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SECTION 01410 - TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 PROCEDURE

A. Owner's Testing Laboratory: An independent testing laboratory will be selected by the Owner or his representative to inspect and test the materials and methods of construction as hereinafter specified for compliance with the specification requirements of the Contract Documents and to perform such other specialized technical services as may be required by the Owner or his representative.

Special Inspection (Threshold Inspection) as required by Chapters 471 and 553 of the Florida Statutes are not included in this section and are to be provided (if required) separately.

B. Contractor's Testing Laboratory: The Contractor shall provide the services of an independent testing laboratory acceptable to the Architect/Engineer to perform specified design testing and certification testing services. Inspections or testing performed as part of the Contractor's operations shall be included as part of the Work. Employment of a testing laboratory shall in no way relieve the Contractor of his obligation to perform the work in accordance with the Contract Documents.

1.3 QUALIFICATIONS OF TESTING LABORATORY (OWNER'S AND CONTRACTOR'S)

A. The Testing Laboratory selected shall meet the basic requirements of ASTM E329 "Standard of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction".

B. The Testing Laboratory selected shall meet "Recommended Requirements for Independent Laboratory Qualification", latest edition, as published by the American Council of Independent Laboratories.

C. Testing machines shall be calibrated at intervals not exceeding 12 months by devices of accuracy traceable to the National Bureau of Standards or accepted values of natural physical constants.

D. Tests and inspections shall be conducted in accordance with specified requirements, and if not specified, in accordance with the applicable standards of the American

Society for Testing and Materials or other recognized and accepted authorities in the field.

1.4 AUTHORITIES AND DUTIES OF THE LABORATORY

A. Attending Preconstruction Conferences: The Owner's Testing Laboratory shall obtain and review the project plans and specifications with the Architect and Engineer as soon as possible prior to the start of construction. The Owner's Laboratory shall attend preconstruction conferences with the Architect, Engineer, Project Manager, General Contractor, and Material Suppliers as required to coordinate materials inspection and testing requirements with the planned construction schedule. The Owner's Laboratory will participate in such conferences throughout the course of the project.

B. Outline Testing Program: The Owner's Testing Laboratory shall be responsible for outlining a written detailed testing program conforming to the requirements as specified in the Contract Documents and in consultation with the Owner, Architect, and Engineer. The testing program shall contain an outline of inspections and tests to be performed with reference to applicable sections of the specifications or drawings and a list of personnel assigned to each portion of the work. Such testing program shall be submitted to the Owner, Architect, and Engineer five weeks in advance of the start of construction so as not to delay the start of construction.

C. Cooperation with Design Team: The Laboratory shall cooperate with the Architect, Engineer, and Contractor and provide qualified personnel promptly on notice.

D. The Laboratory shall perform the required inspections, sampling, and testing of materials as specified under each section and observe methods of construction for compliance with the requirements of the Contract Documents.

E. Notification of Deficiencies in the Work: The Laboratory shall notify the Architect, Engineer, and Contractor first by telephone and then in writing of observed irregularities and deficiencies of the work and other conditions not in compliance with the requirements of the Contract Documents.

F. Reports:

1. Information on Reports: The Laboratory shall submit copies of all reports of inspections and tests promptly and directly to the parties named below. All reports shall contain at least the following information:

    a. Project Name
    b. Date report issued
    c. Testing Laboratory name and address
    d. Name and signature of inspector
    e. Date of inspection and sampling
    f. Date of test
    g. Identification of product and Specification section
    h. Location in the project
    i. Identification of inspection or test

j. Record of weather conditions and temperature (if applicable)
k. Results of test regarding compliance with Contract Documents

2. Copies: The Laboratory shall send certified copies of test and inspection reports to the following parties:

a. 2 copies to the Owner or his representative
b. 2 copies to the General Contractor
c. 1 copy to the Architect
d. 1 copy to the Engineer of responsibility
e. 1 copy to the Supplier of the material tested

G. Accounting: The Testing Laboratory shall be responsible for separating and billing costs attributed to the Owner and costs attributed to the Contractor.

H. Obtaining Product and Material Certifications: The Testing Laboratory shall be responsible for obtaining all product and material certifications from manufacturers and suppliers as specified in the Specifications.

I. Limitations of Authority: The Testing Laboratory is not authorized to revoke, alter, relax, enlarge upon, or release any requirements of the Specifications or to approve or accept any portion of the work or to perform any duties of the General Contractor and his Subcontractors.

1.5 CONTRACTORS RESPONSIBILITY

A. Cooperation with Design Team: The Contractor shall cooperate with laboratory personnel, provide access to the work, and to manufacturers operations.

B. Furnishing Samples: The Contractor shall provide to the laboratory representative, samples of materials proposed for use in the work in quantities sufficient for accurate testing as specified.

C. Furnishing Casual Labor, Equipment and Facilities: The Contractor shall furnish casual labor, equipment, and facilities as required for sampling and testing by the laboratory and otherwise facilitate all required inspections and tests.

D. Advance Notice: The Contractor shall be responsible for notifying the Testing Laboratory sufficiently in advance of operations to allow for assignment of personnel and scheduling of tests.

E. Payment for Substitution Testing: The Contractor shall arrange with the Testing Laboratory and pay for any additional samples and tests above those required by the Contract Documents as requested by the Contractor for his convenience in performing the work.

F. Payment for Retesting: The Contractor shall pay for any additional inspections, sampling, testing, and retesting as required when initial tests indicate work does not comply with the requirements of the Contract Documents.

G. Payment by Contractor: The Contractor shall furnish and pay for the following items:

1. Soil survey of the location of borrow soil materials, samples of existing soil materials, and delivery to the Testing Laboratory.
2. Concrete mix designs as prepared by his concrete supplier or by his Testing Laboratory.
3. Concrete coring, tests of below strength concrete, and load tests, if ordered by the Owner, Architect, or Engineer.
4. Certification of welders.
5. Tests, samples, and mock-ups of substitute material where the substitution is requested by the Contractor and the tests are necessary in the opinion of the Owner, Architect or Engineer to establish equality with specified items.
6. Any other tests when such costs are required by the Contract Documents to be paid by the Contractor.

H. Notification of Source Change: The Contractor shall be responsible for notifying the Owner, Architect, Engineer, and Testing Laboratory when the source of any material is changed after the original tests or inspections have been made.

I. Tests for Suspected Deficient Work: If in the opinion of the Owner, Architect, or Engineer any of the work of the Contractor is not satisfactory, the Contractor shall make all tests that the Owner, Architect, or Engineer deem advisable to determine its proper construction. The Owner shall pay all costs if the tests prove the questioned work to be satisfactory.

1.6 PAYMENT OF TESTING LABORATORY

The Owner will pay for the initial Laboratory services for testing of materials for compliance with the requirements of the Contract Documents. The Contractor will pay for testing and retesting of materials that do not comply with the requirements of the Contract Documents and all other items as specified in these Specifications.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCOPE OF WORK

The work to be performed by the Testing Laboratory shall be as specified in this Section of the Specification and as determined in meetings with the Owner, Architect, and Engineer.

3.2 EARTHWORK

A. Tests of Proposed Fill Material: The Contractor's Testing Laboratory shall conduct a survey of the Contractor's proposed location of borrow soil materials and shall establish the suitability of any proposed fill material by determining the required engineering properties. Soil tests shall include soil classification by the Atterberg Limit Tests ASTM D4138, and grain size determination by ASTM D422 "Particle Size Analysis of Soils".

B. Moisture Density Relationship for Natural and Fill Materials: The Contractor's Testing Laboratory shall provide one optimum moisture density curve for each type of soil, natural, imported fill, or on-site fill, encountered in subgrade and fills under building slabs and paved areas. Curves shall be generated in accordance with ASTM D1557 "Test Methods for Moisture Density Relationships of Soils and Soil Aggregate Mixtures".

C. Quality Control Testing Required During Construction:

1. Inspection of Subgrade and Fill: The Owner's Testing Laboratory shall inspect and approve the following subgrades and fill layers before further construction work is performed thereon:

    a. Paved Areas and Building Slab Subgrade: Make at least one field density test of the natural subgrade for every 2500 square feet of paved area or building slab but in no case less than three tests. In each compacted fill layer or lift, make one field density test for every 2500 square feet of building slab or paved area but in no case less than three tests.
    b. Foundation Wall Backfill: Make at least one field density test for each 200 lineal feet of wall with a minimum of 4 tests for each basement wall around the perimeter of the building and a minimum of one test for every other type of foundation wall on the site. Tests shall be at random locations and elevations for each wall.
    c. Subgrade Beneath Column and Wall Footings: Make at least one field density test for each column footing and one for each twenty-five lineal feet of wall or fraction thereof.

2. Field Density Tests: Field Density Tests shall be run according to ASTM D1556 "Density of Soil in Place by the Sand Core Method", ASTM D2167 "Density of Soil in Place by the Rubber Balloon Method" or ASTM D2922 "Density of Soil and Soil Aggregate in Place by Nuclear Methods" as applicable.
3. Acceptance Criteria: The results of field density tests by the Owner's Testing Laboratory will be considered satisfactory if the average of any three consecutive tests has a value not greater than 2 percent below the required density.
4. Report Copies: The Testing Laboratory shall submit all moisture density curves and results of field density tests to the parties specified earlier in this section.
5. Additional Testing: If reports by the Owner's Testing Laboratory indicate field densities lower than specified above, additional tests will be run by the Owner's Testing Laboratory with at least the frequencies scheduled above on recompacted fill and/or natural subgrade. The Testing Laboratory shall notify

the Contractor on a timely basis for any required retesting so as not to delay the work. The costs of such tests shall be borne by the Contractor.

D. Inspection by the Geotechnical Engineer: The Geotechnical Engineer shall provide inspection service of the following items prior to pouring and placing foundation concrete:

1. Spread (Dug) Footing Subgrade
2. Mat Subgrade

Such inspection shall verify that field conditions are consistent with soil report test results and that the foundation is being installed in the proper soil strata at the proper elevation. The Geotechnical Engineer shall submit written field inspection reports promptly after inspection to all parties listed above and report his findings after each inspection by telephone to the Engineer. Refer to requirements in foundation section as previously described.

3.3 REINFORCING STEEL

A. Visual Inspection: Unless the project has a Special Inspector, the Owner’s Testing Laboratory shall inspect the shipment to determine the following:

1. The bars should be free from injurious defects and shall have a workman-like finish.
2. Deformations shall be of the proper sizes, shapes, and spacing as detailed in ASTM A-615.
3. The bars shall not have excessive rust and/or pelting.
4. The bars shall not have any unusual twists or bends.

3.4 CONCRETE MATERIALS AND POURED IN PLACE CONCRETE

A. Portland Cement: Portland Cement shall be tested by the Contractor's Testing Laboratory for compliance with the requirements of ASTM C150.

1. Mill Certificates: Mill certificates certifying that the cement has been tested and meets the requirements of the Specifications will be acceptable as test results, provided the cement proposed for use can be identified with test lots. Mill certificates shall be submitted by the Contractor prior to use of any such material.

B. Aggregates:

1. The Contractor's Testing Laboratory shall verify that concrete aggregates proposed for use conform to one of the following specifications:

a. ASTM C33 "Specification for Concrete Aggregates"
b. ASTM C330 "Specification for Lightweight Aggregates for Structural Concrete"

C. Concrete Mix Designs: The Contractor shall submit for approval by the Engineer and Owner's Testing Laboratory at least 15 days prior to the start of construction, concrete

mix designs for each class of concrete indicated on the structural drawings and in the Specifications. The Contractor shall not begin work until the applicable mix design has been approved.

1. The Contractor acting in conjunction with his Concrete Supplier and his Testing Laboratory shall submit in writing with his mix designs, whether the concrete is to be proportioned by either of the following methods as outlined in ACI 318:

   a. Field Experience Method
   b. Laboratory Trial Batch Method

   When field experience methods are used to select concrete proportions, establish proportions as specified in ACI 301 and ACI 211. When Laboratory trial batches are used to select concrete proportions, the procedure as outlined in ACI 318 shall be followed. Prepare test specimens in accordance with ASTM C192 and conduct strength tests in accordance with ASTM C39.

2. Required types of concrete and compressive strengths shall be as indicated on the Structural Drawings and as specified in the various sections of the Specifications.

3. All mix designs shall state the following information:

   a. Mix design number or code designation by which the Contractor shall order the concrete from the Supplier
   b. Structural member for which the concrete is designed (i.e. columns, shear walls, footings, etc.)
   c. Type of concrete whether normal weight or lightweight
   d. 28 day compressive strength
   e. Aggregate type, source, size, gradation, fineness modulus
   f. Cement type and brand
   g. Fly ash type and brand (if any)
   h. Admixtures including air entrainment, water reducers, accelerators, and retarders
   i. Slump
   j. Proportions of each material used
   k. Water cement ratio and maximum allowable water content
   l. Method by which the concrete is intended to be placed (bucket, chute, or pump)

4. Concrete Suppliers Record of Quality Control: The concrete supplier's past record of quality control shall be used in the design of the concrete mixes to determine the amount by which the average concrete strength fcr should exceed the specified strength f'c as outlined in ACI 318. If a suitable record of test results is not available, the average strength must exceed the design strength by 1200 PSI as specified in ACI 318. After sufficient data becomes available from the job, the statistical methods of ACI 214 may be used to reduce the amount by which the average strength must exceed f'c as outlined in ACI 318.
5. Admixtures:

a. Admixtures to be used in concrete shall be subject to the approval of the Engineer and Owner's Testing Laboratory.
b. Quantities of admixtures to be used shall be in strict accordance with the manufacturers instructions.
c. Admixtures containing chloride ions shall not be used in prestressed concrete, in concrete containing galvanized or aluminum embedments, or in metal deck floors or roofs.
d. Air entraining admixtures shall conform to "Specification for Air Entraining Admixtures for Concrete" ASTM C260.
e. Water reducing admixtures, retarding admixtures, accelerating admixtures, water reducing and retarding admixtures, and water reducing and accelerating admixtures shall conform to "Specification for Chemical Admixtures for Concrete" ASTM C494.
f. Fly ash or other pozzolons, used as admixtures, shall conform to "Specification for Fly Ash and Raw or Calcined Natural Pozzolons for use in Portland Cement Concrete" ASTM C618. Obtain mill test reports for approval.
g. Use amounts of admixtures as recommended by the manufacturer for climatic conditions prevailing at the time of placing. Adjust quantities of admixtures as required to maintain quality control.

6. Slump Limits: Unless shown otherwise on the structural drawings, proportion and design mixes to result in concrete slump at the point of placement as follows:

a.	Ramps and Sloping surfaces	3" TO 5"
b.	Foundation concrete	4" TO 6”
c.	All other concrete	3” TO 5”

When increased workability, pumpability, lower water-cement ratio, shrinkage reduction, or permeability reduction is required, then a superplasticizer admixture shall be considered for use. The maximum slump with the use of superplasticizers shall be 8 inches unless approved otherwise by the Architect/Engineer and Owner's Testing Laboratory.

Any deviation from these values (such as concrete design to be pumped) shall be submitted to the Engineer and Owner's Testing Laboratory for approval.

7. Adjustments of Concrete Mixes: Mix design adjustments may be requested by the Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrrant. Such mix design adjustments shall be provided at no additional cost to the Owner. Any adjustments in approved mix designs including changes in admixtures shall be submitted in writing to the Engineer and Owner's Testing Laboratory for approval prior to field use.
8. Shrinkage: All concrete shall be proportioned for a maximum allowable unit shrinkage of 0.03% at 28 days as determined by ASTM C 157.

9. Chloride Ion Content: A written submittal shall be made with each mix design proposed for use on the project that the chloride ion content from all

ingredients including admixtures will not exceed the limits specified in the Cast-In-Place section of the Specifications.

