sections, service run spaces, location and type of service fittings.
    1. Coordinate shop drawings with other work involved.
    2. Provide roughing-in drawings for mechanical and electrical services when required.

PART 2 — PRODUCTS

2.1 MANUFACTURERS

A. The basis of this specification is steel casework manufactured according to the standards used by Kewaunee Scientific Corporation, 2700 Front Street, Statesville, North Carolina. The specified design is Research Collection. All laboratory equipment covered by the specification shall be the product of one manufacturer and be fabricated at one geographic location to assure shipping continuity and single-source responsibility. All quotations from a

manufacturer other than Kewaunee Scientific Corporation shall contain a review of the following capabilities:

1. List of shop facilities
2. List of engineering and manufacturing personnel
3. Proof of financial ability to fulfill the contract
4. List of a minimum of ten (10) installations over the last five (5) years of comparable scope
5. Proof of project management and installation capabilities
6. SEFA member in Good Standing.

B. The selected manufacturer must warrant for a period of one-year starting (date of acceptance or occupancy, whichever comes first) that all products sold under the contract referenced above shall be free from defects in material and workmanship. Purchaser shall notify the manufacturer's representative immediately of any defective product. The manufacturer shall have a reasonable opportunity to inspect the goods. The purchaser shall return no product until receipt by purchaser of written shipping instructions from the manufacturer.

C. The architect will retain the above samples of the successful manufacturer or owner to insure that material delivered to jobsite conforms in every respect to the samples submitted.

2.2 CABINET STYLE: Steel: Cabinet bodies, drawer bodies, shelves, drawer heads and door assemblies shall be fabricated from Cold Rolled Steel. Kewaunee Steel Cabinet Style -11: Square Edge Full Overlay.

2.3 DRAWER AND DOOR STYLE:

A. Trademark - Overlay – 11 - The outer drawer and door head shall have a channel formation on all four sides to eliminate sharp raw edges of steel and the top front corners shall be welded and ground smooth. Drawer and door, when closed, shall rest against face of cabinet shell, creating a ¾" overlay front with 1/8" reveal, and with optional pull.

2.4 MATERIALS

A. General Requirements: It is the intent of this specification to provide a high quality steel cabinet specifically designed for the laboratory environment.

B. Steel:

1. Cold Rolled Steel: Cold rolled sheet steel shall be prime grade 12, 14, 16, 18 and 20 gauge U.S. Standard; roller leveled, and shall be treated at the mill to be free of scale, ragged edges, deep scratches or other injurious effects.

C. Glass:

1. Glass used for framed sliding and swinging doors shall be 1/8" float glass. Glass used for unframed sliding doors, shall be 1/4" float glass. Glass used in fume hoods or other hazardous locations shall be 7/32" laminated safety float glass, except the glass shielding fluorescent lights in fume hoods shall be tempered glass to provide greater resistance to heat and impact.

D. Hardware and Trim:

1. Drawer and Door Pulls: Square Aluminum– 8 – Pull shall be of modern design, offering a comfortable handgrip, and be securely fastened to doors and drawers with screws. All pulls shall be satin finish aluminum, with a clear, lacquer finish. Two pulls shall be required on all drawers over 24" long. Use of plastic pulls (molded or extruded), or a design not compatible for usage by the handicapped will not be acceptable.
2. Sliding Door Pulls: Flush pulls for sliding doors shall be aluminum, with clear, lacquer finish, providing a recessed finger grip. Finger holes or slots machined into doors will not be acceptable.
3. Hinges: Hinges shall be made of Type 304 stainless steel .089 thick, 2-1/2" high, with brushed satin finish, and shall be the institutional type with a five-knuckle bullet-type barrel. Hinges shall be attached to both door and case with two screws through each leaf. Welding of hinges to door or case will not be accepted. Doors under 36" in height shall be hung on one pair of hinges, and doors over 36" high shall be hung on 3 hinges.
4. Locks: Disk Tumbler: Locks when shown or called for shall be a 5-disc tumbler with heavy duty interchangeable cylinder. Exposed lock noses shall be dull nickel (satin) plated and stamped with identifying

numbers. Locks shall have capacity for 2000 primary key changes. Master key one level with the potential of 10 different, non-interchangeable master key groups.

5. Positive Catch: A two-piece heavy-duty cam action positive catch shall be provided on all base cupboard doors and shall be positioned near the pivoting edge of door to provide a clean unobstructed opening. Main body of the catch shall be confined within an integral cabinet divider rail, while latching post shall be mounted on the hinge side of door. Nylon roller type catches are not acceptable.
6. Elbow Catches: Elbow catches and strike plates shall be used on left hand doors of double door cases where locks are used, and are to be burnished cast aluminum, with bright brass finish.
7. Shelf Adjustment Clips: Shelf adjustment clips shall be nickel-plated steel.
8. Leg Shoes: Leg shoes shall be provided on all table legs, unless otherwise specified, to conceal leveling device. Shoes shall be a pliable, black vinyl material. Use of a leg shoe, which does not conceal leveling device, will not be acceptable.
9. Base Molding: Base molding shall be provided by others.
10. Support Rods, Upright Rod Assemblies and Rod Sockets: Upright rods, cross rods and ring support rods, where specified, shall be anodized Duralumin (2" or 3/4" dia., as required). Rod sockets shall be chrome-plated brass, secured through tabletops with lock nut and spring washer. Rod clamps shall be heavy duty, designed to securely hold rod assembly in any position. Use of wood rod assemblies will not be accepted.
11. Label Holders: Label holders, where shown or called for, shall be self adhesive type aluminum with satin finish and designed for 2-1/2" x 1-1/8" cards, unless otherwise specified.
12. Number Plates: Number plates, where shown or called for, shall be self-adhesive type aluminum with indented black lettering.
13. Sink Supports: Sink supports shall be the hanger type, suspended from top front and top rear horizontal rails of sink cabinet by four 1/4" dia. rods, threaded at bottom end and offset at top to hang from two full length reinforcements welded to the front and rear top rails. Two 3/4" x 1-2/2" x 12 gauge channels shall be hung on the threaded rods to provide an adjustable sink cradle for supporting sinks. When sink capacity exceeds 3,750 cu. in., the sink supports shall be suspended from full-length reinforcements welded to the two end rails. Two 1" x 2" x 10 gauge full-length channels shall be hung from the four 1/4" dia. rods to provide an alternate sink cradle.
14. Support Struts: Support struts shall consist of two 16 gauge channel uprights fastened top and bottom by two adjustable "U" shaped spreaders, each 12 gauge, 1-1/2" x length required formed from galvanized steel. Struts shall be furnished to support drain troughs, and to support worktop at plumbing space under fume hood superstructures or other heavy loads. Support struts can be furnished with hangers at extra cost when specified, to support mechanical service piping and drain lines.

2.5 CONSTRUCTION

A. Steel Base Cabinet Construction:

1. General:

   a) The steel furniture shall be of modern design and shall be constructed in accordance with the best practices of the Scientific Laboratory Equipment Industry. First class quality casework shall be insured by the use of proper machinery, tools, dies, fixtures and skilled workmanship to meet the intended quality and quantity for the project.
   b) All cabinet bodies shall be flush front construction with intersection of vertical and horizontal case members, such as end panels, top rails, bottoms and vertical posts in same plane without overlap. Exterior corners shall be spot welded with heavy back up reinforcement at exterior corners. All face joints shall be welded and ground smooth to provide a continuous flat plane.
   c) Each cabinet shall be complete so that units can be relocated at any subsequent time without requiring field application of finished ends or other such parts.
   d) Case openings shall be rabbeted on all four sides for both hinged and sliding doors to provide a dust resistant case.
   e) All cabinets shall have a cleanable smooth interior. Bottom edges shall be formed down on sides and back to create easily cleanable corners with no burrs or sharp edges, and front edge shall be offset to create a seamless drawer and door recess rabbet for dust stop.