D. Concrete Test Cylinders by the Owner's Testing Laboratory:

1. Molding and Testing: Cylinders for strength tests shall be molded and Laboratory cured in accordance with ASTM C31 "Method of Making and Curing Concrete Test Cylinders in the Field" and tested in accordance with ASTM C39 "Method of Testing for Compressive Strength of Cylindrical Concrete Specimens".
2. Field Samples: Field samples for strength tests shall be taken in accordance with ASTM C172 "Method of Sampling Fresh Concrete".
3. Frequency of Testing: Each set of test cylinders shall consist of a minimum of four standard test cylinders. A set of test cylinders shall be made according to the following frequency guidelines:

    a. One set for each class of concrete taken not less than once a day.
    b. Mat Foundation: One set for each 250 cubic yards or fraction thereof.
    c. Piers: One set for each 50 cubic yards or fraction thereof.
    d. Underreamed Footings: One set for each 50 cubic yards or fraction thereof.
    e. Piles: One set for each 50 cubic yards or fraction thereof but not less than one set for each pile group under each column or wall.
    f. Retaining Walls: One set for each 150 cubic yards.
    g. Spread Footings: One set for each 50 cubic yards or fraction thereof.
    h. Floors: One set for each 150 cubic yards or fraction thereof but not less than one set for each 5000 square foot of floor area.
    i. Columns: One set for each 50 cubic yards or fraction thereof with a minimum of 2 sets per floor.
    j. All Other Concrete: A minimum of one set for each 150 cubic yards or fraction thereof.
    k. No more than one set of cylinders at a time shall be made from any single truck.
    l. If the total volume of concrete is such that the frequency of testing as specified above would provide less than five strength tests for a given class of concrete, tests shall be made from at least five randomly selected batches or from each batch if fewer than five batches are used.
    m. The above frequencies assume that one batch plant will be used for each pour. If more than one batch plant is used, the frequencies cited above shall apply for each plant used.

    The cylinders shall be numbered, dated, and the point of concrete placement in the building recorded. Of the four cylinders per set break one at seven days, two at 28 days, and one automatically at 56 days only if either 28 day cylinder break is below required strength.

4. Additional Cylinder for Floor Form Stripping: One additional cylinder per set will be required for formed slab and pan joist floors for the purpose of evaluating the concrete strength at the time of form stripping. This cylinder shall be stored on the floor where form removal is to occur under the same

exposure conditions as the floor concrete. The cylinder shall be cured under field conditions in accordance with ASTM C31 "Method of Making and Curing Concrete Test Specimens in the Field". Field cured test cylinders shall be molded at the same time and from the same samples as Laboratory cured test specimens. The cylinder shall be broken at the time of form removal as directed by the Contractor.

5. Cylinder Storage Box: The Contractor shall be responsible for providing a protected concrete cylinder storage box at a point on the job site mutually agreeable with the Testing Laboratory for the purpose of storing concrete cylinders until they are transported to the Laboratory.
6. Transporting Cylinders: The Owner's Testing Laboratory shall be responsible for transporting the cylinders to the Laboratory in a protected environment such that no damage or ill effect will occur to the concrete cylinders.
7. Information on Concrete Test Reports: The Owner's Testing Laboratory shall make and distribute concrete test reports after each job cylinder is broken. Such reports shall contain the following information:

    a. Truck number and ticket number
    b. Concrete Batch Plant
    c. Mix design number
    d. Accurate location of pour in the structure
    e. Strength requirement
    f. Date cylinders made and broken
    g. Technician making cylinders
    h. Concrete temperature at placing
    i. Air temperature at point of placement in the structure
    j. Amount of water added to the truck at the batch plant and at the site and whether it exceeds the amount allowed by the mix design
    k. Slump
    l. Unit weight
    m. Air content
    n. Cylinder compressive strengths with type of failure if concrete does not meet Specification requirements. Seven day breaks are to be flagged if they are less than 60% of the required 28 day strength. 28 day breaks are to be flagged if either cylinder fails to meet Specification requirements.

E. Other Required Tests of Concrete by the Owner's Testing Laboratory (unless noted otherwise):

1. Slump Tests: Slump Tests (ASTM C143) shall be made at the beginning of concrete placement for each batch plant and for each set of test cylinders made.
2. Air Entrainment: Air entrainment (ASTM C233) tests shall be made at the same time slump tests are made as cited above.
3. Concrete Temperature: Concrete temperature at placement shall be measured at the same time slump tests are made as cited above.
4. Chloride Ions: The Contractor shall have his testing laboratory verify in a written submittal with the mix designs that no soluble chloride ions exist in the concrete mix.

F. Evaluation and Acceptance of Concrete:

1. Strength Test: A strength test shall be defined as the average strength of two 28 day cylinder breaks from each set of cylinders.
2. Quality Control Charts and Logs: The Owner's Testing Laboratory shall keep the following quality control logs and charts for each class of concrete containing more than 2,000 cubic yards. The records shall be kept for each batch plant and submitted on a weekly basis with cylinder test reports:

    a. Number of 28 day strength tests made to date.
    b. 28 day strength test results containing the average of all strength tests to date, the high test result, the low test result, the standard deviation, and the coefficient of variation.
    c. Number of tests under specified 28 day strength.
    d. A histogram plotting the number of 28 day cylinders versus compressive strength.
    e. Quality control chart plotting compressive strength test results for each test.
    f. Quality control chart plotting moving average for strength where each point plotted is the average strength of three previous test results.
    g. Quality control chart plotting moving average for range where each point plotted is the average of 10 previous ranges.

3. Acceptance Criteria: The strength level of an individual class of concrete shall be considered satisfactory if both of the following requirements are met:

    a. The average of all sets of three consecutive strength tests equal or exceed the required f'c.
    b. No individual strength test (average of two 28 day cylinder breaks) falls below the required f'c by more than 500 PSI.

    If either of the above requirements is not met, the Testing Laboratory shall immediately notify the Engineer by telephone. Steps shall immediately be taken to increase the average of subsequent strength tests.

G. Investigation of Low Strength Concrete Test Results:

1. Contractor Responsibility for Low Strength Concrete: If any strength test of Laboratory cured cylinders falls below the required f'c by more than 500 psi, the Contractor shall take steps immediately to assure that the load carrying capacity of the structure is not jeopardized.
2. Nondestructive Field Tests: The Owner's Testing Laboratory shall under the direction of the Engineer perform nondestructive field tests of the concrete in question using Swiss Hammer, Windsor Probe, or other appropriate methods as approved by the Engineer and report the results in the same manner as for cylinder test reports.
3. Core Tests: If the likelihood of low strength concrete is confirmed and computations indicate that the load carrying capacity of the structure has been significantly reduced, tests of cores by the Owner's Testing Laboratory, drilled from the area in question under the direction of the Engineer, will be required in accordance with ASTM C42 "Method of Obtaining and Testing Drilled Cores

and Sawed Beams of Concrete". In such case, three cores shall be taken for each strength test more than 500 PSI below required f'c. If concrete in the structure will be dry under service conditions, cores shall be air dried (temperature 60° to 80°F, relative humidity less than 60 percent) for 7 days before test and shall be tested dry. If concrete in the structure will be more than superficially wet under service conditions, cores shall be immersed in water for at least 48 hours and tested wet. The Contractor shall fill all holes made by drilling cores with an approved drypack concrete.

4. Acceptance Criteria for Core Tests: Concrete in an area represented by core tests shall be considered structurally adequate if the average of three cores is equal to at least 85% of f'c and if no single core is less than 75% of f'c. If approved by the Engineer, locations of erratic core strengths may be retested to check testing accuracy.

5. Cost of Investigations for Low Strength Concrete: The costs of all investigations of low strength concrete shall be borne by the Contractor.

H. Job Site Inspection: The scope of the work to be performed by the inspector on the jobsite shall be as follows:

1. Verify that air temperatures at the point of placement in the structure are within acceptable limits defined above prior to ordering of concrete by the Contractor.
2. Inspect concrete upon arrival to verify that the proper concrete mix number, type of concrete, and concrete strength is being placed at the proper location.
3. Inspect plastic concrete upon arrival at the jobsite to verify proper batching. Observe mix consistency and adding of water as required to achieve target slumps in mix designs. Record the amount of water added and note if it exceeds that allowed in the mix design. The responsibility for adding water to trucks at the job site shall rest only with the Contractor's designated representative. The Contractor is responsible that all concrete placed in the field is in conformance to the Contract Documents.
4. Obtain concrete test cylinders.
5. Perform slump tests and air entrainment tests.
6. Record information for concrete test reports.
7. Verify that all concrete being placed meets job Specifications. Report concrete not meeting the specified requirements and immediately notify the Contractor, Batch Plant Inspector, Architect, Engineer, and Owner.
8. Pick up and transport to Laboratory, cylinders cast the previous day.
9. Check concrete placing techniques to determine that concrete deposited is uniform and that vertical drop does not exceed six feet.
10. The job site inspector shall report any irregularities that occur in the concrete at the job site or test results to the Contractor, Architect, Owner, and Engineer.

I. Causes for Rejection of Concrete: The Contractor shall reject all concrete delivered to the site for any of the following reasons:

1. Wrong class of concrete (incorrect mix design number).
2. Concrete with temperatures exceeding 95°F may not be placed in the structure.

3. Air contents outside the limits specified in the mix designs.
4. Slumps outside the limits specified in the mix designs.
5. Excessive Age: Concrete shall be discharged within 90 minutes of plant departure or before it begins to set if sooner than 90 minutes unless approved by the Laboratory job inspector or other duly appointed representative.

   The Contractor is responsible that all concrete placed in the field is in conformance to the Contract Documents.

J. Concrete Batch Trip Tickets: All concrete batch trip tickets shall be collected and retained by the Contractor. Compressive strength, slump, air, and temperature tests shall be identified by reference to a particular trip ticket. All tickets shall contain the information specified in ASTM C 94. Each ticket shall also show the amount of water that may be added in the field for the entire batch that will not exceed the specified water cement ratio for the design mix. The Contractor and Owner's Testing Laboratory shall immediately notify the Architect/Engineer and each other of tickets not meeting the criteria specified.

3.5 STRUCTURAL STEEL

A. Contract Obligations:

1. Owner Responsibility: The Owner shall pay for all initial shop and field inspections and tests as required during the fabrication and erection of the structural steel.
2. Contractor Responsibility: The Contractor shall pay for and arrange with the Owner's Testing Laboratory for the certification of all shop and field welders. Each bolting crew and welder shall be assigned an identifying symbol or mark and all shop and field connections shall be so identified so that the inspector can refer back to the person or crew performing the work. The costs of all retesting of material or workmanship not in conformance with the Contract Documents shall be borne by the Contractor. The Fabricator and Erector shall provide the Laboratory inspector with access to all places where work is being done. A minimum of 24 hours notification shall be given prior to commencement of work. The Contractor shall provide the Testing Laboratory with the following:

   a. A complete set of Architect/Engineer reviewed shop and erection drawings including all revisions and addenda.
   b. Cutting lists, order sheets, material bills, shipping bills and mill test reports.
   c. Information as to time and place of all rollings and shipment of material to shops.
   d. Representative sample pieces requested for testing.
   e. Full and ample means and assistance for testing all material.
   f. Proper facilities, including scaffolding, temporary work platforms, hoisting facilities, etc., for inspection of the work in the mills, shop and field.

3. Testing Laboratory Responsibility: Inspection of field work shall be completed promptly so that corrections can be made without delaying the progress of the work. Inspections shall be performed by qualified technicians with a minimum

of two years experience in structural steel testing and inspection. All inspection personnel shall be certified in accordance with AWS QC-1.

The Testing Laboratory shall provide test reports of all shop and field inspections. All test reports shall indicate types and locations of all defects found during inspection, the measures required and performed to correct such defects, statements of final approval of all welding and bolting of shop and field connections, and other fabrication and erection data pertinent to the safe and proper welding and bolting of shop and field connections. In addition to the parties listed in this Specification the Fabricator and Erector shall receive copies of all test reports.

4. Rejection of Material or Workmanship: The Owner, Architect, Engineer, and Testing Laboratory reserve the right to reject any material or workmanship not in conformance with the Contract Documents at any time during the progress of the work. However, this provision does not allow waiving the obligation for timely, in sequence inspections.

B. Field Inspections and Tests: The Owner's Testing Laboratory shall provide inspection in the field for a period of time as determined in consultation with the Architect, Owner, and Engineer prior to the start of erection in a timely manner so as to not delay the start of erection. The following tests and inspections shall be made:

1. Obtain the planned erection procedure, and review with the Erectors supervisory personnel.
2. Check the installation of base plates for proper leveling, grout type, and grout application.
3. Verify field welding procedures and obtain welder certificates.
4. Check steel as received in the field for possible shipping damage, workmanship, and piece marking.
5. Check plumbness and frame alignment as erection progresses.
6. Check required camber of floor beams.
7. Check joint preparation and fit up, backing strips, and runout plates for welded moment connections and column splices.
8. Check preheating to assure proper temperature, uniformity, and thoroughness through the full material thickness.
9. Review welding sequence.
10. Visually inspect all field welding for size, length, and quality.
11. Perform nondestructive examination services for various weldments of field erection determined in consultation with the Structural Engineer prior to the start of erection. The Laboratory shall furnish a qualified technician with the necessary equipment to perform radiographic, ultrasonic, magnetic particle, or dye penetrant inspection as required for the item being tested. Unless specified otherwise, check all partial and complete penetration welds in connections of beams, girders, columns, and braces. Check 10% of connections with fillet welds. Visual inspection is required for all welds.
12. Check calibration of impact wrenches used in field bolted connections.
13. Check high strength friction field bolted connections according to inspection procedures outlined in the "Specification for Structural Joints Using ASTM A325 or A490 Bolts". Unless specified otherwise, test 10% of the bolts, but not less than two bolts, selected at random in each connection. If any bolt is

found to be improperly tightened, test all bolts in the connection. Visually inspect all bearing type bolts to verify that the bolts are snug tight.

14. Visually inspect the welding of metal deck to the structure.
15. Perform field tests on 10% of completed shear connectors in each beam according to inspection procedures outlined in AWS D1.1.

The costs of repairing all defective welds and the costs of retesting by the Owner's Testing Laboratory shall be borne by the Contractor. If removal of a backing strip is required by the Owner's Testing Laboratory to investigate a suspected weld defect, such cost shall be borne by the Contractor.

3.6 NON-SHRINK GROUT FOR BASE PLATES, BEARING PLATES AND PRECAST WALL PANELS

A. Compressive Strength Tests (by the Owner's Testing Laboratory): Compressive strength of grout shall be determined by testing four cubes two inches in dimension according to the requirements of ASTM C109 "Compressive Strength of Hydraulic Cement Mortars". Each strength test shall be the average of two 28 day strengths. Test one cube at 7 days, 2 at 28 days, and one at 56 days only if either 28 day test is low.

B. Frequency of Testing: One set of cubes (4 cubes) shall be made for every ten base plates and bearing plates or fraction thereof but not less than one set for each day's operation. One set of cubes shall be made for each day's operation of grouting wall panels.

END SECTION 01410

SECTION 02100 - SITE PREPARATION

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.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. See Section 02200 Earthwork.
2. See Section 02900 Landscape Work.

C. Florida Department Of Transportation
1. Standard Specifications for Road and Bridge Construction 2000 edition.

D. University of Florida
1. The University of Florida Construction Standards, Volume I and II, Current Issue, Section 02010.

1.2 SUMMARY

A. This Section includes the following:

1. Protection of existing trees, vegetation, landscape materials, not scheduled for clearing, which might be damaged by construction activities.
2. Protection of existing site improvements, not scheduled for clearing, which might be damaged by construction activities.
3. Clearing and grubbing of stumps, vegetation, debris, rubbish, designated trees, other vegetation, and site improvements.
4. Temporary erosion control, siltation control, and dust control.
5. Temporary protection of adjacent property, structures, benchmarks, and monuments.
6. Removal and legal disposal of legal materials.
7. Protection of onsite creek and jurisdictional wetlands.

1.3 QUALITY ASSURANCE

A. State and local code requirements shall control the methods used to clear site and procedures for disposal of removed materials.

B. Codes and Standards: Comply with provisions of the following codes, specifications, and standards unless specifically indicated otherwise:

1. Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction 2000 edition, (FDOTSS).

2. University of Florida Construction Standards, Volume I and II, Current Issue, Section 02010.

C. Examine Contract Documents for all work required and coordinate and cooperate with others so as not to delay or interfere with the work of others.

D. Employ a State of Florida licensed surveyor to stake out both horizontal and vertical control for all work prior to commencing any work operations.

1.4 PROJECT CONDITIONS

A. Traffic: Conduct site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction.

B. Explosives: The use of explosives shall not be permitted.

C. Protection of Existing Improvements and Utilities:

1. Provide protections necessary to prevent damage to existing improvements and utilities indicated to remain in place. Notify Project Engineer immediately of damage to or an encounter with an unknown existing utility line. The Contractor shall be responsible for the repairs of damage to existing utility lines that are indicated or made known to the Contractor prior to start of clearing and grubbing operations. When utility lines, which are to be removed, are encountered within the area of operations, the Contractor shall notify the applicable Utility Company or provider and the Project Engineer in ample time to minimize interruption of the service.
2. Locate existing utilities with assistance of local utility companies and public agencies.
3. Protect improvements on adjoining properties and on Owner's property.
4. Restore damaged improvements to their original condition and grades, as acceptable to property owners.

D. Protection of Existing Trees and Vegetation:

1. Protect existing trees and other vegetation indicated to remain in place, against unnecessary cutting, breaking or skinning of roots and branches, skinning or bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line.
2. Do not run heavy equipment over tree root systems.
3. Maintain minimum trench widths near root systems so as to avoid unnecessary injury.
4. Protect trees and vegetation designated to remain with temporary barricade or fence enclosures, prior to commencement of site clearing operations. Enclosure shall be a minimum of 8 feet in radius around center of tree trunks, with large trees being protected with fencing set at edge of drip lines. Enclosure of vegetation shall be as

required to prevent damage from construction activities. Maintain fencing throughout construction period, unless otherwise directed.

5. Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.
6. Provide protection for roots over 1-1/2 inch diameter that are cut during construction operations. Coat cut faces with an emulsified asphalt, or other acceptable coating, formulated for use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.
7. Repair or replace trees and vegetation indicated to remain which are damaged by construction operations, in a manner acceptable to Project Engineer. Employ a licensed arborist to repair damages to trees and shrubs at no additional cost to Owner.
8. Replace trees which cannot be repaired and restored to full-growth status, as determined by arborist with same species of equivalent size or of species and acceptable size as determined to the Project Engineer. Replacement cost to Contractor will be determined in accordance with the "Tree Evaluation Formula" published in the "Guide to Professional Evaluation of Landscape Trees, Specimen Shrubs and Evergreens" as published by the International Society of Arboriculture.

E. Protection of Existing Creek and Jurisdictional Wetlands

1. Install required silt fence barrier and other required barriers at initial onset of construction. Maintain silt fence and other barriers throughout construction.
2. Do not trespass beyond barriers for any construction activity with the exception of any necessary or required cleanup or mitigation work.
3. Upon completion of construction, remove all silt fencing and other barriers. Clean up any silt, dirt, limerock, or other erosion material, that bypassed silt barriers during construction.
4. Do not disturb any wetland vegetation.

1.5 EXISTING UTILITY INFORMATION

A. Information on the drawings relating to existing utility lines and services is from the best sources presently available. All such information is furnished only for information and is not guaranteed. Excavate test pits as required to determine exact locations of existing utilities.

B. The contractor shall notify all known utility companies and providers to field locate their respective utilities in the vicinity of the project construction area. The contractor shall avoid existing utilities unless necessary to adjust or relocate due to design considerations or construction conflicts.

PART 2 - PRODUCTS

2.1 TREE PROTECTION

A. Commercial grade tree protection material, both fencing and barriers, shall be placed

in accordance with the construction drawings. All tree protection material shall be placed prior to and site clearing, demolition, or construction. Barricades shall be able to withstand bumps by heavy equipment and trucks. Maintain barricades in good condition.

2.2 SILT FENCING

A. Use a geotextile fabric made from woven or nonwoven fabric, meeting the physical requirements of Section 985 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, 2000 edition, according to those applications for erosion control. Install all sediment control devices prior to the commencement of any earthwork. Do not attach silt fence to existing trees unless approved by the Engineer.

PART 3 - EXECUTION

3.1 LAYOUT

A. Stake out both horizontal and vertical control for all work prior to commencing work operations. Accurately locate and maintain location of all buildings, roads, paved areas, features, etc. Advise Project Engineer of any Contract Document discrepancies, prior to commencing work.

B. Maintain benchmarks, monuments and other reference points. Re-establish benchmarks if disturbed or destroyed at no cost to Owner.

3.2 SITE CLEARING

A. General:

1. Locate and suitably identify trees and improvements to remain. Remove trees, shrubs, grass and other vegetation, snags, brush, rubbish, rock/boulders, improvements, or obstructions as required to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated. "Removal" includes transporting off-site and legally disposing of removed non-salvageable material.
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. Trees to remain within cleared areas shall be trimmed of all dead branches 1-1/2 inches or more in diameter. Cut close to bole of tree and paint with acceptable tree-wound paint.

B. Topsoil: Topsoil is defined as friable clay loam surface soil found in a depth of not less than 4 inches. Satisfactory topsoil is free of subsoil, clay lumps, stones, and other objects over 1 inch in diameter, and without weeds, roots, and other objectionable material.

1. Strip topsoil in all building areas and all areas to be regraded, resurfaced, or paved within Contract Limit Lines, to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material.
2. Stockpile topsoil shall be free of trash, brush, rock/boulders over 1 inch diameter and other extraneous matter.
3. Remove heavy growths of grass from areas before stripping.
4. Where existing trees are indicated to remain, leave existing topsoil in place within drip lines to prevent damage to root system.
5. Stockpile topsoil in storage piles in areas indicated, directed or otherwise available. Construct storage piles to provide free drainage of surface water, maximum slope to be 3:1. Cover storage piles, if required, to prevent wind erosion.
6. No topsoil shall be removed from the site, until after all topsoil requirements have been met.
7. Dispose of unsuitable or excess topsoil same as specified for disposal of waste material.

C. Clearing and Grubbing:

1. Clear site of trees, shrubs and other vegetation, except for those indicated to be left standing.
2. Fell trees to be removed in a controlled, safe manner. Trim branches from bole and cut bole into manageable sections.
3. Cut off shrubs and other vegetation, to be removed, flush with original ground surface.
4. Completely remove stumps, roots, and other debris protruding through ground surface and in area(s) of new foundations, or paved improvement.
5. Remove organic and metallic debris to a depth of 3 feet below existing grade to remain or new finished grade whether lower or higher than existing grade.
6. Use only hand methods for grubbing inside drip line of trees indicated to remain. Strip grass materials under tree canopies and carefully till or scarify existing grading to a maximum depth of 1 inch.
7. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
8. Place fill material in horizontal layers not exceeding 6 inches loose depth, and thoroughly compact to a density equal to adjacent original ground.

D. Removal of Improvements:

1. Remove existing above-grade and below-grade improvements as indicated and as necessary to facilitate new construction.
2. Remove abandoned utility poles with in Contract Limit Lines. Relocate and reinstall designated utility poles, if necessary. Coordinate and cooperate with Division 16 work and local utility company.
3. Abandonment or removal of certain underground pipe or conduits may be indicated on mechanical or electrical drawings, and is included under work of

related Division 15 and 16 sections. Removal of abandoned underground piping or conduit interfering with construction is included under this Section. Record existing utility termination points before disconnecting. Close abandoned piping with 8 inch thick concrete plug(s) or mortar joined masonry bulkhead, or cap off in accordance with utility company or provider standard requirements.

4. Remove existing sidewalks, curbs, and paving, including all base material to subgrade, as required to accommodate new construction, as shown on drawings. Cut existing sidewalks, curbs, and paving in neat, straight lines to provide uniform, even transition from new to adjacent existing work. Cut back existing paving a sufficient distance to permit forming and installation of new work.
5. Remove, temporarily relocate during construction, and reinstall in final location street signs, parking meters, mail boxes, traffic signal control boxes, and other designated items as shown on Drawings. Coordinate the work with applicable governing authorities. Comply with all requirements concerning temporary installation and permanent reinstallation.
6. Raise or lower existing catch basin, inlet and manhole structures and valve box covers to accommodate new grade elevations at paved and lawn areas where indicated on Drawings. Extend structures as required. Reuse existing catch basin, inlet and manhole frames, and covers, unless noted otherwise.
7. Remove existing buildings, structures, walls, concrete pads, enclosures, or other permanent above ground structures. Salvage all material salvageable as appropriate. Dispose of all non-salvageable material offsite in an approved disposal facility in accordance with all local, state, and federal regulations.

3.3 DISPOSAL OF WASTE MATERIALS

A. Burning on Owner's Property: Burning is not permitted on Owner's property.

B. Removal from Owner's Property: Remove waste materials and unsuitable or excess topsoil from Owner's property. Remove to an approved disposal facility in accordance with all local, state, and federal regulations.

3.4 CLEANING

A. Upon completion of site preparation work, clean areas within contract limits, remove tools, and equipment. Provide site clear, clean, and free of materials and debris and suitable for site work operations.

END OF SECTION 02100

SECTION 02200 - EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and all provisions of Contract, including General Conditions, Special Provisions and Division-1 Technical Specification sections, apply to work of this section.

B. See Section 02100 for Site Preparation

C. Florida Department Of Transportation
   1. Standard Specifications for Road and Bridge Construction 2000 edition.

1.2 DESCRIPTION OF WORK

A. This Section includes the following:
   1. Excavating and backfilling of foundations within building lines.
   2. Excavating and backfilling of trenches within building lines.
   3. Excavating and backfilling for underground mechanical and electrical utilities and buried mechanical and electrical appurtenances.
   4. Site grading, including final finishing of earthwork areas as indicated on the drawings and includes, but is not limited to constructing, shaping, and finishing site earthwork.

1.3 DEFINITIONS

A. Excavation consists of removal of material to subgrade elevations indicated and subsequent disposal of materials removed.

B. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Project Engineer. Unauthorized excavation, as well as remedial work directed by Project Engineer, shall be at Contractor's expense.

   1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Project Engineer.
   2. In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Project Engineer.

C. Additional Excavation: When excavation has reached required subgrade elevations, notify Project Engineer, who will make in inspection of conditions. If Project Engineer determines that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by Project Engineer. The Contract Sum may be adjusted by an appropriate Contract Modification.

1. Removal of unsuitable material and its replacement as directed will be paid by Unit Price on basis of Conditions of the Contract relative to changes in work.

D. Subgrade: The undisturbed earth or the compacted soil layer immediately below granular subbase, drainage fill, or topsoil materials.

E. Structure: Buildings, foundations, slabs, tanks, curbs, or other man-made stationary features occurring above or below ground surface.

1.4 QUALITY ASSURANCE

A. Employ, at Contractor's expense, testing laboratory to perform soil testing and inspection service for quality control testing during earthwork operations.

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

1. Florida Department of Transportation Standard Specification for Road and Bridge Construction 2000 edition.

1.5 SUBMITTALS

A. Test Reports: Submit the following reports directly to Project Engineer from the testing services, with copy to Contractor:
1. Test reports on borrow material including gradation.
2. Verification of suitability of each footing subgrade material, in accordance with specified requirements.
3. Field reports; in-place soil density tests.
4. One optimum moisture-maximum density curve for each type of soil encountered.
5. Report of actual unconfirmed compressive strength and/or results of bearing tests of each strata tested.

B. Written assurance that the contractor performing trench excavations will comply with all applicable trench safety standards of authorities having jurisdiction.

1.6 JOB CONDITIONS

A. Dig Permit: The Contractor shall obtain a dig permit from Physical Plant Division (PPD) prior to commencing any excavation or grading.

B. Site Information: Data on indicated subsurface conditions are not intended as representations or warranties of accuracy of existing soils conditions. It is expressly understood that Owner will not be responsible for interpretations or conclusions drawn therefrom by Contractor. Data are made available for convenience of Contractor.

C. Additional test borings and other exploratory operations may be made by Contractor at no cost to Owner.

D. Existing Utilities

1. Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.
2. Movement of construction machinery and equipment over pipes and utilities during construction shall be at the Contractor's risk. Perform work adjacent to privately owned utilities in accordance with procedures outlined by the utility company. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, excavate by hand. Start hand excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines or other existing work as affected by the contract excavation until approval for backfill is granted by the Project Engineer. Report damage to utility lines or subsurface construction immediately to the Project Engineer.
3. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult Project Engineer and utilities companies immediately for directions. Cooperate with Project Engineer and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of Project Engineer.
4. Do not interrupt existing utilities serving facilities occupied and used by Owner or others, except when permitted in writing by Owner, and then only after acceptable temporary utility services have been provided as required by Owner and other utilities companies.
5. Provide a minimum of 48 hours notice to Project Engineer, and receive written notice to proceed before interrupting any utility.
6. Record any underground utilities observed, encountered or discovered that deviate from the base survey or project drawings. Keep record of any utility adjustments or deviations and provide engineer upon completion of construction for incorporation into project record documents.

E. Use of Explosives: The use of explosives is not permitted.

F. Protection of Persons and Property:
   1. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
   2. Barricade open excavations occurring as part of this work and post with warning lights.

G. Site Information: Data on indicated subsurface conditions are not intended as representations or warranties of accuracy of existing soils conditions. It is expressly understood that the Owner will not be responsible for interpretations or conclusions drawn therefrom by the Contractor. Data are made available for the convenience of the Contractor.

H. Weather limitations: Fill and backfill shall not be constructed when weather conditions detrimentally affect the quality of the finished course. Place fill and backfill only if the atmospheric temperature is above freezing in the shade and is rising. Do not construct fill and backfill in the rain or on saturated subgrades. If weather conditions are windy, hot or arid, with high rate of evaporation, schedule the placement in cooler portions of the day and furnish equipment to add moisture to the fill or backfill during and after placement.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups SM, SW and SP.

B. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups SC, ML, MH, CL, CH, OL, OH and PT.

C. Subbase Material: Naturally or artificially graded mixture of natural crushed sand containing not more than (12%) of material passing a #200 sieve.

D. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100 percent passing a 1-1/2 inch sieve and not more than 5 percent passing a No. 4 sieve.

E. Backfill and Fill Materials: Satisfactory soil materials free of clay, rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter.

F. General Backfill Adjacent to Structures: Soft, spongy, highly plastic, or otherwise unstable material is prohibited. Material shall be classified as GP, GM, GC, SP, SM, per ASTM D 2487. If more material is required than is available from on-site excavation, then provide that material from approved sources.

G. Borrow: Provide materials meeting requirements for controlled fill and controlled backfill. Obtain borrow materials in excess of those furnished from excavations described herein from sources off site.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Excavation is unclassified and includes excavation to subgrade elevations indicated, regardless of character of materials and obstructions encountered.

B. Earth Excavation includes excavation of pavements and other obstructions visible on surface; underground structures, utilities, and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as unauthorized excavation.

C. Notify the Project Engineer immediately in writing in the event that it becomes necessary to remove rock, hard material, or other material defined as unsatisfactory to a depth greater than indicated. Refill excavations cut below the depths indicated with controlled fill and compact as specified herein.

D. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F (1 degree C).

3.2 STABILITY OF EXCAVATIONS

A. General: Comply with local codes, ordinances, and requirements of agencies having jurisdiction.

B. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Provide excavation shoring and bracing where excavations occur adjacent to existing structures to preserve the existing structures without settlement of, or damage to, these existing structures.

C. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

D. Shoring and Bracing: The Contractor shall furnish the material for and do all shoring, bracing, and sheeting necessary to perform and protect the work, excavation and as required to protect adjacent structures, the public, and the Contractor's employees. Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.

3.3 DEWATERING:

A. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.

B. Do not allow water to accumulate in excavations. Remove water to prevent soil changes detrimental to stability of subgrades and foundations and to prevent erosion and sedimentation of surrounding areas. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

C. Establish and maintain temporary drainage ditches and other diversions outside excavations to convey rainwater and water removed from excavations to collection or runoff areas. Do not use trench excavations as temporary drainage ditches. Contractor shall be responsible for all dewatering operations and all damage due to flooding, erosion, sedimentation or failure of dewatering operations.

3.4 STORAGE OF EXCAVATED MATERIALS

A. Stockpile satisfactory excavated materials as approved by the Project Engineer until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage in area previously approved by Project Engineer.

B. Locate and retain soil materials away from edge of excavations. Do not store within the dripline of trees indicated to remain.

C. Owner retains the right to all excess topsoil. Contractor to locate at place designated within 5 miles of campus.

D. Dispose of excess excavated soil material and materials not acceptable for use as backfill or fill, in accordance with all applicable regulatory requirements.

3.5 EXCAVATION FOR STRUCTURES

A. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete form work, installation of services, and other construction and for inspection.

B. Excavation for footings and foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.

C. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Structures: Conform to elevations and dimensions indicated within a tolerance of plus or minus 0.10 foot; plus a sufficient distance to permit placing and removal of concrete form work, installation of services, and other construction and for inspection. Do not disturb bottom of excavations, intended for bearing surface.

3.6 EXCAVATION FOR PAVEMENT

A. Excavation for pavement shall conform to FDOT Standard Specification Section 120.

B. Cut surface under pavements to comply with cross-sections, elevations and grades as indicated.

3.7 TRENCH EXCAVATION FOR PIPES AND CONDUIT

A. Trench excavation, pipe placement, and trench backfill shall comply with the appropriate portions of FDOT Section 430-4 and the sections referenced therein with the exception of Section 430-13.

B. Excavate trenches to uniform width sufficiently wide to provide ample working room and a minimum of 6 to 9 inches of clearance on both sides of pipe or conduit.