2. Steel Gauges: Gauges of steel used in construction of cases shall be 18 gauge, except as follows:

   a) Corner gussets for leveling bolts and apron corner braces, 12 gauge.
   b) Case and drawer suspension channels, 14 gauge.
   c) Top and intermediate front horizontal rails, table aprons, hinge reinforcements, and reinforcement gussets, 16 gauge.
   d) Drawer assemblies, door assemblies, bottom, bottom back rail, toe space rail, and adjustable shelves,

20 gauge.

3. Base Cabinets:

a) End uprights shall be formed into not less than a channel formation at top, bottom, back and front. The front edge shall further offset to form a strike for doors and drawers, and shall be perforated for the support of drawer channels, intermediate rails and hinge screws. An upright filler shall be screwed in place in all cupboard units to close the back of the channel at front of the upright and to provide a smooth interior for the cupboard to facilitate cleaning. The upright filler shall be perforated with shelf adjustment holes at not more than 2" centers painted prior to assembly. The inside front of the upright shall be further reinforced with a full height 16 gauge hinge reinforcement angle.
b) Top horizontal rail on base cabinets shall interlock within the flange at top of end panels for strength, but shall be flush as face of unit. Top rail shall have a full width rabbet for swinging doors and drawers. Reinforcements shall be provided at all front corners for additional welded strength between vertical and horizontal case members.
c) Intermediate rails shall be provided between doors and drawers, but shall not be provided between drawers unless made necessary by locks in drawers. When required, intermediate rails shall be recessed behind doors and drawer fronts, and designed so that security panels may be added as required.
d) Intermediate vertical uprights shall be furnished to enclose cupboards when used in a unit in combination with a half width bank of drawers. However, to allow storage of large or bulky objects, no upright of any type shall be used at the center of double door cupboard units.
e) Cabinet bottom, and bottom rail shall be formed of one piece of steel except in corner units and shall be formed down on sides and back to create a square edge transition welded to cabinet end panels, and front edge shall be offset to create a seamless drawer and door recess rabbet for dust stop.
f) Toe space rail shall extend up and forward to engage bottom rail to form a smooth surfaced fully enclosed toe space, 3" deep x 5" high. Whenever toe space base is omitted for units to set on building bases on separate steel bases, then the toe space rail shall extend back 4-1/2".
g) Back construction shall consist of a top and bottom rail, channel formed for maximum strength and welded to back and top flange of end uprights, open for access to plumbing lines. Cupboard units only shall be provided with removable back panels.
h) Die formed gussets, with multiple ends for strength, shall be furnished in each bottom corner of base units to insure rigidity, and a 3/8"-16 leveling bolt, 3" long, shall engage a clinch nut in each gusset. Access to the leveling bolts shall be through plug buttons in the bottom pan. Each leveling bolt and gusset shall be capable of supporting 500 lbs. Access to leveling bolts through toe space or leveling bolts requiring special tools to adjust are not acceptable.
i) Adjustable shelves shall be formed down 3/4", returned back 7/8" and up 1/4" into a channel formation front and rear; formed down 3/4" at each end, shelves over 42" long shall be further reinforced with a channel formation welded to underside of shelf.
j) Drawer bodies shall be made in one-piece construction including the bottom, two sides, back and front. They shall be fully coved at interior bottom on all four sides for easy cleaning. The top front of the inner drawer body shall be offset to interlock with the channel formation in drawer head providing a 3/4" thick drawer head.
k) Drawer suspension assembly shall consist of 2 sections providing a quiet, smooth operation on ball bearing nylon rollers. All drawers shall be self-closing from a point 5" open. Cabinet channels shall maintain alignment of drawer and provide an integral drawer stop, but the drawer shall be removable without the use of tools. Drawers shall provide 13-5/8" front to back clearance when fully extended. Drawers shall rise when opened thus avoiding friction with lower drawers and/or doors. Drawer suspension system shall incorporate a double stop, lock open feature. Case suspension channels shall be Galvanized Steel, drawer suspension channels shall be Cold Rolled Steel. Drawer suspension channels on Stainless Steel Cabinets shall be zinc plated after they are formed.
l) Steel Door assembly (two-piece) for solid pan swinging doors shall consist of an inner and outer door pan. Outer door pan shall be formed at all four sides. The corners on the pull side of the outer door pan shall be welded and ground smooth to prevent exposure of sharp edges of steel at these critical points. Inner door pan shall be flanged at all four sides with hinge reinforcements welded in place. The door assembly shall be 3/4" thick and contains sound deadening material.
m) Steel Drawer/door assemblies shall be painted prior to assembly. Both shall be punched for attaching drawer pulls. Likewise, inner pan formation of door and drawer body shall be indented for in-field installation of locks when required.
n) Doors shall be readily removable and hinges easily replaceable. Hinges shall be applied to the cabinet and door with screws. Welding of hinges to either cabinet or door will not be acceptable.
o) Knee space panels, where shown or specified, shall be 20 gauge, finished same as casework cabinets,

and easily removable for access to mechanical service areas.

B. Special Purpose Storage Cabinets:

1. Acid Storage Fume Hood Cabinets: Acid storage fume hood cabinets shall utilize the same gauges of steel and construction features as other base cabinets except they shall be completely lined with a one piece Polyethylene corrosion resistant liner. The liner shall be 1/4" thick, molded into a seamless tub, including top, sides and bottom, with a 1" lip at the bottom front to contain spills. Each door shall have a set of louvers at the top and bottom, and have a 1/8" sheet polyethylene liner. Where specified, each cabinet shall be vented into the fume hood with a 1-1/2" vent pipe. It should provide a positive airflow directly into the fume hood exhaust system. Where specified or shown on drawings, supply an epoxy coated wire shelf supported by integral brackets built into the Polyethylene liner.

2. Solvent Storage Cabinets: Solvent storage cabinets shall be specifically designed for the storage of flammable and combustible liquids. Construction shall be based upon the requirements listed by UFC, OSHA and NFPA No. 30 - 1993, and cabinets shall be FM approved and labeled. The bottoms, top, sides and doors shall be fabricated of 18" gauge steel and shall be all double panel construction with a 1-1/2" air space between panels. All joints shall be welded, or screwed, to provide a rigid enclosure. The doors shall swing on full-length stainless steel piano hinges and shall be fully insulated. The doors are self-closing and synchronized so that both doors will always fully close. The right hand door is equipped with a three-point latching system that automatically engages when the doors close. Each door is equipped with a fusible-link hold-open feature that will ensure the door closes should the temperature outside the cabinet exceed 165 degrees Fahrenheit. Units 24" long have only one door, self-closing, and equipped with a three-point latching system and hold-open feature. A 2" deep liquid tight pan that covers the entire bottom of the cabinet shall be furnished to contain liquid leaks and spills. A full-depth adjustable shelf is also provided. The shelf is perforated to allow air circulation within the cabinet. Two diametrically opposed vents with spark screens are provided in the back of the cabinet as well as a grounding screw. The cabinet shall have interior finish same as exterior. The cabinet shall be labeled: "FLAMMABLE - KEEP FIRE AWAY".