C. Excavate trenches and conduit to depth indicated or required to establish indicated slope and invert elevations and to support bottom of pipe or conduit on undisturbed soil. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

D. Overexcavate soft, weak, or wet excavations as indicated. Use sand placed in 6 inch maximum layers to refill to the proper grade. At the Contractor's option, the excavations may be cut to an over depth of not less than 4 inches and refilled to required grade as specified.

E. For pipes or conduit less than 6 inches in nominal size, and for flat-bottomed, multiple duct conduit units, do not excavate beyond indicated depths. Hand-excavated bottom cut to accurate elevations and support pipe or conduit on undisturbed soil.

F. For pipes and equipment 6 inches or larger in nominal size, shape bottom of trench to fit

bottom pipe for 90 degrees (bottom 1/4 of the circumference). Fill depressions with tamped sand backfill. At each pipe joint, dig bell holes to relieve pipe bell of loads ensure continuous bearing of pipe barrel on bearing surface.

3.8 BACKFILL AND FILL

A. General: Place soil material in layers to required subgrade elevations, for each area classification listed below, using materials specified in Part 2 of this Section.

B. Under grassed areas, use satisfactory excavated or borrow material.

C. Under walks and pavements, use subbase material, satisfactory excavated or borrow material, or a combination.

D. Under steps, use subbase material.

E. Under building slabs, use subbase material.

F. Under piping and conduit and equipment, use subbase materials where required over rock bearing surface and for correction of unauthorized excavation. Shape excavation bottom to fit bottom 90 degrees of cylinder.

G. Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings and that are carried below bottom of such footings or that pass under the wall footings. Place concrete to level bottom of adjacent footing.

1. Concrete is specified in Division 3.
2. Do not backfill trenches until tests and inspections have been made and backfilling is authorized by Project Engineer. Use care in backfilling to avoid damage or displacement of pipe systems.

H. Backfill excavation promptly as work permits, but not until completion of the following:

1. Acceptance of construction below finish grade including, where applicable, damp proofing, waterproofing, and perimeter insulation.
2. Inspection, testing, approval, and recording locations of underground utilities have been performed and recorded.
3. Removal of concrete formwork.
4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.
5. Removal of trash and debris from excavation.
6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

3.9 PLACEMENT AND COMPACTION

A. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions and deleterious materials from ground surface prior to placement of fills. Plow

strip or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.

1. When existing ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.

B. Place backfill and fill materials in layers 6 - 12 inches in loose depth for material compacted by heavy compaction equipment, and not more than six inches in loose depth for material compacted by hand-operated tampers.

C. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

D. Place backfill and fill material evenly adjacent to structures, piping, or conduit to required elevations. Prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, conduit to approximately the same elevation in each lift.

E. Backfilling Utility Trenches: Construct backfill in two operations (initial and final) as indicated and specified in this section.

1. Place initial backfill in 6 inch maximum loose lifts to one foot above pipe or conduit unless otherwise specified. Ensure that initially placed material is tamped firmly under pipe haunches. Bring up evenly on each side and along the full length of the pipe, conduit, or structure. Ensure that no damage is done to the utility or its protective coating.
2. Place the remainder of the backfill (final backfill) in 9 inch maximum loose lifts unless otherwise specified. Compact each loose lift as specified in the paragraph entitled "General Compaction" before placing the next lift.
3. Do not backfill in freezing weather or where the material in the trench is already frozen or is muddy, except as authorized.
4. Provide a minimum cover from final grade of 3 feet for water piping and 2 feet for storm and sewer mains.
5. Where settlements greater than the tolerance allowed herein for grading occur in trenches and pits due to improper compaction, excavate to the depth necessary to rectify the problem, then backfill and compact the excavation as specified herein and restore the surface to the required elevation.
6. Coordinate backfilling with testing of utilities. Testing for the following shall be complete before final backfilling: water distribution, sanitary sewer systems.
7. Provide buried warning and identification tape installed in accordance with the manufacturer's recommendation.

F. Control soil and fill compaction providing minimum percentage of density specified for each area classification indicated below. Correct improperly compacted areas or lifts as directed by Project Engineer if soil density tests indicate inadequate compaction.

1. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentage of maximum density, in accordance with ASTM D1557:

    a. In overexcavated areas, compact to not less than 95% Modified Proctor maximum dry density (ASTM D-1557).
    b. Under structures (plus a margin of 5 feet beyond building limits) footing bottoms, building slabs and steps, compact for a minimum depth of one foot below exposed surface grade and two feet below footings and slabs on grade to a minimum of 95% of the modified Proctor (ASTM D-1557) maximum dry density.
    c. Paved Areas: Fill placed in areas to be paved shall be compacted to not less than 98% modified Proctor maximum Dry Density (ASTM D1557 Method D).
    d. Under lawn or unpaved areas compact top six inches of subgrade and each layer of backfill or fill material at 85% maximum density.
    e. Under walkways compact top six inches of subgrade and each layer of backfill or fill material at 95% maximum density.
    f. Fill and backfill placed behind retaining walls supporting slabs on grade shall, within 5 feet of the wall, be placed in thin lifts and compacted only with hand operated light-weight compactors to 95% of the Standard Proctor (ASTM D698) Maximum Dry Density. Otherwise, fill and backfill placed behind retaining walls shall be compacted to 90% of the Standard Proctor (ASTM D698) Maximum Dry Density. Heavy equipment shall not be located or operated within 5 feet of retaining walls.

G. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.

    1. Remove and replace or scarify and air dry, soil material that is too wet to permit compaction to specified density.
    2. Stockpile or spread soil material that has been removed because it is too wet to permit compaction. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.

H. Compaction:

    1. Proof Rolling: The bottom of all cleared and stripped areas and the bottom of all excavated areas shall be proof rolled with a large, fully loaded tandem axle dump truck, in the presence of a representative of the testing laboratory, to locate and identify soft spots prior to proof compaction as herein specified. Unsuitable materials in soft areas shall be removed, as approved by the testing laboratory representative, and replaced with suitable fill material as specified herein.
    2. Prior to beginning compaction, in-situ soil moisture contents may need to be controlled in order to facilitate proper compaction. If additional moisture is necessary to achieve compaction objectives, then water should be applied in such a way that it will not cause erosion or removal of the subgrade soils. A moisture content within two percentage points of the optimum indicated by the Modified Proctor test (ASTM D-1557) is recommended.
    3. Proof Compaction:

a. The bottom of all cleared and stripped building areas and the bottom of all excavated building areas, all within the extents as indicated herein, shall be densified by rolling with an 8 to 10 ton vibratory roller. At least ten overlapping passes should be made over the site, with the successive passes aligned perpendicular. Within the building areas, compaction should continue until a minimum density of 95 percent of the Modified Proctor maximum dry density (ASTM D-1557) is developed for a minimum depth of two foot below the footing bottom elevation(s) as determined by field density (compaction) tests. Within roadways and parking areas, the natural in-place soils also need to be compacted to a dry density of at least 95 percent of the Modified Proctor maximum dry density (ASTM D-1557) as tested to a depth of one foot below the stripped subgrade.
b. Rutting or pumping shall indicate unsatisfactory material and that material shall be undercut as directed by the Project Engineer, to a depth of 12 inches, and replaced with the appropriate fill material.
c. Perform proof rolling only when weather conditions permit. Do not proof roll wet or saturated subgrades. Materials degraded by proof rolling a wet or saturated subgrade shall be replaced by the Contractor as directed by Project Engineer at no cost to the Project Engineer.
d. Notify the Architect, Owner, and Project Engineer 3 days prior to proof rolling.
e. The contractor shall exercise care to avoid transmission of vibrations that could cause settlement damage or disturb occupants of nearby existing structures. Proof compaction within 25 feet of existing structures, or farther away as warranted to avoid transmission of vibrations as noted herein, shall be accomplished with a fully loaded 2 cubic yard capacity rubber tired front end loader. Any compaction effort that is anticipated to cause vibrations that may affect adjacent structures or occupants shall not be performed unless prior notification is provided to the owner and approval for compaction activity proposed is granted by the owner.

4. Control soil compaction during construction providing minimum percentages of maximum densities specified for each area classification as specified herein.
5. Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, to prevent free water appearing on surface during or subsequent to compaction operations.

6. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

   a. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry as directed by the Project Engineer. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.

8. Use hand-operated, plate-type, vibratory, or other suitable hand tampers in areas not accessible to larger rollers or compactors. Avoid damaging pipes and protective pipe coatings. Compact material in accordance with the following unless otherwise specified. If necessary, alter, change, or modify selected equipment or compaction methods to meet specified compaction requirements.

3.10 GRADING

A. Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated on the plans, or between points where elevations are indicated on the plans, or between such points and existing grades. Slopes shall be graded no steeper than 6 horizontal to 1 vertical, unless otherwise indicated on the drawings.

B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes and as follows:

1. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10 foot above and below required subgrade elevations.
2. Walks: Shape surface of areas under walks to line, grade, and cross-section, with finish surface not more than 0.10 foot above or below required subgrade elevation.
3. Pavements: Shape surface of areas under pavement to line, grade, and cross-section, with finish surface not more than 1/2" above or below required subgrade elevation.

C. Grading Surface of Fill Under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/2" when tested with a 10" straightedge.

D. Compaction: After grading compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

3.11 PREPARATION FOR TOPSOIL

A. Clear areas indicated or specified to receive topsoil of materials interfering with planting and maintenance operations. Do not place topsoil when subgrade is frozen, extremely wet or dry, or in other conditions detrimental to seeding, planting, or grading. Spread topsoil to a uniform depth of 4 inches over the designated area.

B. Spreading Topsoil: Clear areas to receive topsoil for the finished surface of materials that would interfere with planting and maintenance operations. Scarify subgrade to a depth of 2 inches. Do not place topsoil when the subgrade is frozen, extremely wet or dry, or in other conditions detrimental to seeding, planting, or grading.

3.12 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: Allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.

B. Perform field density tests in accordance with ASTM D1556 (sand cone method) or ASTM D2167 (rubber balloon method), as applicable.

1. Field density tests may also be performed by the nuclear method in accordance with ASTM D2922, providing that calibration curves are periodically checked and adjusted to

correlate to tests performed using ASTM D1556. In conjunction with each density calibration check, check the calibration curves furnished with the moisture gauges in accordance with ASTM D3017.

2. If field tests are performed using nuclear methods, make calibration checks of both density and moisture gauges at the beginning of work, on each different type of material encountered, and at intervals as directed by the Project Engineer.

C. Footing Subgrade: For each strata of soil on which footings will be placed, perform at least one test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata when acceptable to Project Engineer. Contractor will verify the minimum separation between bottom of footings and Strata 2 and 3 soils have been met.

D. Paved Areas and Building Slab Subgrade: Perform at least one field test of subgrade for every 5,000 square feet of paved area or building slab, but in no case fewer than three tests.

1. In each compacted fill layer, perform one field density test for every 5,000 square feet of overlaying building slab or paved area, but in no case fewer than three tests.
2. Foundation Wall Backfill: Perform at least two field density tests at locations and elevations as directed.
3. If in opinion of Project Engineer based on testing service reports and inspection, subgrade or fills that have been placed are below specified density, perform additional compaction and testing until specified density is obtained.

E. In pavement subgrade areas and landscaped areas the field density testing interval shall be every 7,500 square feet, with at least one test performed in non-contiguous areas.

F. In backfill for pipes, the field density testing interval shall be every 100 feet on alternating sides of the pipe.

3.13 MAINTENANCE:

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

B. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

D. Settling: Where settling is measurable or observable at excavated areas before project completion, remove surface, add backfill material, compact and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.14 DISPOSAL OF EXCESS AND WASTE MATERIALS:

A. Remove trash, debris, and waste materials and dispose of them off Owner's property.

Stockpile excess excavated material as directed by Project Engineer.

B. Dispose of excavated material in such a manner that it will not obstruct the flow of runoff, streams, endanger a partly finished structure, impair the efficiency or appearance of facilities, or be detrimental to the completed work.

END OF SECTION 02200

SECTION 02230 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Related Sections: The following sections contain requirements that relate to this Section:

1. See Section 02310 "Grading"
2. See Section 02315 “Excavation and Fill”
3. See Section 02335 “Subgrade and Roadbed”
4. See Section 02930 “Trees, Plants, and Groundcover”

1.2 SUMMARY

A. This Section includes the following:

1. Protection of existing trees to remain.
2. Protection of existing utilities to remain.
3. Removal of trees and other vegetation.
5. Topsoil stripping and stockpiling.
6. Clearing and grubbing.
7. Removing above-grade improvements as indicated on drawings.
8. Removing below-grade improvements as indicated on drawings or as determined by Project Engineer.

1.3 QUALITY ASSURANCE

A. State and local code requirements shall control the methods used to clear site and procedures for disposal of removed materials.

B. Codes and Standards: Comply with provisions of the following codes, specifications, and standards unless specifically indicated otherwise:

1. Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction 2000 edition, (FDOTSS).

C. Examine Contract Documents for all work required and coordinate and cooperate with

others so as not to delay or interfere with the work of others.

D. Employ a State of Florida licensed surveyor to stake out both horizontal and vertical control for all work prior to commencing any work operations.

1.4 PROJECT CONDITIONS

A. Traffic: Conduct site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction.

B. Explosives: The use of explosives shall not be permitted.

C. Protection of Existing Improvements and Utilities:

1. Provide protections necessary to prevent damage to existing improvements and utilities indicated to remain in place. Notify Project Engineer immediately of damage to or an encounter with an unknown existing utility line. The Contractor shall be responsible for the repairs of damage to existing utility lines that are indicated or made known to the Contractor prior to start of clearing and grubbing operations. When utility lines, which are to be removed, are encountered within the area of operations, the Contractor shall notify the applicable Utility Company or provider and the Project Engineer in ample time to minimize interruption of the service.
2. Locate existing utilities with assistance of local utility companies and public agencies.
3. Protect improvements on adjoining properties and on Owner's property.
4. Restore damaged improvements to their original condition and grades, as acceptable to property owners.

D. Protection of Existing Trees and Vegetation:

1. Protect existing trees and other vegetation indicated to remain in place, against unnecessary cutting, breaking or skinning of roots and branches, skinning or bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line.
2. Do not run heavy equipment over tree root systems.
3. Maintain minimum trench widths near root systems so as to avoid unnecessary injury.
4. Protect trees and vegetation designated to remain with temporary barricade or

fence enclosures, prior to commencement of site clearing operations. Enclosure shall be a minimum of 8 feet in radius around center of tree trunks, with large trees being protected with fencing set at edge of drip lines. Enclosure of vegetation shall be as required to prevent damage from construction activities. Maintain fencing throughout construction period, unless otherwise directed.

5. Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.
6. Provide protection for roots over 1-1/2 inch diameter that are cut during construction operations. Coat cut faces with an emulsified asphalt, or other acceptable coating, formulated for use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.
7. Repair or replace trees and vegetation indicated to remain which are damaged by construction operations, in a manner acceptable to Project Engineer. Employ a licensed arborist to repair damages to trees and shrubs at no additional cost to Owner.
8. Replace trees which cannot be repaired and restored to full-growth status, as determined by arborist with same species of equivalent size or of species and acceptable size as determined to the Project Engineer. Replacement cost to Contractor will be determined in accordance with the "Tree Evaluation Formula" published in the "Guide to Professional Evaluation of Landscape Trees, Specimen Shrubs and Evergreens" as published by the International Society of Arboriculture.

1.5 EXISTING UTILITY INFORMATION

A. Information on the drawings relating to existing utility lines and services is from the best sources presently available. All such information is furnished only for information and is not guaranteed. Excavate test pits as required to determine exact locations of existing utilities.

B. The contractor shall notify all known utility companies and providers to field locate their respective utilities in the vicinity of the project construction area. The contractor shall avoid existing utilities unless necessary to adjust or relocate due to design considerations or construction conflicts.

PART 2 - PRODUCTS

Not applicable to this Section.

PART 3 - EXECUTION

3.1 LAYOUT

A. Stake out both horizontal and vertical control for all work prior to commencing work operations. Accurately locate and maintain location of all buildings, roads, paved areas, features, etc. Advise Project Engineer of any Contract Document discrepancies, prior to commencing work.

B. Maintain benchmarks, monuments and other reference points. Re-establish benchmarks if disturbed or destroyed at no cost to Owner.

3.2 SITE CLEARING

A. General:

1. Locate and suitably identify trees and improvements to remain. Remove trees, shrubs, grass and other vegetation, snags, brush, rubbish, rock/boulders, improvements, or obstructions as required to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated. "Removal" includes transporting off-site and legally disposing of removed non-salvageable material.
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. Trees to remain within cleared areas shall be trimmed of all dead branches 1-1/2 inches or more in diameter. Cut close to bole of tree and paint with acceptable tree-wound paint.

A. Topsoil: Topsoil is defined as friable clay loam surface soil found in a depth of not less than 4 inches. Satisfactory topsoil is free of subsoil, clay lumps, stones, and other objects over 1 inch in diameter, and without weeds, roots, and other objectionable material.

1. Strip topsoil in all building areas and all areas to be regraded, resurfaced, or paved within Contract Limit Lines, to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material.
2. Stockpile topsoil shall be free of trash, brush, rock/boulders over 1 inch diameter and other extraneous matter.
3. Remove heavy growths of grass from areas before stripping.
4. Where existing trees are indicated to remain, leave existing topsoil in place within drip lines to prevent damage to root system.
5. Stockpile topsoil in storage piles in areas indicated, directed or otherwise available. Construct storage piles to provide free drainage of surface water, maximum slope

to be 3:1. Cover storage piles, if required, to prevent wind erosion.
6. No topsoil shall be removed from the site, until after all topsoil requirements have been met.
7. Dispose of unsuitable or excess topsoil same as specified for disposal of waste material.

B. Clearing and Grubbing:

1. Clear site of trees, shrubs and other vegetation, except for those indicated to be left standing.
2. Fell trees to be removed in a controlled, safe manner. Trim branches from bole and cut bole into manageable sections.
3. Cut off shrubs and other vegetation, to be removed, flush with original ground surface.
4. Completely remove stumps, roots, and other debris protruding through ground surface and in area(s) of new foundations, or paved improvement.
5. Remove organic and metallic debris to a depth of 3 feet below existing grade to remain or new finished grade whether lower or higher than existing grade.
6. Use only hand methods for grubbing inside drip line of trees indicated to remain. Strip grass materials under tree canopies and carefully till or scarify existing grading to a maximum depth of 1 inch.
7. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
8. Place fill material in horizontal layers not exceeding 6 inches loose depth, and thoroughly compact to a density equal to adjacent original ground.

C. Removal of Improvements:

1. Remove existing above-grade and below-grade improvements as indicated and as necessary to facilitate new construction.
2. Remove abandoned utility poles with in Contract Limit Lines. Relocate and reinstall designated utility poles, if necessary. Coordinate and cooperate with Division 16 work and local utility company.
3. Abandonment or removal of certain underground pipe or conduits may be indicated on mechanical or electrical drawings, and is included under work of related Division 15 and 16 sections. Removal of abandoned underground piping or conduit interfering with construction is included under this Section. Record existing utility termination points before disconnecting. Close abandoned piping with 8 inch thick concrete plug(s) or mortar joined masonry bulkhead, or cap off in accordance with utility company or provider standard requirements.
4. Remove existing sidewalks, curbs, and paving, including all base material to

subgrade, as required to accommodate new construction, as shown on drawings. Cut existing sidewalks, curbs, and paving in neat, straight lines to provide uniform, even transition from new to adjacent existing work. Cut back existing paving a sufficient distance to permit forming and installation of new work.

5. Remove, temporarily relocate during construction, and reinstall in final location street signs, parking meters, mail boxes, traffic signal control boxes, and other designated items as shown on Drawings. Coordinate the work with applicable governing authorities. Comply with all requirements concerning temporary installation and permanent reinstallation.
6. Raise or lower existing catch basin, inlet and manhole structures and valve box covers to accommodate new grade elevations at paved and lawn areas where indicated on Drawings. Extend structures as required. Reuse existing catch basin, inlet and manhole frames, and covers, unless noted otherwise.
7. Remove existing buildings, structures, walls, concrete pads, enclosures, or other permanent above ground structures. Salvage all material salvageable as appropriate. Dispose of all non-salvageable material offsite in an approved disposal facility in accordance with all local, state, and federal regulations.

3.3 DISPOSAL OF WASTE MATERIALS

A. Burning on Owner's Property: Burning is not permitted on Owner's property.

B. Removal from Owner's Property: Remove waste materials and unsuitable or excess topsoil from Owner's property. Remove to an approved disposal facility in accordance with all local, state, and federal regulations.

3.4 CLEANING

A. Upon completion of site preparation work, clean areas within contract limits, remove tools, and equipment. Provide site clear, clean, and free of materials and debris and suitable for site work operations.

END OF SECTION 02230

SECTION 02361 - TERMITE CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following for termite control:

1. Soil treatment.

B. The University will provide soil treatment to the General Contractor at no charge; the payment for this service shall be directly from the project funds to the University's Environmental Health and Safety Division (EH&S). The Contractor shall coordinate with EH&S's Pest Control Unit, and request this service at least 48 hours in advance by calling 352-392-1904 or 352-392-2365.

1.2 QUALITY ASSURANCE

A. Regulatory Requirements: Formulate and apply termiticides, and label with a Federal registration number, to comply with EPA regulations and authorities having jurisdiction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

1.3 APPLICATION, GENERAL

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

B. Soil treatment shall be required under all footings, slabs on grade, and sidewalks that adjoin new or existing buildings. Soil treatment shall not be applied until excavating, filling, compacting, and grading operations are complete.

C. The Contractor shall exercise caution to prevent disturbance of the treated area. If any area is required to be re-treated, through no fault of the Owner or Architect, it will be done at the Contractor's expense.

END OF SECTION 02361

SECTION 02511 – HOT-MIXED ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Related Work Specified Elsewhere

1. See Section 02200 for Earthwork.
2. See Section 02520 for Portland Cement Concrete Paving.
3. See Section 02530 for Sanitary Sewage Systems.
4. See Section 02630 for Storm Drainage.

C. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1. Florida Department of Transportation. Standard Specifications for Road and Bridge Construction 2000 edition.

1.2 DESCRIPTION OF WORK

A. Construction of limerock base course is included in this section.

B. Furnish all labor, material and equipment necessary to complete all placement of limerock base course and related work as shown and/or specified herein.

C. Extent of asphalt concrete paving work is shown on Drawings.

D. Asphaltic Concrete paving including FDOT Type S is included in this section.

E. Prepared aggregate sub-base is specified in earthwork sections.

F. Saw-cutting of edges of existing pavement is specified in site preparation section.

G. Furnish all labor, material and equipment necessary to complete all paving and related work as shown and/or specified herein.

1.3 SUBMITTALS

A. Certificates: Provide copies of current FDOT approvals of sources for the limerock material for base course, and current FDOT approvals for compliance with the specified requirements.

B. Job-mix formula: Prior to production of any asphaltic paving mixture, the Contractor shall

submit a mix design to the Project Engineer at least two weeks before the scheduled start of production. The information furnished shall be as described in Section 331 of the FDOT Standard Specifications.

C. Material Certificates: Provide copies of materials certificates signed by material producer and Contractor, certifying that each material item complies with, or exceeds, specified requirements for the following materials:

1. Bituminous material, coarse and fine aggregate and mineral filler for asphalt concrete.

D. Asphaltic Concrete Mix Plant Certificate: Provide copy of FDOT approval of Asphaltic concrete mix plant for compliance with the specified requirements.

E. Test Reports: Submit reports to Project Engineer for all tests as herein specified, to include surface materials.

1. Specific gravity test of asphalt
2. Coarse aggregate tests
3. Weight of slag test
4. Percent of crushed pieces in gravel
5. Fine aggregate tests
6. Specific gravity of mineral filler
7. Bituminous mixture tests

F. Field Test Reports

1. Aggregates tests
2. Bituminous mix tests
3. Pavement courses

1.4 QUALITY ASSURANCE

A. Codes and Standards:

1. Comply with Florida Department of Transportation Standard Specifications for Road and Bridge Construction, 2000 edition and with local governing regulations if more stringent than herein specified.
2. The University of Florida Construction Standards.

B. Provide material furnished by a bulk asphaltic concrete producer regularly engaged in the production of hot-mix, hot-laid asphaltic concrete paving materials.

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

D. Testing: All testing shall be performed by a qualified testing lab under the direction of a

professional engineer registered in the State of Florida. Test results shall be submitted to the Project Engineer for review. The Contractor shall bear all testing expenses.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver manufactured products in manufacturer's original, unopened, and undamaged containers with labels intact and legible.

B. Store and handle manufactured products to prevent damage and deterioration.

C. Inspect materials delivered to the site for damage and store with a minimum of handling. Store aggregates in such a manner as to prevent segregation, contamination, or intermixing of the different aggregate sizes.

1.6 SITE CONDITIONS

A. Construct asphalt concrete surface course when atmospheric temperature is above 40 degrees F (4 degrees C) and when base is dry.

B. Grade Control: Establish and maintain required lines and elevations, including crown, inverted crown, and cross-slopes, for each course during paving operations.

C. Provide temporary barricades and warning lights as required for protection of project work and public safety.

D. Protect adjacent work from damage, soiling and staining during paving operations.

1.7 EQUIPMENT

A. Paving Equipment: Spreading, self-propelled asphalt paving machines capable of maintaining line, grade and thickness shown.

B. Compacting equipment: Self-propelled rollers, minimum 10 ton weight.

C. Hand tools: Rakes, shovels, tampers, and other miscellaneous equipment required to complete the work.

1. Hand Tampers: Minimum weight of 25 pounds with a tamping face of not more than 50 square inches.
2. Mechanical Hand Tampers: Commercial type, operated by pneumatic pressure or by internal combustion.

1.8 COORDINATION:

A. Examine Drawings and Specifications for all Contracts, to determine nature of proposed construction. Perform work to conform to construction called for in such a manner as not to interfere or delay work of other Contractors.

PART 2 - PRODUCTS

2.1 GENERAL

A. Use locally available, State Department of Transportation approved materials and gradations which exhibit a satisfactory record of previous installations.

B. Limerock Material: Limerock material for limerock base course shall be supplied from an FDOT approved source and shall conform to the requirements of FDOT Section 911

2.2 LIMEROCK BASE

A. Limerock base shall be constructed in accordance with the requirements of FDOT Section 200 with the exception of Section 200-5.3, 200-6.3, 200-6.4, 200-9.1, 200-9.3, 200-10, 200-11, 200-12.

B. The limerock base course shall be compacted to a minimum density of 98% Modified Proctor Maximum Dry Density (ASTM D1557 Method D). The Modified Proctor Maximum Dry Density shall be based on limerock material specimens obtained on this specific project site. Non project specific Proctor tests shall not be used.

C. Place base material on dry subgrade in lifts from minimum 6" to maximum 12". Remove all subgrade material churned or mixed with foundation course and replace as necessary at Contractor's expense.

D. Grades for base course shall be +/- .25" of required grades.

E. Remove loose and foreign material from compacted foundation course immediately before application of surface materials.

2.3 HERBICIDE TREATMENT

A. Use commercially available chemical for weed control, registered by Environmental Protection Agency. Provide granular, liquid or wettable powder form, labeled for use under asphaltic concrete pavement surfaces. Material shall not damage trees and plants adjacent to pavement surfaces.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. Allied Chemical Corp.
2. Achem Products, Inc.
3. Ciba-Geigy Corp.
4. Dow Chemical U.S.A.
5. E.I. DuPont De Nemours & Co., Inc.
6. FMC Corp.

7. Thompson-Hayward Chemical Co.
8. U.S. Borax and Chemical Corp.

2.3 AGGREGATES

A. Grade and proportion aggregates and filler so that combined mineral aggregate conforms to specified grading.

B. Course aggregate shall be supplied from FDOT approved sources and shall conform to the requirements of FDOT Section 901 and the referenced provisions of Section 331 for aggregates to be used in asphaltic concrete.

C. Fine aggregate shall be supplied from FDOT approved sources and shall conform to the requirements of FDOT Section 902 and the referenced provisions of Section 331 for fine aggregates to be used in asphaltic concrete.

D. Mineral filler shall conform to the requirements of FDOT Section 917 and the referenced provisions of Section 331.

2.4 ASPHALTIC CONCRETE:

A. General: Asphaltic Concrete shall be Type S-I and Type S-III as indicated on the plans.

B. Type S-I Asphaltic Concrete: Type S-I asphaltic concrete shall conform with the requirements of FDOT Section 331 and the Sections referenced therein with the exception of references to acceptance of work on a lot by lot basis in Section 331-1 and references to reclaimed asphalt pavement in Section 331-4 and with the exception of Sections 331-6.1, 331-6.3 and 331-7 and other references to payment as detailed below.

C. Type S-III Asphaltic Concrete: Type S-III asphaltic concrete shall conform with the requirements of FDOT Section 333 and the Sections referenced therein with the exception of references to acceptance of work on a lot by lot basis in Section 333-1 and payment and references to reclaimed asphalt pavement in Section 331-4 and with the exception of Sections 333-1, 333-6.2 and other references to payment as detailed below.

D. Bituminous material shall conform to FDOT Section 916-1 for Asphalt Cement Viscosity Grade AC-20 or AC-30 with the exception that material failing to meet the viscosity requirements will be rejected.

PART 3 - EXECUTION

3.1 PREPARATION

A. Refer to FDOT Standard Specifications Section 330-8.

3.2 PLACING MIX

A. Refer to FDOT Standard Specifications Section 330-9.

3.3 COMPACTING MIXTURE

A. Refer to FDOT Standard Specifications Section 330-10, with the exception of 330-10.3.3 and 330-10.3.4

3.4 JOINTS.

A. Refer to FDOT Standard Specifications Section 330-11.

3.5 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: Allow testing service to inspect, test and approve limerock base before further construction work is performed as indicated herein.

B. Testing:

1. The limerock base shall be tested for field density with one test taken every 7,500 square feet or portion thereof at locations designated by the Project Engineer.
2. Field density checks shall be performed by either the Sand Cone Method ASTM D 1556 or the Nuclear Density Method ASTM D 2922.
3. As required by the Project Engineer, the asphaltic concrete finished surface shall be checked for irregularities according to FDOT Section 330-12.3 with the exception of references to payments or pay quantities. As required by the Project Engineer, the pavement thickness shall be checked in accordance with FDOT Section 330-14 and 330-15 with the exception of references to payments or pay quantities.
4. At the option of the Project Engineer, stability of asphaltic concrete determined according to ASTM D1559, extraction tests for asphaltic concrete according to ASTM D1856 or ASTM D2172, and in-place density tests of pavement according to ASTM D2950 shall be performed.

C. If in the opinion of the Project Engineer, based on testing service reports and inspection, for asphaltic concrete surface course, which have been placed and do not meet specified requirements, provide corrections and additional testing at no additional expense.

3.6 PROTECTION

A. Refer to FDOT Standard Specifications Section 330-13 for protection of finished surface.

3.7 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work.

Remove from site all excess materials, debris, and equipment. Repair damage resulting from paving operations.

B. Sweep pavement and wash free of stains, discolorations, dirt, and other foreign material immediately prior to final acceptance.

END OF SECTION 02511

SECTION 02515 – UNIT PAVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Related Work Specified Elsewhere

1. See Section 02200 for Earthwork.
2. See Section 02511 for Hot-Mixed Asphalt Paving.
3. See Section 02520 for Portland Cement Concrete Paving.
4. See Section 02530 for Sanitary Sewage Systems.
5. See Section 02630 for Storm Drainage.

C. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1. Florida Department of Transportation. Standard Specifications for Road and Bridge Construction 2000 edition.

1.2 DESCRIPTION OF WORK

A. Construction of exterior brick pavers over a prepared setting bed is included in this section.

B. Furnish all labor, material and equipment necessary to complete all placement of pavers and related work as shown and/or specified herein.

C. Extent of brick paver work is shown on Drawings.

D. Prepared base is specified in earthwork sections.

E. Furnish all labor, material and equipment necessary to complete all paver and related work as shown and/or specified herein.

1.3 QUALITY ASSURANCE

A. Construction Tolerance: Unit-to-unit offset tolerance of 1/32 inch from flush an d 1/8 inch in 10 feet from level or required slope.

B. Construction Tolerance: Unit-to-unit offset tolerance of 1/16 inch from flush, 1/8 inch in 2 feet and 1/4 in 10 feet from level or required slope

C. Comply with Florida Department of Transportation Standard Specifications for Road and Bridge Construction, 2000 edition and with local governing regulations if more stringent than herein specified and the University of Florida Construction Standards.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver manufactured products in manufacturer's original, unopened, and undamaged containers with labels intact and legible.

B. Store and handle manufactured products to prevent damage and deterioration.

C. Inspect materials delivered to the site for damage and store with a minimum of handling.

1.6 SITE CONDITIONS

A. Construct brick paver surface course when base is dry.

B. Grade Control: Establish and maintain required lines and elevations, including crown, inverted crown, and cross-slopes, for each course during paving operations.