3. Vacuum Pump Storage Base Cabinets: Vacuum Pump Storage Cabinet shall be specifically designed for storing equipment within cabinet. Cabinet shall not have bottom to allow equipment to be rolled in and out over flush finished floor material. Interior surfaces shall be lined with 1” thick neoprene foam for sound deadening and ease of cleaning. Toe space at cabinet doors shall be integral with doors. Provide one (1) 120VAC-20AMP duplex receptacle at back of cabinet with pilot lighted toggle switch mounted on front top rail. Provide 1-1/2” PVC vent out back to above.

C. Upper Cabinet Construction (Steel Swinging Door, Steel/Glass Swinging Door, Open) :

1. Swinging door and open storage cabinets shall have a completely finished interior same as exterior.
2. End uprights shall be formed at the front in a 1" channel formation with the inside flange formed to provide a 31/32" x 1/2" door recess. The back of the upright shall be formed to a 2-1/2" formation. A 16 gauge hinge reinforcement, same as specified for BASE CABINETS, shall be welded to inner side of front uprights.
3. Cabinet tops shall be formed into a 1" x 1-3/16" channel shape at front, with a 31/32" x 1/2″ offset for door recess, and with flange at rear and sides for electro-welding cabinet top to cabinet back and ends.
4. Cabinet flush bottoms shall be formed with a 1" wide front fascia and a 13/16" channel shape formation at front edge flanged back and up to create a door recess rabbet for dust stop.
5. Cabinet backs shall be welded to the top, bottom and ends. Backs shall be perforated for shelf adjustment holes on not more than 1" centers. Holes shall be set in a channel formation in cabinet back and enclosed by end uprights.
6. Adjustable shelves shall be formed down 3/4", returned back 7/8" and up 1/4" into a channel formation front and rear, formed down 3/4" at each end, shelves over 42" long shall be further reinforced with a channel formation welded to underside of shelf.
7. Glazed swinging doors shall be 3/4” thick and consist of an inner and outer door pan welded to form a single unit. Outer door pan shall be 18 gauge steel, formed into a channel or flanged shape at all four sides. It shall be pierced and formed to create a 3” wide frame with a beveled edge around the glass opening in the center of the door. Inner door pan shall be 18 gauge steel, flanged at all four sides, pierced for a glass opening in center of the door, with 16 gauge hinge reinforcements welded in place. Doors shall be glazed with 1/8” float glass, held in place by a rubber or vinyl gasket around the entire edge of the glass. Outer door pan shall be pierced for a recessed flush pull, as described under HARDWARE.
8. Door assembly (two-piece) for solid panel swinging doors shall consist of an inner and outer door pan. Outer door pan shall be formed into a channel or flanged shape at all four sides. The corners on the pull side of the

outer door pan shall be welded and ground smooth to prevent exposure of sharp edges of steel at these critical points. Inner door pan shall be flanged at all four sides with hinge reinforcements welded in place. The door assembly shall be 3/4" thick and contains sound deadening material.

D. Steel Free Standing and Wall Supported Table Construction:

1. In general, freestanding tables and/or apron and leg assemblies consist of welded leg assemblies connected to aprons by mechanical fasteners.
2. Table apron rails shall be formed of 16-gauge steel. The rails shall be 4" high, formed top and bottom into a 1.844" wide channel formation with 3/8" high return. Where drawers occur, the apron rails shall provide the required opening.
3. Table legs shall be 2" square welded tubing. Securely welded to bottom end shall be a 14-gauge die formed gusset with four flanges. A threaded clinch nut shall accommodate a 3/8" 16 x 2-1/2" long adjustment bolt.
4. Stretchers shall be constructed of 18-gauge steel and furnished where indicated on drawings. They shall be formed into a 2-7/64" x 1-1/2" channel formation, and secured to table legs by a die-formed clip of 16-gauge steel. Clips shall be welded at ends of channel.
5. Wall supported tables shall have brackets and backing installed in framed walls as required to support cantilevered arms to support steel table aprons and countertops as indicated. Coordinate any backing required or provide brackets and attachments to framing installer for installation at time of frame erection.
6. Table tops shall be as indicated on drawing and by specifications, and all clips, screws and parts for fastening top to apron, shall be provided with apron section. Leg shoes for table legs shall be furnished with leg assembly.

E. Miscellaneous Equipment Supports, Racks, Shelving and Enclosures

1. Center Bench Shelving Assemblies: Shelving support assemblies consist of four uprights with slots on 1” centers and a top frame. Field fasten to countertop material as required. Provide Shelving Assembly Support Struts as required for shelving application indicated. Provide 11 gauge steel shelf brackets and 1” thick, formed 16 gauge cold rolled steel painted shelves as indicated.
2. Pegboards (Drying Rack): Kemresin pegboard with ½” diameter, 5” long black polypropylene pegs with drip trough where indicated. Size as indicated.
3. Pipe Enclosures: Cold rolled steel painted to match cabinets to conceal vertical service lines coming down from ceiling to worksurface. One side to be removable for access with no exposed fasteners. Enclosure to sit on top of counter curb and extend full height to penetrate ceiling.

2.6 PERFORMANCE REQUIREMENTS

A. Steel Casework Construction Performance:
1. Base cabinets shall be constructed to support at least a uniformly distributed load 200 lbs. per square foot of cabinet top area, including working surface without objectionable distortion of interference with door and drawer operation.
2. Base cabinet corner gussets with leveling bolts shall support 500 lbs. per corner, at 1-1/2" projection of the leveling bolt below the gusset.
3. Each adjustable and fixed shelf 4 ft. or shorter in length shall support an evenly distributed load of 40 lbs. per square ft. up to a maximum of 200 lbs., with nominal temporary deflection, but without permanent set.
4. Drawer construction and performance shall allow 13-5/8" clear when in an extended position and suspension system shall prevent friction contact with any other drawer or door during opening or closing. All drawers shall operate smoothly, a minimum of 10,000 cycles with an evenly distributed load of 150 lbs.
5. Swinging doors on floor-mounted casework shall support 200 lbs. suspended at a point 12" from hinged side, with door swung through an arc of 160 degrees. Weight load test shall allow only a temporary deflection, without permanent distortion or twist. Door shall operate freely after test and assume a flat plane in a closed position.

B. Steel Paint System Finish and Performance Specification:
1. Steel Paint System Finish: After Cold Rolled Steel component parts have been completely welded together and before finishing, they shall be given a pre-paint treatment to provide excellent adhesion of the finish system to the steel and to aid in the prevention of corrosion. Physical and chemical cleaning of the steel shall be accomplished by washing with an alkaline cleaner, followed by a spray treatment with a complex metallic phosphate solution to provide a uniform fine grained crystalline phosphate surface that shall provide both an excellent bond for the finish and enhance the protection provided by the finish against humidity and corrosive chemicals. After the phosphate treatment, the steel shall be dried and all steel surfaces shall be

coated with a chemical and corrosion-resistant, environmentally friendly, electrostatically applied powder coat finish. All components shall be individually painted, insuring that no area be vulnerable to corrosion due to lack of paint coverage. The coating shall then be cured by baking at elevated temperatures to provide maximum properties of corrosion and wear resistance. The completed finish system in standard colors shall meet the performance test requirements specified under PERFORMANCE TEST RESULTS.

2. Performance Test Results (Chemical Spot Tests):

   a. Testing Procedure: Chemical spot tests for non-volatile chemicals shall be made by applying 5 drops of each reagent to the surface to be tested and covering with a 1-1/4" dia. watch glass, convex side down to confine the reagent. Spot tests of volatile chemicals shall be tested by placing a cotton ball saturated with reagent on the surface to be tested and covering with an inverted 2-ounce wide mouth bottle to retard evaporation. All spot tests shall be conducted in such a manner that the test surface is kept wet throughout the entire test period, and at a temperature of 77° ±3° F. For both methods, leave the reagents on the panel for a period of one hour. At the end of the test period, the reagents shall be flushed from the surface with water, and the surface scrubbed with a soft bristle brush under running water, rinsed and dried. Volatile solvent test areas shall be cleaned with a cotton swab soaked in the solvent used on the test area. Immediately prior to evaluation, 16 to 24 hours after the reagents are removed, the test surface shall be scrubbed with a damp paper towel and dried with paper towels.
   b. Test Evaluation: Evaluation shall be based on the following rating system.