C. Provide temporary barricades and warning lights as required for protection of project work and public safety.

D. Protect adjacent work from damage, soiling and staining during paving operations.

1.7 EQUIPMENT

A. Compacting equipment: Vibratory compactor.

B. Hand tools: Rakes, shovels, tampers, and other miscellaneous equipment required to complete the work.

1. Hand Tampers: Minimum weight of 25 pounds with a tamping face of not more than 50 square inches.
2. Mechanical Hand Tampers: Commercial type, operated by pneumatic pressure or by internal combustion.

1.8 COORDINATION:

A. Examine Drawings and Specifications for all Contracts, to determine nature of proposed construction. Perform work to conform to construction called for in such a manner as not to interfere or delay work of other Contractors.

PART 2 - PRODUCTS

2.1 GENERAL

A. Brick Pavers:

1. Class: ASTM C902, Weather Class SX for use subject to freezing application
2. Traffic Type: ASTM C 902, Traffic Type II for exterior commercial walkways use.
3. Application: ASTM C 902, Application Type PS for general use application

B. Mortar and Grout:

1. Mortar: Portland cement and lime setting-bed mortar, ASTM C 270, Type M.
2. Bond Coat: Latex-modified Portland cement slurry.
3. Grout: Latex-modified Portland cement grout.
4. Integral Color: Pigment additive.

C. Edge Restraints: Commercial steel edging with loops for support stakes.

D. Setting Bed: Ungrouted mortarless setting bed over filter fabric and stone dust bed and prepared sub-base.

E. Joint Treatment: Hand-tight joints with sand filler.

PART 3 - EXECUTION

3.1 PREPARATION

A. Base to be placed in accordance with Section 02520 contained herein.

3.2 PLACING PAVERS

A. Setting base to be placed within specified tolerances.

B. Unit pavers to be placed within specified tolerances and set in a pattern as described by construction drawings.

C. Joint treatment sand to be spread across the surface of the brick pavers for joint filling.

D. Vibratory compactor to be used to settle brick pavers in the setting bed to final grade. Finished surface grade for the unit pavers shall be within the specified tolerances.

3.6 PROTECTION

A. Refer to FDOT Standard Specifications Section 330-13 for protection of finished surface.

3.7 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, debris, and equipment. Repair damage resulting from paving operations.

B. Sweep pavers and wash free of stains, discolorations, dirt, and other foreign material immediately prior to final acceptance.

END OF SECTION 02515

SECTION 02520 – PORTLAND CEMENT CONCRETE PAVING

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.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. See Section 02200 for Earthwork.

1.2 DESCRIPTION OF WORK

A. Portland cement concrete paving as shown on Drawings, including pavement, parking areas, driveways, curbs, gutters, walkways, and pads.

1.3 SUBMITTALS

A. Shop Drawings: Layout of concrete pavement score lines and expansion joints.

B. Test Reports: All test reports required by this section and referenced related sections.

C. Certification: Written "Certificate of Compliance", signed by Contractor, that all concrete paving and curb materials and products, to be used on this project will comply with Standards referenced in the Specifications.

D. Samples: Where exposed aggregate treatments are used, exposed aggregate sample panel(s), approximately three (3) feet square, fabricated with specified materials and demonstrating the color, texture, pattern, edging and joint treatments proposed for use on this project. Accepted panel will be used to set quality standard for all related work on this project.

1. If so accepted by the Architect, sample panel(s) may be cost as, and remain as part of the work. Unaccepted panels must be removed from the work.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Comply with local codes if more stringent than herein specified. Comply with Florida Department of Transportation Standard Specifications for Road and Bridge Construction, 2000 Edition, (FDOTSS), except as otherwise specified herein.

B. Do not change source of brands of cement and aggregate materials during course of the work.

C. Maintain accurate field records of time, date of placing, curing and removal of forms for

concrete work in each portion of the work.

D. Construction Tolerance: 1/8 inch in 10 feet for grade and alignment of top forms; 1/4 inch in 10 feet for vertical face on longitudinal axis.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store decorative exposed aggregates in segregated area to prevent mixing with foreign materials.

B. Deliver curing materials, admixtures, and retarders in manufacturer's standard, unopened containers with labels legible and intact. Store and protect from freezing and damage.

1.6 PROJECT CONDITIONS

A. Establish and maintain required lines and grade elevations.

B. Do not install concrete work over wet, saturated, muddy or frozen subgrade.

C. Protect adjacent work.

D. Provide temporary barricades, warning lights and signs as required for protection of work and public safety.

1.7 COOPERATION

A. Examine Drawings and Specifications for all Contracts, to determine nature of proposed construction. Perform work to conform with construction called for in such a manner as not to interfere or delay work of other Contractors.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Forms: Steel, wood, or other suitable material of sufficient size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion, defects and of height equal to full depth of concrete work.

1. Use flexible spring steel forms or laminated boards to form radius bends as required.

B. Coat forms with a non-staining form release agent that will not discolor or deface surface of concrete.

C. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A 185. Refer to Division 3 Section "Concrete Reinforcement".

1. Furnish in flat sheets, not rolls, unless otherwise acceptable to Architect.

D. Reinforcing Bars: New deformed steel bars, ASTM A 615, Grade 60.

E. Concrete Materials: ASTM C 150, Typ 1, Portland cement; ASTM C 33, normal weight aggregates; potable water. Comply with requirements of applicable Division 3 sections for concrete materials, admixtures, bonding materials, curing materials, and others as required.

1. For concrete pavement use Class I concrete per FDOTSS Section 346 with a minimum compressive strength of 4000 psi at 28 days, 6 percent (plus or minus 1 percent) air entrained unless otherwise indicated.
2. For sidewalks, curb and gutters, concrete pads and other miscellaneous concrete site work, use Class I concrete per FDOTSS Section 346.

F. Expansion Joint Materials: Comply with requirements of the following for preformed expansion joint fillers and sealers:

1. Fillers: Preformed expansion joint fillers conforming to ASTM D-1752, ½" thickness. Filler material(s) selected must be compatible with sealant(s) to be used when applicable, and suitable for intended use.

2. Sealants: Meeting requirements of ASTM C920, Type M, Grade P or NS as required by application, Class 25, Use T, Color: gray, unless otherwise indicated.

G. Liquid-Membrane Forming and Sealing Curing Compound: Comply with ASTM C 309, Type I, Class A unless other type acceptable to Architect. Moisture loss no more than 0.055 gr./sq. cm. when applied at 200 sq. ft./gal.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

a. "Masterseal"; Master Builders.
b. "A-H 3 Way Sealer"; Anti-Hydro Waterproofing Co.
c. "Ecocure"; Euclid Chemical Co.
d. "Clear Seal"; A. C. Horn.
e. "J-20 Acrylic Cure"; Dayton Superior.
f. "Sure Cure"; Kaufman Products Inc.
g. "AR -30"; W.R. Meadows.
h. "Spartan-Cote"; The Burke Co.
i. "Sealkure"; Toch Div. - Carboline.
j. "Kure-N-Seal"; Sonneborn-Contech.
k. "Polyclear"; Upco Chemical/USM Corp.
l. "L&M Cure"; L & M Construction Chemicals.
m. "Klearseal"; Setcon Industries.
n. "LR-152"; Protex Industries.
o. "Hardtop"; Gifford - Hill.

H. Bonding Compound: Polyvinyl acetate or acrylic base, rewettable type.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

a. "J-40 Bonding Agent"; Dayton Superior Corp.
b. "Weldcrete"; Larsen Products.
c. "Intralok"; W.R. Meadows.
d. "Everbond"; L & M Construction Chemicals.
e. "EucoWeld"; Euclid Chemical Co.
f. "Hornweld"; A. C. Horn.
g. "Sonocrete"; Sonneborn-Contech.
h. "Acrylic Bondcrete"; The Burke Co.

I. Epoxy Adhesive: ASTM C 881, 2-component material suitable for use on dry or damp surfaces. Provide material "Type", "Grade", and "Class" to suit project requirements.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include but are not limited to the following:

a. "Epoxtite"; A. C. Horn.
b. "Edoco 2118 Epoxy Adhesive"; Edoco Technical Prod.
c. "Sikadur Hi-Mod"; Sika Chemical Corp.
d. "Euco Epoxy 463 or 615"; Euclid Chemical Co.
e. "Patch and Bond Epoxy"; The Burke Co.
f. "Sure-Poxy"; Kaufman Products Inc.

2.2 PAVEMENT MARKING PAINT

A. Traffic marking paint by Sherwin Williams; Traffic Paint by Pratt and Lambert, Inc.; Hi-Hide Plexicolor line paint by California Products Corporation, or approved equal.

1. Colors: As specified on the drawings.

PART 3 - EXECUTION

3.1 SUBGRADE PREPARATION

A. REFER TO SECTION 02200 Earthwork.

3.2 FORM CONSTRUCTION

A. Set forms to required grades and lines, braced and secured. Install forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.

1. Check completed formwork for grade and alignment to following tolerances:

    a. Top of forms not more than 1/8 inch in 10 feet.
    b. Vertical face on longitudinal axis, not more than 1/4 inch in 10 feet.

2. Clean forms after each use and coat with form release agent as required to ensure separation from concrete without damage.
3. Slope step treads at 1/4 inch per foot to drain.
4. Pitch walks/pads to have a minimum of 1/8 inch/ft. cross-slope, pitched toward low points.

3.3 REINFORCEMENT

A. Locate, place, and support reinforcement as specified in Division 3 sections, unless otherwise indicated.

    1. Install slip bars at all expansion joints.

3.4 CONCRETE PLACEMENT

A. General: Comply with requirements of Division 3 sections for mixing and placing concrete, as well as FDOTSS Section 350, and as herein specified.

B. Do not place concrete until subbase and forms have been checked for line and grade. Moisten subbase if required 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.

C. Place concrete by methods that prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.

D. Use bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

E. Deposit and spread concrete in a continuous operation between transverse joints as far as possible. If interrupted for more than ½ hour, place a construction joint.

F. When adjacent pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained sufficient strength to carry loads without injury.

G. Curbs and Gutters: Automatic machine may be used for curb and gutter placement at Contractor's option. If machine placement is to be used, submit revised mix design and laboratory test results that meet or exceed minimums specified. Machine placement must produce curbs and gutters to required cross-section, lines, grades, finish, and

jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified.

3.5 JOINTS

A. General: Construct expansion, weakened-plane (contraction), and construction joints true to line with face perpendicular to surface of concrete. Construct transverse joints at right angles to the center line, unless otherwise indicated.

1. When joining existing structures, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Weakened-Plane (Contraction) Joints: Provide weakened-plane (contraction) joints, sectioning concrete into areas as shown on drawings. Construct weakened-plane joints for a depth equal to at least 1/4 concrete thickness, as follows:

1. Tooled Joints: Form weakened-plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer.

2. Sawed Joints: Form weakened-plane joints with powered saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut joints into hardened concrete as soon as surface will not be torn, abraded, or otherwise damaged by cutting action.

3. Inserts: Use embedded strips of metal or sealed wood to form weakend-plane joints. Set strips into plastic concrete and carefully remove strips after concrete has hardened.

C. Walks/Pads: Score joints at approximately 5 ft. on center, unless otherwise noted on Plans. Use tool that produces "V" joint not over 1/4" wide.

D. Concrete Curbs: Score joints at approximately 5 ft. on center matching, as closely as possible, abutting walk joints. Use tool that produces "V" joint not over 1/4" wide.

E. Construction Joints: Place construction joints at end of placements and at locations where placement operations are stopped for more than ½ hour, except where such placements terminate at expansion joints.

1. Construct joints as shown or, if not shown, use standard metal keyway-section forms.
2. Where load transfer-slip dowel devices are used, install so that one end of each dowel bar is free to move.

F. Expansion Joints: Provide premolded joint filler for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structures, walks, and other fixed objects, unless otherwise indicated.

1. Locate expansion joints in step construction where indicated on Drawings.
2. Locate expansion joints at maximum intervals of 30 ft. on center and at all beginnings and ends of radius at curbs. Match abutting walk expansion joints as much as possible.
3. Locate expansion joints at 50 feet o.c. for each pavement lane unless otherwise indicated.
4. Locate expansion joints at a maximum of every 225 sq. ft. of drive/pads with a minimum dimension one way between joints of 10 lin. ft.
5. Locate expansion joints at a maximum of 150 sq. ft. of walks/pads, except that maximum dimensions between joints in a linear walk to be no more than 30 ft.

G. Extend joint fillers full width and depth of joint, not less than ½ inch or more than 1 inch below finished surface where joint sealer is indicated. If no joint sealer, place top of joint filler flush with finished concrete surface.

H. Furnish joint fillers in one-piece lengths for full width being placed wherever possible. Where more than one length is required, lace or clip joint filler sections together.

I. Protect top edge of joint filler during concrete placement with a metal cap or other temporary material. Remove protection after concrete has been placed on both sides of joint.

J. Fill joints, with sealant, flush with top surfaces and tool concave, unless otherwise indicated.

K. Fillers and Sealants: Comply with requirements of applicable Division 7 sections for preparation of joints, materials, installation, and performance.

3.6 FIELD QUALITY CONTROL

A. Provide field quality control testing and inspection during concrete operations, utilizing Geotechnical Engineer and Testing Laboratory at contractor’s expense.

B. Contractor shall provide adequate notice, cooperate with, and provide access to the work, obtain samples, and assist the Geotechnical Engineer or their representatives in execution of their function.

C. Testing

1. Provide slump test on first load of concrete delivered each day and whenever requested due to changes in consistency or appearance of concrete.

2. Provide air indicator tests and air meter tests for all air-entrained concrete.

a. Perform air indicator test with a "Chase" AE 35 or equal air indicator, and air meter test in accordance with ASTM C231 or C173. Test first load of concrete delivered each day.

b. Furnish copies of field records and tests reports as listed for strength tests.

3. Strength testing:

    a. Provide 1 set of 3 test specimens for each 50 cu. yd. placed in any one day. Secure samples in accordance with ASTM C172 and mold specimens in accordance with ASTM C31.

    b. Test 1 specimen at 7 days and 2 specimens at 28 days in accordance with ASTM C39.

    c. Furnish copies of field records and test reports as follows:

        (1) 2 copies to Architect

        (2) 1 copy to Contractor

        (3) 1 copy to Ready Mix Supplier

    d. Record the exact location of the concrete in the work represented by each set of cylinders and show on test reports.

    e. Provide an insulated moist box for protection of the test cylinders until shipped to the laboratory.

D. Finishing and Sealing - See Division 3. Screed to grade and wood float, edge all sides, fine broom finish (except where otherwise indicated) and seal.

3.7 CONCRETE FINISHING

A. After striking-off and consolidating concrete, smooth surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.

B. After floating, test surface for trueness with a 10-ft. straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous smooth finish.

C. Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool, and round to ½-inch radius, unless otherwise indicated. Eliminate tool marks on concrete surface.

D. After completion of floating and when excess moisture or surface sheen has disappeared, complete troweling and finish surface as follows:

    1. All flatwork to receive a fine broom finish by drawing a fine-hair broom across concrete surface perpendicular to line of traffic. Repeat operation if required to provide a fine line texture acceptable to Architect.

a. On inclined slab surfaces, provide a coarse, non-slip finish by scoring surface with a stiff-bristled broom, perpendicular to line of traffic.

3.8 CURING

A. Protect and cure finished concrete paving in compliance with applicable requirements of Division 3 sections. Use membrane-forming curing and sealing compound or approved moist-curing methods.

3.9 PAINTING OF PAVEMENT MARKINGS

A. Over clean pavement, following application and curing of sealer, apply parking line stripes and other pavement markings as indicated, per manufacturer's recommendations.

B. Apply by brush or zone marking equipment, one coat.

3.10 REPAIRS AND PROTECTIONS

A. Repair or replace broken or defective concrete, as directed by Architect.

B. Drill test cores where directed by Architect when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage until acceptance of work. Concrete shall be protected from all stains. This includes gas, oil, diesel fuel spills, food and drink spills, tobacco juice, cutting oil from pipe work, and any other miscellaneous staining formed during construction. All staining shall be removed and cleaned prior to being accepted by the owner.

D. 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.

E. Sweep concrete walks and pavement and wash free of stains, discolorations, dirt, and other foreign material prior to final inspection.

F. Concrete work will not be accepted if damaged, cracked, uneven, stained or improperly graded.

END OF SECTION 02520

SECTION 02530 - SANITARY SEWAGE SYSTEMS

PART 1 -- GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. See Section 02200 for Earthwork.

1.2 DESCRIPTION OF WORK

A. Installation of all work necessary to provide sanitary sewer service to within 5 feet of the exterior of the building. Extent of sanitary sewage systems work is indicated on drawings and schedules, and by requirements of this section.

1.3 SUBMITTALS

A. Product Data: Submit complete materials list of items proposed for the work. Submit piping and sewer structures product data.

B. Sanitary Sewer Record Drawings: Legibly mark drawings to record actual construction. Indicate horizontal and vertical locations, referenced to permanent surface improvements. Identify field changes of dimension and detail and changes made by change order.

C. Certification: For all materials specified to comply with reference standards, submit Certificate of Compliance.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of sanitary sewage system's products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Materials and methods of construction shall comply with the following standards:

1. American Water Works Association, (AWWA).
2. American Society for Testing and Materials, (ASTM).
3. American Association of State Highway and Transportation Officials, (AASHTO).
4. American Concrete Pipe Association, (ACPA).
5. Comply with all rules, regulations, or ordinances having jurisdiction over this work. In absence of local codes, comply with the Uniform Plumbing Code.
6. The University of Florida Construction Standards.
7. Gainesville Regional Utilities (GRU) Construction Standards.
8. Florida Department of Transportation Standard Specifications for Road and Bridge

Construction, 1991 edition, (FDOTSS).

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle piping and accessories to prevent damage and deterioration. Materials shall not be stored directly on the ground. The inside of pipes and fittings shall be kept free of dirt and debris. Gasket materials and plastic materials shall be protected from exposure to the direct sunlight. Storage facilities for plastic pipe, fittings, joint materials and solvents shall be classified and marked in accordance with NFPA No. 704 with classification as indicated in NFPA No. 49 and NFPA No. 325M.

1.6 COORDINATION

A. Coordinate locations and inverts of sanitary sewer lines at 5 feet outside building with Division 15.

1.7 PROJECT CONDITIONS

A. Known underground and surface utility lines are indicated on the drawings.

B. Protect existing trees, plant, lawns, and other features designated to remain as part of the landscape work.

C. Barricade open excavations and post warning lights at work adjacent to public streets and walks.

D. Promptly repair damage to adjacent facilities caused by sanitary sewer earthwork operations. Cost of repair at Contractor's expense.

E. Promptly notify the Project Engineer of unexpected sub-surface conditions.

1.8 COOPERATION

A. Examine Drawings and Specifications for all Contracts to determine the nature of proposed construction. Perform work to conform with construction called for in such a manner as not to interfere or delay work of other Contractors.

PART 2 -- PRODUCTS

2.1 IDENTIFICATION:

A. Underground-Type Plastic Line Markers: Manufacturer's standard permanent, bright-colored, continuous-printed plastic tape, intended for direct-burial service; not less than 6" wide x 4 mils thick. Provide green tape with black printing reading "CAUTION SEWER LINE BURIED BELOW".

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering identification markers which may be incorporated in the work include, but are

not limited to, the following:

a. Allen Systems, Inc.
b. Emed Co., Inc.
c. Seton Name Plate Corp.

B. Tracer Wire: 14 gauge insulated tracer wire shall be attached to all non-metallic piping.

2.2 PIPES AND PIPE FITTINGS:

A. General: Provide pipes of one of the following materials, of weight/class indicated. Provide pipe fittings and accessories of same material and weight/class as pipes, with joining method as indicated.

B. Gravity Sewer Piping:

1. Polyvinyl Chloride (PVC) Pipe: Gravity Sewer Pipe per ASTM D3034, SDR 35.
2. Fittings shall conform to ASTM D3034 for gravity sewer pipe fittings.

C. Joints for Gravity Sewer Piping:

1. PVC Pipe: Integral Elastomeric bell joints and couplings complying with ASTM D3212 using elastomeric seals complying with ASTM F477.

2.3 Manholes and Structures

A. Frames and Covers: ASTM A48 gray cast-iron, asphalt coated, with lettering cast into top reading "SANITARY SEWER".

1. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

a. Neenah Foundry Co., Neenah, WI.
b. US Foundry, Miami, FL.

B. Concrete Masonry Units: ASTM C139.

C. Manhole Brick: ASTM C32, Grade MS.

D. Precast Concrete Manhole Barrels and Cones: ASTM C478, 5" wall thickness with ASTM C443 "0" - ring gasket joints
1. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

a. Southern Pre-cast, Inc., Alachua, FL.
b. Taylor Pre-cast, Green Cove Springs, FL.
c. Southern Culvert, Jacksonville, FL.

E. Mortar

1. Mortar for laying and parging concrete masonry: 1 part portland cement and 2 parts sand.
2. Mortar for brickwork: 1 part portland cement, ½ part hydrated lime, and 4-1/2 parts sand.

F. Manhole Rungs: Where specified, rungs or steps shall be polyvinyl chloride, polyethylene, fiberglass, or other non-corrosive material.

G. Manhole Drop Assembly: The vertical drop pipe and sweep shall be made from polyvinyl chloride (PVC) sewer pipe and fittings as specified herein. The fitting required for this work shall be molded PVC tees, plugs, and adapters. To the inside end of the tee, a threaded adapter shall be solvent welded, utilizing fresh solvent cement, made by the fittings manufacturer, containing at least 15 percent by weight of the same PVC compound used in making the fittings. Outside drop assemblies shall be encased in concrete as indicated on drawings.

H. Bedding Material: Clean subbase material conforming to requirements in Section 02315.

I. Backfill Material: As specified in Section 02315.

J. Pipe Connections: The precast reinforced concrete manhole sections shall be provided with circular openings at the locations and elevations for the proper connection of all pipes. Unless otherwise indicated, all PVC pipe connections shall be sealed with a flexible manhole seal assembly, per ASTM C-923. Flexible manhole seal assemblies shall permit at least an eight (8) degree deflection from the centerline of the opening in any direction while maintaining a watertight connection.

PART 3 -- EXECUTION

3.1 PREPARATION

A. Permits and Inspections: File all Drawings and obtain all necessary permits, licenses, and inspections required by authorities having jurisdiction over the work.

B. Layout sanitary sewer work and establish extent of excavation by area and elevation. Designate and identify datum elevation and project engineering reference points. Set required lines, levels and elevations.

C. Do not cover or enclose work of this Section before obtaining required inspections, test, approvals, and location recording.

D. Remove existing paving, including base material, as required to accommodate sanitary sewer work. Saw cut existing paving to provide uniform straight transition at new to existing paving.

3.2 EXISTING UTILITIES

A. Before starting excavation, establish the location and extent of underground utilities in the work area. Exercise care to protect existing utilities during earthwork operations. Perform excavation work near utilities by hand and provide necessary shoring, sheeting, and supports as work progresses.

B. Protect active utility services uncovered by excavation.

3.3 INSTALLATION OF IDENTIFICATION:

A. General: During back-filling of sanitary sewage systems, install continuous underground-type plastic line marker located directly over buried line at approximately 12” below finished grade.

B. During pipe laying of non-metallic piping, 14 gauge insulated tracer wire shall be installed as an attachment to the pipe prior to backfilling.

3.4 HANDLING PIPE:

A. Pipe and accessories shall be handled so as to insure delivery to the trench in sound, undamaged condition. Particular care shall be taken not to injure the pipe coating or lining. If the coating or lining of any pipe or fitting is damaged, the repair shall be made by the Contractor at his expense in a satisfactory manner. No other pipe or material of any kind shall be placed inside a pipe or fitting after the coating has been applied. Pipe shall be carried into position and not dragged. Use of pinch bars and tongs for aligning or turning pipe will be permitted only on the bare ends of the pipe. The interior of pipe and accessories shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations by plugging or other approved method. Before installation, the pipe shall be inspected for defects. Material found to be defective before or after laying shall be replaced with sound material without additional expense to the Owner. Rubber gaskets that are not to be installed immediately shall be stored in a cool and dark place.

3.5 CUTTING OF PIPE:

A. Cutting of pipe shall be done in a neat and workmanlike manner without damage to the pipe. Cutting shall be done with an approved type mechanical cutter. Wheel cutter shall be used when practical. Squeeze type mechanical cutters shall not be used for ductile iron.

3.6 LOCATING SEWER LINES NEAR WATER LINES:

A. Where the location of the sewer is not clearly defined by dimensions on the drawings, the sewer shall not be laid closer horizontally than 10 feet from the water pipe except where the bottom of the water pipe will be at least 18" above the top of the sewer pipe, in which case the sewer shall not be laid closer horizontally than 6 feet from the water pipe. Where gravity-flow sewers cross above water lines, the sewer pipe for a distance of at least 10 feet on each side of the crossing shall be fully encased in concrete or shall be made of pressure pipe. The minimum cover of the concrete encasement including that at the pipe joints shall not be less than 6" unless otherwise indicated on the drawings.

Water and sanitary line crossings shall be at the mid points of full lengths of both pipes.

3.7 CROSSING ROADWAY DITCHES:

A. Where sewer lines cross a ditch with less than three feet of cover, ductile iron pipe with appropriate end fittings shall be provided for a distance of 9 feet on each side of the crossing as shown on detail drawings.

3.8 SEWER LINES AT STRUCTURES;

A. Where shown on the drawings, the sewer pipe shall be sleeved as required. Care shall be exercised and proper precautions taken during installation of the sewer pipe and sleeve to assure that there will be no damage to such structures and no settlement or movement of foundations or footings. Any damage occurring as a result of the Contractor's operation shall be corrected and all costs connected there with shall be borne by the Contractor. When the sewer pipe location is within 3 feet of a proposed building, retaining wall, or structural foundation as stated above, the pipe shall be sleeved as required for an existing structure.

3.9 TRENCHING

A. Perform excavating and backfilling as required to install sanitary sewer work. Trenching, excavation, and backfilling shall be performed in accordance with manufacturer’s recommendations and Section 02315.

B. Provide trench wall support and pumping of surface and ground water as required to provide suitable conditions for performing the work.

C. Excavate trenches to accommodate indicated bedding conditions and material. Trim and shape trench bottoms to proper line and grade, free of irregularities. Remove unstable material and replace with compacted fill.

3.10 PLACING AND LAYING OF PIPE

A. Pipe shall be protected during handling against impact shocks and free fall and the pipe interior shall be free of extraneous material.

B. Gravity Sewer Piping

1. Pipe laying shall proceed upgrade with the spigot ends of bell-and-spigot pipe pointing in the direction of the flow. Each pipe shall be laid accurately to the line and grade shown on the drawing by use of a laser projector in the downstream manhole. Lay and fit pipe with sealed joints and full bearing in bedding material. Laser alignment shall be set as directed by the Contractor's surveyor. Blowers shall be utilized to assure uniform temperatures within the pipe to keep laser beam straight. Pipe shall be laid and centered so that the sewer has a uniform invert. As the work progresses, the interior of the sewer shall be cleared of all superfluous materials.
2. Before making pipe joints, all surfaces of the portions of the pipe to be joined shall be clean and dry. Lubricants, and primers, shall be used as recommended by the pipe

manufacturer. The joints shall then be placed, fitted, joined, and adjusted so as to obtain the degree of water tightness required.

3. Installation of PVC pipe shall be installed in accordance with ASTM D2321 and ASTM F402, and all required precautions shall be taken to assure adequate trench ventilation and protection for workers installing the pipe.

C. Trenches shall be kept free of water and as dry as possible during bedding, laying, and jointing and for as long a period as required. When work is not in progress, open ends of pipe and fittings shall be satisfactorily closed so that no trench water or other material will enter the pipe or fittings.

D. Install pipe joint gaskets in accordance with manufacturer's recommendations.

E. Cut pipe ends entering structures flush with inner face of structures.

F. Extend sanitary sewer system as shown on drawings and make required connection.

G. Backfill trenches to subgrade with material as specified under Section 02335.

1. Backfill trenches in 6" compacted layers until there is a cover of not less than 24" over piping. Place remaining backfill material in 12" compacted layers.
2. Backfill evenly on both sides of piping for its full depth. Provide thorough compaction of fill under pipe haunches.
3. Provide granular backfill at all paved areas and in building areas, per Section 02315.

H. Mechanically compact backfill in accordance with Section 02315 requirements. Water settling, puddling, and jetting as a compaction method are not acceptable.

I. Fill, compact, and restore to subgrade level and condition all settlement.

J. Replace paving, lawns, and finished surfaces removed to accommodate the sanitary sewer system, except where new surfaces are provided as part of the work.

3.11 ALIGNMENT TEST

A. After the pipelines have been installed and the trench satisfactorily backfilled and compacted, all sanitary sewer mains 8 inches diameter and greater shall be inspected for misalignment and displacement by television camera testing in accordance with University requirements. Television testing shall at contractor’s expense.

B. Television camera testing video shall be turned over to the University Physical Plant Division for review and approval.

C. Should the video of the pipeline reveal poor alignment, displaced pipe, or any other defect, the Contractor shall undertake such remedial action as required to correct the defect. The pipeline shall be retested following any corrective action. All corrective action shall be performed at no additional cost to the Owner and prior to any leakage tests.

3.12 LEAKAGE TEST:

A. Sanitary sewer shall be tested throughout their entire length for water tightness. Pipelines installed shall satisfy the requirements of the tests as specified. The Contractor shall make necessary repairs or replacements and re-test as required to comply with these regulations. Testing, correction, and retesting shall be made at no additional cost to the Owner.

B. The Contractor shall furnish all necessary and approved material, equipment, labor and other facilities required to satisfactorily perform the test including furnishing and placing of low head weirs, depth gauges, and bulkheads for testing. Weirs shall be of appropriate type (90, 60, 45, 22-1/2, or as required) for the flows to be measured.

C. Prior to testing, pipe shall be thoroughly cleaned of accumulated silt or debris.

D. A section of sewer as referred to in the Specification for testing shall be defined as a length of sewer line between any two consecutive manholes in a sewer line.

E. Infiltration test shall be made on a section, or sections of sewer when directed, after backfilling has been completed and after a sufficient interval of time has elapsed to permit the groundwater to rise up to its normal level. Infiltration tests shall only be run on sewers where the groundwater level is normally at least 2 feet above the top of the sewer. Initially tests shall be performed on one section at a time. After the Contractor has demonstrated a record of tight sewers based on the results of the tests, the Architect at his option, may call for subsequent tests to be made on longer lengths up to 1000 linear feet.

F. Normal groundwater level, as herein referred to, shall be the elevation to which the groundwater will rise at the time of test, when unaffected by any dewatering operations within the area of influence.

G. The Contractor shall furnish and install an approved type low head measuring weir or other approved method in the invert at the downstream end of the section together with all other necessary facilities as may be required to properly perform the test. It is intended that the test be made as soon as thereafter as the groundwater has risen to its normal level to the satisfaction of the Architect and necessary facilities for conducting the test are in position.

H. Exfiltration tests shall be substituted for infiltration tests where the groundwater is lower than an elevation 2 feet above the top of the pipe. Test shall be conducted by sealing off sections to be tested, filling manholes and pipe to an elevation of 2 feet over the crown, as measured from the upstream point. The filled line shall be allowed to stand until the pipe has reached its maximum absorption, but not less than 4 hours. After absorption, the head shall be re-established. The amount of water required to maintain this water level during a 2-hour test period shall be measured. The Contractor shall dispose of all water at the end of the test.

I. A continuous twenty-four (24) hour test period will be required except where, in the opinion of the Architect a longer test period is necessary. The maximum allowable

quantity of infiltration of leakage into the section of sewer shall be 0.12 gallons per hour per inch of internal diameter for each one hundred linear feet of sewer under test. There shall be no separate infiltration allowance for manholes except that manholes shall not be deducted from the length of pipe used in computing the total infiltration allowance for the section under test.

J. Allowable exfiltration shall be at the same rate as for infiltration.

K. Any section or sections of sewer which does not fully comply with the requirements of the infiltration or exfiltration test as specified shall be satisfactorily repaired by the Contractor at his expense, and additional tests shall be made until the specified allowable leakage has been fully satisfied.

3.13 REPAIRS TO BROKEN PIPE:

A. Where cracks or ruptures develop in the pipe after installation, the entire length of pipe to a distance of at least 3 feet beyond the pipe joint on each side of the damage area shall be re-excavated. The pipe shall be replaced, or if approved by the Architect, shall be repaired in a suitable manner. Details of repairs shall be submitted for record. If the Contractor utilizes concrete cradle or encasement in his repair, he shall take precautions to guard against shear breaks at the limits of the concrete. Repaired sections shall be reinspected approximately 6 months after completion of the repair. Should additional failures be noted, they shall be promptly repaired and later reinspected as approved and at no additional cost to the Owner.