      Level 0 – No detectable change.
      Level 1 – Slight change in color or gloss.
      Level 2 – Slight surface etching or severe staining.
      Level 3 – Pitting, cratering, swelling, or erosion of coating. Obvious and significant deterioration.

      After testing, panel shall show no more than three (3) Level 3 conditions.

   c. Test Reagents

Test No.	Chemical Reagent	Test Method
1.	Acetate, Amyl	Cotton ball & bottle
2.	Acetate, Ethyl	Cotton ball & bottle
3.	Acetic Acid, 98%	Watch glass
4.	Acetone	Cotton ball & bottle
5.	Acid Dichromate, 5%	Watch glass
6.	Alcohol, Butyl	Cotton ball & bottle
7.	Alcohol, Ethyl	Cotton ball & bottle
8.	Alcohol, Methyl	Cotton ball & bottle
9.	Ammonium Hydroxide, 28%	Watch glass
10.	Benzene	Cotton ball & bottle
11.	Carbon Tetrachloride	Cotton ball & bottle
12.	Chloroform	Cotton ball & bottle
13.	Chromic Acid, 60%	Watch glass
14.	Cresol	Cotton ball & bottle
15.	Dichlor Acetic Acid	Cotton ball & bottle
16.	Dimethylformanide	Cotton ball & bottle
17.	Dioxane	Cotton ball & bottle
18.	Ethyl Ether	Cotton ball & bottle
19.	Formaldehyde, 37%	Cotton ball & bottle
20.	Formic Acid, 90%	Watch glass
21.	Furfural	Cotton ball & bottle
22.	Gasoline	Cotton ball & bottle
23.	Hydrochloric Acid, 37%	Watch glass
24.	Hydrofluoric Acid, 48%	Watch glass
25.	Hydrogen Peroxide, 3%	Watch glass
26.	Iodine, Tincture of	Watch glass
27.	Methyl Ethyl Ketone	Cotton ball & bottle
28.	Methylene Cloride	Cotton ball & bottle
29.	Mono Chlorobenzene	Cotton ball & bottle
30.	Naphthalene	Cotton ball & bottle
31.	Nitric Acid, 20%	Watch glass

32.	Nitric Acid, 30%	Watch glass
33.	Nitric Acid, 70%	Watch glass
34.	Phenol, 90%	Cotton ball & bottle
35.	Phosphoric Acid, 85%	Watch glass
36.	Silver Nitrate, Saturated	Watch glass
37.	Sodium Hydroxide, 10%	Watch glass
38.	Sodium Hydroxide, 20%	Watch glass
39.	Sodium Hydroxide, 40%	Watch glass
40.	Sodium Hydroxide, Flake	Watch glass
41.	Sodium Sulfide, Saturated	Watch glass
42.	Sulfuric Acid, 33%	Watch glass
43.	Sulfuric Acid, 77%	Watch glass
44.	Sulfuric Acid, 96%	Watch glass
45.	Sulfuric Acid, 77% and Nitric Acid, 70%, equal parts	Watch glass
46.	Toluene	Cotton ball & bottle
47.	Trichloroethylene	Cotton ball & bottle
48.	Xylene	Cotton ball & bottle
49.	Zinc Chloride, Saturated	Watch glass

* Where concentrations are indicated, percentages are by weight.

3. Performance Test Results (Heat Resistance): Hot water (190° F - 205° F) shall be allowed to trickle (with a steady stream at a rate not less than 6 ounces per minute) on the finished surface, which shall be set at an angle of 45° from horizontal, for a period of five minutes. After cooling and wiping dry, the finish shall show no visible effect from the hot water treatment.
4. Performance Test Results (Impact Resistance):A one-pound ball (approximately 2" diameter) shall be dropped from a distance of 12 inches onto the finished surface of steel panel supported underneath by a solid surface. There shall be no evidence of cracks or checks in the finish due to impact upon close eye-ball examination.
5. Performance Test Results (Bending Test): An 18 gauge steel strip, finished as specified, when bent 180^{o} over a 1/2" diameter mandrel, shall show no peeling or flaking off of the finish.
6. Performance Test Results (Adhesion):Ninety or more squares of the test sample shall remain coated after the scratch adhesion test. Two sets of eleven parallel lines 1/16" apart shall be cut with a razor blade to intersect at right angle thus forming a grid of 100 squares. The cuts shall be made just deep enough to go through the coating, but not into the substrate. They shall then be brushed lightly with a soft brush. Examine under 100 foot-candles of illumination. Note: This test is based on ASTM D2197-68, "Standard Method of Test for Adhesion of Organic Coatings".
7. Performance Test Results (Hardness): The test sample shall have a hardness of 4-H using the pencil hardness test. Pencils, regardless of their brand are valued in this way: 8-H is the hardest, and next in order of diminishing hardness are 7-H, 6-H, 5-H, 4-H, 3-H, 2-H, F, HB, B (soft), 2-B, 3-B, 4-B, 5-B (which is the softest). The pencils shall be sharpened on emery paper to a wide sharp edge. Pencils of increasing hardness shall be pushed across the paint film in a chisel-like manner until one is found that will cut or scratch the film. The pencil used before that one-that is, the hardest pencil that will not rupture the film-is then used to express or designate the hardness.

2.7 WORKSURFACES

A. Materials: Provide counter tops of the following materials where indicated
   1. Kemresin Epoxy Resin Tops
   2. Trespa Top Lab ‘Eco-Fibre’

PART 3 — EXECUTION

3.1 SITE EXAMINATION

A. The owner and/or his representative shall assure all building conditions conducive to the installation of a finished goods product; all critical dimensions and conditions previously checked have been adhered to by other contractors (general, mechanical, electrical, etc.) to assure a quality installation.

3.2 INSTALLATION

A. Preparation: Prior to beginning installation of casework, check and verify that no irregularities exist that would affect quality of execution of work specified.

B. Coordination: Coordinate the work of the Section with the schedule and other requirements of other work being prepared in the area at the same time both with regard to mechanical and electrical connections to and in the fume hoods and the general construction work.

C. Performance:

1. Casework:
    1. Set casework components plumb, square, and straight with no distortion and securely anchor to building structure. Shim as required using concealed shims.
    2. Bolt continuous cabinets together with joints flush, tight and uniform, and with alignment of adjacent units within 1/16" tolerance.
    3. Secure wall cabinets to solid supporting material, not to plaster, lath or gypsum board.
    4. Abut top edge surfaces in one true plane. Provide flush joints not to exceed 1/8".

2. Worksurfaces:

    1. Where required due to field conditions, scribe to abutting surfaces.
    2. Only factory prepared field joints, located per approved shop drawings, shall be permitted. Secure the joints in the field, where practical, in the same manner as in the factory.
    3. Secure worksurfaces to casework and equipment components with materials and procedures recommended by the manufacturer.

D. Adjust and Clean:

1. Repair or remove and replace defective work, as directed by owner and/or his representative upon completion of installation.
2. Adjust doors, drawers and other moving or operating parts to function smoothly.
3. Clean shop finished casework; touch up as required.
4. Clean worksurfaces and leave them free of all grease and streaks.
5. Casework to be left broom clean and orderly.

E. Protection:

1. Provide protective measures to prevent casework and equipment from being exposed or damaged by other construction activity.

END OF SECTION

SECTION 12480 - ENTRANCE FLOOR MATS AND FRAMES

Part 1 - General

1.01 Summary

A. This section includes the following types of entrance flooring systems:
1. Floor Mats & Frame Assemblies

B. Related Sections: The following sections contain requirements related to this section:
1. Grouting frames into recess; refer to sections 03300 “Cast-In-Place Concrete”

1.02 References

A. American Society for Testing and Materials (ASTM)

B. The Aluminum Association

C. The Carpet and Rug Institute (CRI)

D. The National Floor Safety Institute (NFSI)

1.03 Submittals

A. General: Submit the following in accordance with conditions of contract and Division 1 specification section 01300.

B. Product data for each type of floor mat and frame specified including manufacturer's specifications and installation instructions.

C. Shop drawings in sufficient detail showing layout of mat and frame specified including details indicating construction relative to materials, direction of traffic, spline locations, profiles, anchors and accessories.

D. Samples for verification purposes: Submit an assembled section of floor mat and frame members with selected tread insert showing each type of color for exposed floor mat, frame and accessories required.

E. Maintenance data in the form of manufacturer's printed instructions for cleaning and maintaining floor mats.

1.04 Quality Assurance

A. Flammability in accordance with ASTM E648, Class I, Critical Radiant Flux, minimum 0.45 watts/m^2

B. Slip resistance in accordance with ASTM D-2047-96, Coefficient of Friction, minimum 0.60 for accessible routes.

C. Standard rolling load performance is 350 lb./wheel with larger loading requirements as specified (load applied to a solid 5” x 2” wide polyurethane wheel, 1000 passes without damage).

D. Single Source Responsibility: Obtain floor mats and frames from one source of a single manufacturer.

E. Utilize superior structural aluminum alloy 6063-T6 for rail components.

1.05 Delivery, Storage and Handling

A. Deliver materials to the project site ready for use and fabricated in as large sections and assemblies as practical, in unopened original factory packaging clearly labeled to identify manufacturer.

1.06 Project Conditions

A. Field measurements: Check actual openings for mats by accurate field measurements before fabrication. Record actual measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid

delay of work.

B. For recess application coordinate frame installation with concrete construction to ensure recess and frame anchorage are accurate and that the base is level and flat. Defer frame installation until building enclosure is complete and related interior finish work is in progress.

Part 2 - Products

2.01 Manufacturers

A. Drawings and specifications are based on manufacturer's literature from Construction Specialties, Inc. unless otherwise indicated. Other manufacturers must comply with the minimum levels of material and detailing indicated on the drawings and specified herein.

2.02 Materials

A. Aluminum - ASTM B 221, alloy 6063-T5, 6063-T6 for extrusions.

B. Tread insert options - refer to section 2.05.

C. Flexible EPDM extrusions.

2.03 Floor Mats

A. Model and Description – M2 Pedimat AA shall be manufactured from 6063-T6 aluminum continuously hinge connected to permit rollback for easy cleaning. Supplied in mill finish (standard).

2.04 Mat Frames – None (NF) Square end vinyl 2” wide at all perimeter.

2.05 Tread Insert Options for M2 Pedimat All Aluminum

A. SAI - Serrated Aluminum Insert shall be extruded 6105-T5 alloy. Available in clear anodized finish only.

Part 3 Execution

3.01 Examination

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

1. Do not proceed until unsatisfactory conditions have been corrected.

3.02 Preparation

A. Manufacturer shall offer assistance and guidance to provide a template of irregular shaped mat assemblies to ensure a proper installation.

3.03 Installation

A. Install the work of this section in strict accordance with the manufacturer's recommendations.

B. Set mat at height recommended by manufacturer for most effective cleaning action.

C. Coordinate top of mat surface with bottom of doors that swing across to provide ample clearance between door and mat.

3.04 Cleaning

A. It is important to the life cycle of the entrance mat that a maintenance schedule be developed which includes regular vacuuming and extraction that correctly matches the amount of traffic the mat incurs.

3.05 Protection

A. After completing required frame installation and concrete work, provide temporary filler of plywood or fiberboard in recess, and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and project is near time of substantial completion.

B. Defer installation of floor mats until time of substantial completion of project.

END OF SECTION 12480

SECTION 14240 - HYDRAULIC ELEVATORS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes: Hydraulic passenger elevators as shown and specified. Elevator work includes:
1. Standard pre-engineered hydraulic passenger elevators.
2. Elevator car enclosures, hoistway entrances and signal equipment.
3. Jack(s).
4. Operation and control systems.
5. Accessibility provisions for physically disabled persons.
6. Equipment, machines, controls, systems and devices as required for safely operating the specified elevators at their rated speed and capacity.
7. Materials and accessories as required to complete the elevator installation.
8. Battery Powered Emergency Return Equipment

B. Related Sections:
1. Division 3 Concrete: Installing inserts, sleeves and anchors in concrete.
2. Division 4 Masonry: Installing inserts, sleeves and anchors in masonry.
3. Division 5 Metals:
   a. Providing hoist beams, pit ladders, steel framing, auxiliary support steel and divider beams for supporting guide-rail brackets.
   b. Providing steel angle sill supports and grouting hoistway entrance sills and frames.
4. Division 9 Finishes: Providing elevator car finish flooring and field painting unfinished and shop primed ferrous materials.
5. Division 15 Plumbing:
   a. Sump pit and oil interceptor.
6. Division 15: Heating, Ventilation and Air Conditioning
   a. Heating and ventilating hoistways and machine rooms.
7. Division 16 Sections:
   a. Providing electrical service to elevators, including fused disconnect switches.
   b. Emergency power supply, transfer switch and auxiliary contacts.
   c. Heat and smoke sensing devices.
   d. Convenience outlets and illumination in machine room, hoistway and pit.

C. Work Not Included: General contractor shall provide the following in accordance with the requirements of the Model Building Code and ANSI A17.1 Code. For specific rules, refer to ANSI A17.1, Section 300 for hydraulic elevators. State or local requirements must be used if more stringent.

1. Elevator hoist beam to be provided at top of elevator shaft. Beam must be able to accommodate proper loads and clearances for elevator installation and operation.
2. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports and bracing including all setting templates and diagrams for placement.
3. Hatch walls require a minimum two hours of fire rating. Hoistway should be clear and plumb with variations not to exceed 1/2'' at any point.
4. Elevator hoistways shall have barricades, as required.
5. Install bevel guards at 75° on all recesses, projections or setbacks over 2'' (4'' for A17.1 2000 areas) except for loading or unloading.
6. Provide rail bracket supports at pit, each floor and roof. For guide rail bracket supports, provide divider beams between hoistway at each floor and roof.
7. Pit floor shall be level and free of debris. Reinforce dry pit to sustain normal vertical forces from rails and buffers.
8. Where pit access is by means of the lowest hoistway entrance, a vertical ladder of non-combustible material extending 42'' minimum, (48'' minimum for A17.1-2000 areas) shall be

provided at the same height, above sill of access door or handgrips.
9. Machine room to be enclosed and protected.
10. Machine Room temperature must be maintained between 55º and 90º F.
11. If machine room is remote from the elevator hoistway, clear access must be available above the ceiling or metal/concrete raceways in floor for oil line and wiring duct from machine room.
12. Access to the machinery space and machine room must be in accordance with the governing authority or code.
13. Provide an 8” x 16” cutout through machine room wall, for oil line and wiring duct, coordinated with elevator contractor at the building site.
14. All wire and conduit should run remote from either the hoistways or the machine room.
15. When heat, smoke or combustion sensing devices are required, connect to elevator machine room terminals. Contacts on the sensors should be sided for 120 volt D.C.
16. Install and furnish finished flooring in elevator cab.
17. Finished floors and entrance walls are not to be constructed until after sills and door frames are in place. Consult elevator contractor for rough opening size. The general contractor shall supply the drywall framing so that the wall fire resistance rating is maintained, when drywall construction is used.
18. Where sheet rock or drywall construction is used for front walls, it shall be of sufficient strength to maintain the doors in true lateral alignment. Drywall contractor to coordinate with elevator contractor.
19. Before erection of rough walls and doors; erect hoistway sills, headers, and frames. After rough walls are finished; erect fascias and toe guards. Set sill level and slightly above finished floor at landings.
20. To maintain legal fire rating (masonry construction), door frames are to be anchored to walls and properly grouted in place.
21. The elevator wall shall interface with the hoistway entrance assembly and be in strict compliance with the elevator contractor's requirements.
22. General Contractor shall fill and grout around entrances, as required.
23. Elevator sill supports shall be provided at each opening.
24. All walls and sill supports must be plumb where openings occur.
25. For applications with jack hole, free and clear access to the elevator pit area for the jack hole-drilling rig is required.
26. Where jack hole is required, remove all spoils from jack hole drilling.
27. When not provided by Elevator Contractor, jack hole shall accommodate the jack unit. If required the jack hole is to be provided in strict accordance with the elevator contractor's shop drawings.
28. Locate a light fixture and convenience outlet in pit with switch located adjacent to the access door.
29. A light switch and fused disconnect switch for each elevator should be located inside the machine room adjacent to the door, where practical, per the National Electrical Code (NFPA No. 70).
30. As indicated by elevator contractor, provide a light outlet for each elevator, in center of hoistway (or in the machine room).
31. For signal systems and power operated door: provide ground and branch wiring circuits, including main line switch. For car light and fan: provide a feeder and branch wiring circuits, including main line switch.
32. Wall thickness may increase when fixtures are mounted in drywall. These requirements must be coordinated between the general contractor and the elevator contractor.
33. Provide supports, patching and recesses to accommodate hall button boxes, signal fixtures, etc.
34. Locate telephone and convenience outlet on control panel.

1.2 SUBMITTALS

A. Product data: The elevator contractor will provide standard cab, entrance and signal fixture data to describe product for approval.

B. Shop drawings:

1. Show equipment arrangement in the machine room/control space, pit and hoistway. Provide plans, elevations, sections and details of assembly, erection, anchorage, and equipment location.
2. Indicate elevator system capacities, sizes, performances, safety features, finishes and other pertinent information.
3. Show floors served, travel distances, maximum loads imposed on the building structure at points of support and all similar considerations of the elevator work.
4. Indicate electrical power requirements and branch circuit protection device recommendations.

C. Powder Coat Paint selection: Submit manufacturer's standard selection charts for exposed finishes and materials.

D. Plastic laminate selection: Submit manufacturer's standard selection charts for exposed finishes and materials.

E. Metal Finishes: Submit standard metal samples.

F. Operation and maintenance data. Include the following:
1. Owner's Manual and Wiring Diagrams.
2. Parts list, with recommended parts inventory.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: An approved manufacturer with minimum fifteen years experience in manufacturing, installing, and servicing elevators of the type required for the project.
1. Must be the manufacturer of the power unit, controller, signal fixtures, door operators cab, entrances, and all other major parts of the elevator operating equipment.
a. The major parts of the elevator equipment shall be manufactured in the United States, and not be an assembled system.
2. The manufacturer shall have a documented, on-going quality assurance program.
3. ISO-9001:2000 Manufacturer Certified
4. ISO-14001:2004 Environmental Management System Certified

B. Installer Qualifications: The manufacturer or an authorized agent of the manufacturer with not less than fifteen years of satisfactory experience installing elevators equal in character and performance to the project elevators.

C. Regulatory Requirements:
1. ASME/ANSI A17.1 Safety Code for Elevators and Escalators, latest edition or as required by the local building code.
2. Building Code: National.
3. NFPA 70 National Electrical Code.
4. NFPA 80 Fire Doors and Windows.
5. Americans with Disabilities Act Accessibility Guidelines (ADAAG).

D. Fire-rated Entrance Assemblies: Opening protective assemblies including frames, hardware, and operation shall comply with ASTM E2074, CAN4-S104 (ULC-S104), UL10(B), and NFPA 80. Provide entrance assembly units bearing Class B or 1 1/2 hour label by a Nationally Recognized Testing Laboratory (2 hour label in Canada).

E. Inspection and testing: Elevator Installer shall obtain and pay for all required inspections, tests, permits and fees for elevator installation.
1. Arrange for inspections and make required tests.
2. Deliver to the Owner upon completion and acceptance of elevator work.

1.4 DELIVERY, STORAGE AND HANDLING

A. Manufacturing will deliver elevator materials, components and equipment and the contractor is responsible to provide secure and safe storage on job site.

1.5 PROJECT CONDITIONS

A. Prohibited Use: Elevators shall not be used for temporary service or for any other purpose during the construction period before Substantial Completion and acceptance by the purchaser unless agreed upon by Elevator Contractor and General Contractor with signed temporary agreement.

B. Provide the hole for the jack unit (if required by the type of jack provided), based on excavation through normal soil or clay which can be removed by manual digging or by standard truck-mounted regular drilling unit. Provide a casing if required to retain the walls of the hole. General contractor shall remove excavation spoils deposited in the elevator pit.

1.6 WARRANTY

A. Warranty: Submit elevator manufacturer's standard written warranty agreeing to repair, restore or replace defects in elevator work materials and workmanship not due to ordinary wear and tear or improper use or care for 12 months from date of Substantial Completion.

1.7 MAINTENANCE

A. Furnish maintenance and call back service for a period of 3 months for each elevator from date of Substantial Completion during normal working hours, excluding callbacks. Service shall consist of periodic examination of the equipment, adjustment, lubrication, cleaning, supplies and parts to keep the elevators in proper operation.

1. Manufacturer shall have a service office and full time service personnel within a 100 mile radius of the project site.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: ThyssenKrupp Elevator

2.2 MATERIALS, GENERAL

A. Colors, patterns, and finishes: As selected by the Architect from manufacturer's standard colors, patterns, and finish charts except plastic laminate finish shall be custom selection as determined by Architect.

B. Steel:
1. Shapes and bars: Carbon.
2. Sheet: Cold-rolled steel sheet, commercial quality, Class 1, matte finish.
3. Finish: Factory-applied baked enamel.

2.3 HOISTWAY EQUIPMENT

A. Platform: Fabricated frame of formed or structural steel shapes, gusseted and rigidly welded with a wood subfloor. Underside of the platform shall be fireproofed. The car platform shall be designed and fabricated to support one-piece loads weighing up to 25% of the rated capacity.

B. Sling: Steel stiles affixed to a steel crosshead and bolstered with bracing members to remove strain

from the car enclosure.

C. Guide Rails: Steel, omega shaped, fastened to the building structure with steel brackets.

E. Guide Shoes: Slide guides shall be mounted on top and bottom of the car.

F. Buffers: Provide substantial buffers in the elevator pit. Mount buffers on a steel template that is fastened to the pit floor or continuous channels fastened to the elevator guide rail or securely anchored to the pit floor. Provide extensions if required by project conditions.

G. Jack: Jack unit shall be of sufficient size to lift the gross load the height specified. Factory test jack to insure adequate strength and freedom from leakage. Brittle material, such as gray cast iron, is prohibited in the jack construction. Provide the following jack type: Single post conventional (in ground). Single polished steel hydraulic plunger housed in a steel sealed casing with sufficient clearance space to allow for alignment during installation. The casing shall have a dished endcap and safety bulkhead as required by A17.1 code. The plunger shall have a high-pressure sealing system which will not allow for seal movement or displacement during the course of operation. The jack system will be supplied with schedule 40 PVC or an HDPE protection system complying with A17.1 code requirements to prevent in ground corrosion of the casing. The jack casing shall have a bleeder valve to discharge any air trapped in the jack.

G. Automatic Self-Leveling: Provide each elevator car with a self-leveling feature to automatically bring the car to the landings and correct for overtravel or undertravel. Self-leveling shall, within its zone, be automatic and independent of the operating device. The car shall be maintained approximately level with the landing irrespective of its load.

H. Wiring, Piping, and Oil: Provide all necessary hoistway wiring in accordance with the National Electrical Code. All necessary code compliant pipe and fittings shall be provided to connect the power unit to the jack unit. Provide proper grade readily biodegradable oil as specified by the manufacturer of the power unit (see Power Unit section 2.04.G for further details)

2.4 POWER UNIT

A. Power Unit (Oil Pumping and Control Mechanism): A self-contained unit consisting of the following items:
1. Oil reservoir with tank cover.
2. An oil hydraulic pump.
3. An electric motor.
4. Oil control valve with the following components built into single housing; high pressure relief valve, check valve, automatic unloading up start valve, lowering and leveling valve, and electro-magnetic controlling solenoids.

B. Pump: Positive displacement type pump specifically manufactured for oil-hydraulic elevator service. Pump shall be designed for steady discharge with minimum pulsation to give smooth and quiet operation. Output of pump shall not vary more than 10 percent between no load and full load on the elevator car.

C. Motor: Standard manufacture motor specifically designed for oil-hydraulic elevator service. Duty rating shall be selected for specified speed and load.

D. Control System: Shall be microprocessor based and protected from environmental extremes and excessive vibrations in a NEMA 1 enclosure.

E. Oil Control Unit: The following components shall be built into a single housing. Welded manifolds with separate valves to accomplish each function are not acceptable. Adjustments shall be accessible and be made without removing the assembly from the oil line.
1. Relief valve shall be externally adjustable and be capable of bypassing the total oil flow without

increasing back pressure more than 10 percent above that required to barely open the valve.

2. Up start and stop valve shall be adjustable and designed to bypass oil flow during start and stop of motor pump assembly. Valve shall close slowly, gradually diverting oil to or from the jack unit, ensuring smooth up starts and up stops.
3. Check valve shall be designed to close quietly without permitting any perceptible reverse flow.
4. Lowering valve and leveling valve shall be adjustable for down start speed, lowering speed, leveling speed and stopping speed to ensure smooth "down" starts and stops. The leveling valve shall be designed to level the car to the floor in the direction the car is traveling after slowdown is initiated.

F. Solid State Starting: Provide an electronic starter featuring adjustable starting currents.

H. Oil Type: USDA certified biobased product, ultra low toxicity, readily biodegradable, energy efficient, high performing fluid made from canola oil with antioxidant, anticorrosive, antifoaming, and metal-passivating additives. Especially formulated for operating in environmentally sensitive areas. USDA certified biobased product, >90% bio-based content, per ASTM D6866

2.5 HOISTWAY ENTRANCES

A. Doors and Frames: Provide complete hollow metal type hoistway entrances at each hoistway opening bolted\knock down construction.
   1. Manufacturer's standard entrance design consisting of hangers, doors, hanger supports, hanger covers, fascia plates, sight guards, and necessary hardware.
   2. Main landing door & frame finish: Stainless steel panels, no. 4 brushed finish.
   3. Typical door & frame finish: Stainless steel panels with no. 4 brushed finish.

B. Interlocks: Equip each hoistway entrance with an approved type interlock tested as required by code. Provide door restriction devices as required by code.

C. Door Hanger and Tracks: Provide sheave type two point suspension hangers and tracks for each hoistway horizontal sliding door.
   1. Sheaves: Polyurethane tires with ball bearings properly sealed to retain grease.
   2. Hangers: Provide an adjustable device beneath the track to limit the up-thrust of the doors during operation.
   3. Tracks: Drawn steel shapes, smooth surface and shaped to conform to the hanger sheaves.

D. Hoistway Sills: Extruded metal, with groove(s) in top surface. Provide mill finish on aluminum.

2.6 CAR ENCLOSURE

A. Car Enclosure:
   1. Walls: Cab type TKAP, reinforced cold-rolled steel with two coats factory applied baked enamel finish, with applied vertical wood core panels faced with plastic laminate. Laminate to be custom selection as determined by Architect.
      a. Reveals and frieze: Stainless steel, no. 4 brushed finish
   2. Canopy: Cold-rolled steel with hinged exit.
   3. Ceiling: Downlight type, metal pans with suspended LED downlights.
   4. Cab Fronts, Return, Transom, Soffit and Strike: Provide panels faced with brushed stainless steel.
   5. Doors: Horizontal sliding car doors reinforced with steel for panel rigidity. Hang doors on sheave type hangers with polyurethane tires that roll on a polished steel track and are guided at the bottom by non-metallic sliding guides.
      a. Door Finish: Stainless steel panels: No. 4 brushed finish.
      b. Cab Sills: Extruded aluminum, mill finish.
   6. Handrail: Provide 2" flat metal bar on side walls only on front and rear opening cars. Handrails shall have a stainless steel, no. 4 brushed finish.
   7. Ventilation: Manufacturer’s standard exhaust fan, mounted on the car top.

B. Car Top Inspection: Provide a car top inspection station with an “Auto-Inspection” switch, an "emergency stop" switch, and constant pressure "up and down" direction and safety buttons to make the normal operating devices inoperative. The station will give the inspector complete control of the elevator. The car top inspection station shall be mounted in the door operator assembly.

2.7 DOOR OPERATION

A. Door Operation: Provide a direct current motor driven heavy duty operator designed to operate the car and hoistway doors simultaneously. Door movements shall be electrically cushioned at both limits of travel and the door operating mechanism shall be arranged for manual operation in event of power failure. Doors shall automatically open when the car arrives at the landing and automatically close after an adjustable time interval or when the car is dispatched to another landing. Closed-loop, microprocessor controlled motor-driven linear door operator, with adjustable torque limits, also acceptable. AC controlled units with oil checks or other deviations are not acceptable.

1. No Un-Necessary Door Operation: The car door shall open only if the car is stopping for a car or hall call, answering a car or hall call at the present position or selected as a dispatch car.
2. Door Open Time Saver: If a car is stopping in response to a car call assignment only (no coincident hall call), the current door hold open time is changed to a shorter field programmable time when the electronic door protection device is activated.
3. Double Door Operation: When a car stops at a landing with concurrent up and down hall calls, no car calls, and no other hall call assignments, the car door opens to answer the hall call in the direction of the car's current travel. If an onward car call is not registered before the door closes to within 6 inches of fully closed, the travel will reverse and the door will reopen to answer the other call.
4. Nudging Operation: The doors shall remain open as long as the electronic detector senses the presence of a passenger or object in the door opening. If door closing is prevented for a field programmable time, a buzzer will sound. When the obstruction is removed, the door will begin to close at reduced speed. If the infra-red door protection system detects a person or object while closing on nudging, the doors will stop and resume closing only after the obstruction has been removed.
5. Limited Door Reversal: If the doors are closing and the infra-red beam(s) is interrupted, the doors will reverse and reopen partially. After the obstruction is cleared, the doors will begin to close.
6. Door Open Watchdog: If the doors are opening, but do not fully open after a field adjustable time, the doors will recycle closed then attempt to open six times to try and correct the fault.
7. Door Close Watchdog: If the doors are closing, but do not fully close after a field adjustable time, the doors will recycle open then attempt to close six times to try and correct the fault.
8. Door Close Assist: When the doors have failed to fully close and are in the recycle mode, the door drive motor shall have increased torque applied to possibly overcome mechanical resistance or differential air pressure and allow the door to close.

B. Door Protection Devices: Provide a door protection system using 150 or more microprocessor controlled infra-red light beams. The beams shall project across the car opening detecting the presence of a passenger or object. If door movement is obstructed, the doors shall immediately reopen.

2.8 CAR OPERATING STATION

A. Car Operating Station, General: The main car control in each car shall contain the devices required for specific operation mounted in an integral swing return panel requiring no applied faceplate. Swing return shall have a brushed stainless steel finish. The main car operating panel shall be mounted in the return and comply with handicap requirements. Pushbuttons that illuminate using long lasting LED’s shall be included for each floor served, and emergency buttons and switches shall be provided per code. Switches for car light and accessories shall be provided.

B. Emergency Communications System: Integral phone system provided.

C. Auxiliary Operating Panel: Not Required

D. Column Mounted Car Riding Lantern: A car riding lantern shall be installed in the elevator cab and located in the entrance. The lantern, when illuminated, will indicate the intended direction of travel. The lantern will illuminate and a signal will sound when the car arrives at a floor where it will stop. The lantern shall remain illuminated until the door(s) begin to close.

E. Special Equipment: Limited Access Operation: Keyswitch and card reader space.(card reader by others)

2.9 CONTROL SYSTEMS

A. Controller: The elevator control system shall be microprocessor based and software oriented. Control of the elevator shall be automatic in operation by means of push buttons in the car numbered to correspond to floors served, for registering car stops, and by "up-down" push buttons at each intermediate landing and "call" push buttons at terminal landings.
B. Automatic Light and Fan shut down: The control system shall evaluate the system activity and automatically turn off the cab lighting and ventilation fan during periods of inactivity. The settings shall be field programmable.
C. Special Operation: Limited Access Operation: A key switch shall be provided to initiate the Limited Access Operation. The activation of this operation shall restrict the operation of the elevator car calls to selected floors on a per-floor, per elevator basis. Travel to the restricted floors shall be allowed after the entry of the required access code via a card reader device supplied by others. The card reader entry shall override the car call restrictions and allow entry of a car call to a restricted floor.

2.10 HALL STATIONS

A. Hall Stations, General: Vandal resistant buttons with center jewels which illuminate to indicate that a call has been registered at that floor for the indicated direction. Each button shall be provided with an internal automatic stop to prevent damage of switches that register the call. Provide 1 set of pushbutton risers. All fixtures shall be vandal resistant type. Provide one pushbutton riser with faceplates having a brushed stainless steel finish.
   1. Phase 1 firefighter's service key switch, with instructions, shall be incorporated into the hall station at the designated level.

B. Floor Identification Pads: Provide door jamb pads at each floor. Jamb pads shall comply with Americans with Disabilities Act (ADA) requirements.

C. Hall Position Indicator: Not Applicable

D. Hall lanterns: Not Applicable

E. Special Equipment: Not Applicable

2.11 MISCELLANEOUS ELEVATOR COMPONENTS

A. Oil Hydraulic Silencer: Install an oil hydraulic silencer (muffler device) at the power unit location. The silencer shall contain pulsation absorbing material inserted in a blowout proof housing arranged for inspecting interior parts without removing unit from oil line.

B. Battery Powered Emergency Return Equipment
   1. Powervator HFP Series by Reynolds and Reynolds Electronics, Inc. or approved equal.
   2. Steel cabinet enclosed electronic circuitry and batteries.
   3. Automatic activation during power failure.
   4. 480V AC output.

PART 3 EXECUTION

3.1 EXAMINATION

A. Before starting elevator installation, inspect hoistway, hoistway openings, pits and machine rooms/control space, as constructed and verify all critical dimensions, and examine supporting structures and all other conditions under which elevator work is to be installed. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.2 INSTALLATION

A. Install elevator systems components and coordinate installation of hoistway wall construction.
   1. Work shall be performed by competent elevator installation personnel in accordance with ASME A17.1, manufacturer's installation instructions and approved shop drawings.
   2. Comply with the National Electrical Code for electrical work required during installation.

B. Jack unit excavation (if required by the type of jack provided): Drill or otherwise excavate below elevator pit construction as required to install the jack unit.
   1. Install casing for jack unit.
   2. Provide HDPE jack protection system for all in ground jacks.
   3. Set casing for jack unit assembly plumb, and partially fill with water-settled sand, eliminating voids. Back fill depth shall be sufficient to hold the bottom of the jack in place over time.

C. Coordination: Coordinate elevator work with the work of other trades, for proper time and sequence to avoid construction delays. Use benchmarks, lines, and levels designated by the Contractor, to ensure dimensional coordination of the work.

D. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum safe, workable dimensions at each landing.

E. Lubricate operating parts of system where recommended by manufacturer.

3.3 FIELD QUALITY CONTROL

A. Acceptance testing: Upon completion of the elevator installation and before permitting use of elevator, perform acceptance tests as required by A17.1 Code and local authorities having jurisdiction. Perform other tests, if any, as required by governing regulations or agencies.

B. Advise Owner, Contractor, Architect, and governing authorities in advance of dates and times tests are to be performed on the elevator.

3.4 ADJUSTING

A. Make necessary adjustments of operating devices and equipment to ensure elevator operates smoothly and accurately.

3.5 CLEANING

A. Before final acceptance, remove protection from finished surfaces and clean and polish surfaces in accordance with manufacturer's recommendations for type of material and finish provided. Stainless stall shall be cleaned with soap and water and dried with a non-abrasive surface; shall not be cleaned with bleached-based cleansers.

B. At completion of elevator work, remove tools, equipment, and surplus materials from site. Clean equipment rooms and hoistway. Remove trash and debris.

3.6 PROTECTION

A. At time of Substantial Completion of elevator work, or portion thereof, provide suitable protective coverings, barriers, devices, signs, or other such methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

3.7 DEMONSTRATION

A. Instruct Owner's personnel in proper use, operations, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train Owner's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions.

B. Make a final check of each elevator operation, with Owner's personnel present, immediately before date of substantial completion. Determine that control systems and operating devices are functioning properly.

3.8 ELEVATOR SCHEDULE

A. Elevator Qty.
1. Elevator Model: endura Below-Ground Conventional
2. Rated Capacity: 5000H lbs.
3. Rated Speed: 150 ft./min.
4. Operation System: TAC32
5. Travel: 48'-0"
6. Landings: 4 total
7. Openings:
   a. Front: 3
   b. Rear: 1
8. Clear Car Inside: 5' - 8" wide x 9' - 0 1/2" deep
9. Cab Height: 9'-0" nominal
10. Hoistway Entrance Size: 4' - 0" wide x 8'-0" high
11. Door Type: Two Speed
12. Power Characteristics: 460 volts, 3 Phase, 60 Hz.
13. Seismic Requirements: Zone 1
14. Fixture & Button Style: Vandal Resistant Signal Fixtures
15. Special Operations: Limited Access with card readers by others.
16. Protection Pad Buttons and Pads

END OF SECTION