3.14 MANHOLE STRUCTURES

A. Manholes and concrete structures utilized as part of the work shall conform to FDOTSS Section 425.

B. Masonry Manholes

1. Install masonry manhole structures on a sound cast-in-place segmented concrete base.
2. Lay radial and batter concrete masonry with full mortar joints completely filled with portland cement mortar. Strike joints flush with surface of concrete masonry.
3. Horizontal joints shall not exceed ½". Vertical joints shall not exceed 1/4" on their interior surface.
4. Provide headers where required to adjust frames to grade, breaking joints between courses.
5. Parge inside and outside face of masonry structure walls with ½" mortar.

C. Precast Concrete Manholes

1. Place precast concrete manhole sections as indicated. Where manholes occur in pavements, set tops of frames and covers flush with finish surface. Elsewhere, set tops 3" above finish surface, unless otherwise indicated.

   a. Install in accordance with ASTM C891.

b. Provide rubber joint gasket complying with ASTM C443 at joints of sections.

D. Construct flow channels with concrete or brick, conforming to the inside diameter of connecting lines. Make changes in grade gradually and make changes in line with true curves.

E. Set frames and covers to required grade and bed in place with mortar.

F. Cold weather protection: Provide all necessary means for heating concrete, masonry materials, and mortar to protect concrete and masonry work during and after installation from damage by frost and freezing.

G. Perform no work when the temperature is below 25 degrees F. (ambient).

H. Drop manhole assemblies shall be constructed per detail on plans.

3.15 CLEANOUTS

A. Furnish and install where shown on Drawings all exterior cleanouts extended to finished grade, with solid cover, of size indicated on Drawings. Where cleanouts occur in lawn or paved area, provide concrete collar per detail.

3.16 CONNECTIONS TO EXISTING MANHOLES:

A. Pipe connections to existing manholes shall be made in such manner that the finished work will conform as nearly as practicable to the essential applicable requirements specified for new manholes, including all necessary concrete work, cutting, and shaping.

3.17 BUILDING CONNECTIONS:

A. Shall include the lines to and connection with the building waste drainage piping at a point approximately 5 feet outside the building, unless otherwise indicated. Where building drain piping is not installed, the Contractor shall terminate the building connections approximately 5 feet from the site of the building at a point and in a manner designated by the Architect.

3.18 TAP CONNECTIONS:

A. Make connections to existing piping and underground structures, so that finished work will conform as nearly as practical to requirements specified for new work.

3.19 DISPOSAL OF WASTE MATERIALS

A. Stockpile, haul from site, and legally dispose of waste materials, including excess excavated materials, rock, trash, and debris.

B. Maintain disposal route clear, clean, and free of debris.

3.20 CLEANING

A. Maintain sanitary sewer piping and structures in a clean workable condition during construction operations.

B. Flush sanitary sewer system with water in sufficient volume to obtain free flow through each line. Remove all silt, trash, and debris just prior to acceptance of work.

C. Upon completion of sanitary sewer work, remove tools and equipment. Provide site clear, clean, free of debris, and suitable for continued site work operations.

END OF SECTION 02530

SECTION 02630 - STORM DRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related Sections: The following sections contain requirements that relate to this Section:
   1. See Section 02200 for Earthwork.
   2. See Section 02520 for Portland Cement Concrete Paving

C. Division 15 Sections for storm sewer work within the building structure and to 5 feet outside building foundation walls, including final connections to storm sewer lines provided under work of this Section.

1.2 DESCRIPTION OF WORK

A. Storm Drainage includes all conveyance and distribution systems for stormwater runoff control.

1.3 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data and installation instructions for storm sewage system materials.

B. Certificates:

   1. Pipeline and fittings, including factory-applied linings and joint materials.

C. Shop Drawings: Submit shop drawings for storm sewage systems, showing piping materials, size, locations, and inverts. Include details of underground structures, connections, and manholes. Show interface and spatial relationship between piping and proximate structures.

D. Record Drawings: At project close-out, submit record drawings of installed storm sewage piping and products, in accordance with requirements of Division 1.

E. Maintenance Data: Submit maintenance data and parts lists for storm sewage system materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual; in accordance with requirements of Division 1.

1.4 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of storm sewage

system's products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with storm sewage work similar to that required for project.

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

1. Florida Department of Transportation Standard Specifications for Road and Bridge Construction 2000 edition, (FDOTSS).
2. Plumbing Code Compliance: Comply with applicable portions of National Standard Plumbing Code pertaining to selection and installation of storm sewage system's materials and products.
3. Environmental Compliance: Comply with applicable portions of local Environmental Agency regulations pertaining to storm sewage systems.

PART 2 - PRODUCTS

2.1 IDENTIFICATION:

A. Underground-Type Plastic Line Marker: Manufacturer’s standard permanent, bright-colored, continuous-printed plastic tape, intended for direct-burial service; not less than 6" wide x 4 mils thick. Provide green tape with black printing reading "CAUTION SEWER LINE BURIED BELOW".

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering identification markers which may be incorporated in the work include, but are not limited to, the following:

1. Allen Systems Inc.
2. Emed Co., Inc.
3. Seton Name Plate Corp.

2.2 PIPES AND PIPE FITTINGS:

A. In addition to the following listed requirements, all piping and fittings shall conform to FDOTSS. In the event a conflict exists between the following requirements and FDOTSS, then FDOTSS shall prevail.

B. General: Provide pipes of one of the following materials, of weight/class indicated. Provide pipe fittings and accessories of same material and weight/class as pipes, with joining method as indicated.

C. Storm Lines less than 15 inches in diameter: Contractor shall install the type of pipe specified on the drawings. Where appropriate or desired for good cause, the contractor

may request a pipe material alternate option. Any alternate or substitution shall be approved by the Project Engineer for both material type and cost adjustment.

1. Concrete Pipe: ASTM C 14, Class 2 nonreinforced concrete pipe.
2. Polyvinyl Chloride (PVC) Pipe: Schedule 80, ASTM D 1785.
3. Corrugated Polyethylene Pipe: High density corrugated polyethylene smooth interior pipe, manufactured in conformity with the latest AASHTO specification of M294 Type S or SP, and the material compound shall conform to ASTM D3350.
4. Ductile Iron Pipe: ANSI/AWWA C150/A21.5 & C151/A21.51.

D. Storm Lines 15 inch diameter or larger: Contractor shall install the type of pipe specified on the drawings. Where appropriate or desired for good cause, the contractor may request a pipe material alternate option. Any alternate or substitution shall be approved by the Project Engineer for both material type and cost adjustment.

1. Concrete Pipe: ASTM C 76, Class III, reinforced concrete pipe, unless specifically requested Class IV or IV for additional protection.

B. Pipe Fittings

1. Concrete Pipe: Reinforced or non-reinforced concrete fittings to match type and strength of concrete pipe being joined. Tongue-and-groove gasketed joints complying with ASTM C 443.
2. PVC Pipe: Bell and spigot elastomeric joints shall conform to ASTM D3212 and shall be assembled with gaskets conforming to ASTM F477. Assembly shall be per manufacturer's specifications.
3. Corrugated Metal Pipe: Comply with the requirements of AASHTO M36 and in addition include neoprene gaskets as indicated in the technical manual of the National Corrugated Steel Pipe Association. Design to provide strength to preserve pipe alignment, to prevent separation of pipe to prevent filtration of fill material and penetration of roots into pipe, and to prevent seepage of storm water out of pipe.
4. Ductile Iron Pipe: Push on joints such as Tyton or Fastite in accordance with ANSI/AWWA C111/A21.11 complete with all necessary accessories.
5. Corrugated polyethylene Pipe: Conform to AASHTO M 294, with the material conforming to ASTM D3350.

2.3 CONCRETE INLETS, MANHOLES, AND JUNCTION BOXES

A. In addition to the following listed requirements, all concrete inlets, manholes, and junction boxes shall conform to FDOTSS (Section 425). In the event a conflict exists between the following requirements and FDOTSS, then FDOTSS shall prevail.

B. Units shall be manufactured in accordance with ASTM C478, Specifications for Precast Reinforced Concrete Manhole Risers and Tops.

C. Concrete to be minimum 3000 psi at 28 days.

D. Joints between units shall be made using flexible watertight rubber gaskets, Portland Cement mortar or approved jointing compound, at Contractor's option and to meet local regulations.

E. Include cast iron steps and traps where indicated, at all required openings.

F. Manufacturers: Subject to compliance with requirements, provide products as indicated on the drawings. These products may be obtained from the following suppliers:

1. Southern Pre-cast, Inc., Alachua, FL.
2. Taylor Pre-cast, Green Cove Springs, FL
3. Southern Culvert, Jacksonville, FL

2.4 DRAINAGE STRUCTURE CASTINGS

A. Material: Gray iron castings, ASTM A48-76 Class 30B.

B. Finish: One coat of high grade bituminous asphalt paint, Federal Spec. MIL-C-4508, on all castings except where field painting is indicated. Surface preparation for shop priming and field painting shall be SSPC-SP10 near-white blast cleaning and prime paint shall be equivalent to Tnemec 66-1211 Epoxoline Primer applied in accordance with manufacturers written recommendations.

C. Manufacturer: The products of the Neenah Foundry Company, Neenah, Wisconsin may have been indicated on the Drawings by catalog number to establish the types and quality of products expected. Equivalent products as manufactured by, but not limited to, the US FOUNDRY Company Miami, FL are acceptable.

D. Grate covers shall be identified by the casting of the words “Storm Sewer”.

PART 3 - EXECUTION

3.1 INSTALLATION OF IDENTIFICATION:

A. General: During back-filling/top-soiling of storm sewage systems, install continuous underground-type plastic line marker, located directly over buried line at 6" to 8" below finished grade.

3.2 INSTALLATION OF PIPE AND PIPE FITTINGS:

A. General: Install piping in accordance with governing authorities having jurisdiction, except where more stringent requirements are indicated.

B. Bedding: Round trench bottom so that pipe has firm bearing on well-compacted soil or on undisturbed soil. Provide minimum of 4" sand cushion where bedrock or broken rock

exists on trench bottom. Excavate bell hole by hand. Do not lay pipe in wet trench. Do not permit water in trench until joints are set.

C. Inspect piping before installation to detect apparent defects. Mark defective materials with white paint and promptly remove from site.

D. Lay pipe true to line and grades. Begin at low end. Place spigot ends facing downstream. Center spigot in bells with inverts smooth and uniform. Protect exposed ends against impact, dirt, cement, and debris. A perfect circle shall be evident when "lamped". Install rubber gasket or caulked joints per manufacturer's recommendations.

E. Install gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements.

F. Ductile Iron Pipe: Install in accordance with manufacturer’s recommendations and DIPRA installation guide.

G. Concrete Pipe: Install in accordance with applicable provisions of ACPA "Concrete Pipe Installation Manual".

H. Plastic Pipe: Install in accordance with manufacturer's installation recommendations, and in accordance with ASTM D 2321.

I. Cleaning Piping: Clear interior of piping of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed.

1. In large, accessible piping, brushes and brooms may be used for cleaning.
2. Place plugs in ends of uncompleted conduit at end of day or whenever work stops.
3. Flush lines between manholes if required to remove collected debris.

J. Joint Adaptors: Make joints between different types of pipe with standard manufactured adapters and fittings intended for that purpose.

K. Cushion Sand: Apply by hand. Compact by approved mechanical means.

1. Lines 24" in diameter or less - Apply around pipe to 6" above pipe.
2. Lines larger than 24" in diameter - Apply around pipe to 6" above centerline of pipe.

L. Closing Abandoned Utilities: Close open ends of abandoned underground utilities which are indicated to remain in place. Provide sufficiently strong closures to withstand hydrostatic or earth pressure which may result after ends of abandoned utilities have been closed.

1. Close open ends of concrete or masonry utilities with not less than 8" 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. Wood plugs are not acceptable.

M. Interior Inspection: Inspect piping to determine whether line displacement or other damage has occurred.

1. Make inspections after lines between manholes, or manhole locations, have been installed and approximately 2' of backfill is in place, and again at completion of project.
2. If inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects, correct such defects, and re-inspect.

3.3 DRAINAGE STRUCTURES

A. Inlets, Manholes, & Junction Boxes

1. Set all structures true to grade and location, utilizing a licensed surveyor for establishing location and project elevation benchmark.
2. Dewater as necessary to install all structures and utilize proper excavation and fill techniques in accordance with all other sections of these specifications.
3. Construct masonry or precast concrete structures as detailed, joints completely filled, wet brick thoroughly, strike joints flush, parge exterior of brick structures, build in all castings as detailed.
4. Precast structure: Place on prepared subgrade per detail and manufacturer's recommendations and specifications.
5. Grout inverts of bottom of structures cleanly for smooth flow in and out of structures.
6. Brick and mortar all open space in pipe penetrations into structures. Cleanly sawcut and remove any pipe protrusions into the structures. Grout smoothly any holes or deformities within the structure that could affect drainage flow.
7. Protect structures from siltation collection during construction by using proper erosion controls, such as filter fabrics, silt fencing, haybales, gravel blankets, sumps, or other measures as applicable and appropriate.
8. Remove all accumulated sediment from construction activity within structures.

3.4 BACKFILLING:

A. General: Conduct backfill operations of open-cut trenches closely following laying, jointing, and bedding of pipe, and after initial inspection and testing are completed.

1. To minimize local area traffic interruptions, allow no more than 100' between pipe laying and point of complete backfilling.

3.5 FIELD QUALITY CONTROL:

A. Testing: Perform testing of completed piping in accordance with local authorities having jurisdiction.

B. Lamp all completed piping systems from structure to structure to assure proper installation and joint integrity and assure piping system has been thoroughly flushed and cleaned and no blockages have occurred or remain.

C. Remove all accumulated deposits, debris, and sediment from storm drainage system by thoroughly flushing and cleaning the entire storm drainage system. Monitor and remove any flushed deposits, debris, and sediment from downstream receiving body, structure, or outfall.

END OF SECTION 02630

SECTION 02660 - WATER SERVICE PIPING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

A. This Section includes water service piping and appurtenances for domestic water and fire service from the source of potable water to a point 5 feet outside the building.

B. The Contractor shall coordinate installation with Physical Plant Division (PPD) for connection to the public water transmission system. Contractor shall verify that permitting has been obtained prior to installation, and shall follow all permit criteria.

C. Related Sections: The following Sections contain requirements that relate to this Section:
1. See Section 02200 for Earthwork.
2. See Section 02720 for Storm and Sanitary Sewerage.
3. See Section 15140 for Domestic Water Piping for interior building water piping systems and equipment.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. Product data for pipes, fittings, valves, water meter, and identification devices.
2. Shop drawings for pre-cast concrete meter pit, including frames and covers.
3. Shop drawings for cast-in-place concrete meter pit, including frames and covers.
4. Record drawings at project closeout of installed water service piping and products in accordance with requirements of Division 1.
5. Maintenance data for valves and water meter, for inclusion in Operating and Maintenance Manuals specified in Division 1 Section "Project Closeout."

1.4 QUALITY ASSURANCE:

A. Comply with requirements of The University of Florida Construction Standards.

B. Testing: Hydrostatic tests at minimum 2 time working pressure for 2 hours.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Preparation for Transport: Prepare valves for shipping as follows:

B. Ensure valves are dry and internally protected against rust and corrosion.

C. Protect valves against damage to threaded ends, flange faces, and weld ends.

D. Set valves in best position for handling. Set gate valves closed to prevent rattling.

E. Storage: Use the following precautions for valves during storage:
   1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
   2. Protect valves from weather. Store valves indoors. Maintain valve temperature higher than the ambient dew point temperature. If outdoor storage is necessary, support valves off the ground or pavement in watertight enclosures.

F. Handling: Use a sling to handle valves whose size requires handling by crane or lift. Rig valves to avoid damage to exposed valve parts. Do not use handwheels or stems as lifting or rigging points.

1.6 PROJECT CONDITIONS:

A. Site Information: Perform site survey, research utility records, and verify existing utility locations. Verify that water service piping may be installed in compliance with the original design and referenced standards.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate connection to public water main with PPD.

B. Coordinate with interior water distribution piping.

C. Coordinate with other utility work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

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

B. Gate Valves:

   1. American Darling Valve; Div. of American Cast Iron Pipe Co.
   2. Clow Valve Co.; Div. of McWane, Inc.
   3. Mueller-Hersey; A Grinnell Co.
   4. Waterous Co.

C. Tapping Valves:

1. Clow Valve Co.; Div. of McWane, Inc.
2. Mueller-Hersey; A Grinnell Co.
3. American Darling

D. Fire Hydrants, Post Type:

1. Mueller-Hersey; A Grinnell Co.
2. American Darling.

E. Water Meters:

1. Badger Meter, Inc.
2. Mueller-Hersey; A Grinnell Co.

F. Underground Warning Tapes:

1. Allen Systems, Inc.; Reef Industries, Inc.
2. Brady (W.H.) Co.; Signmark Div.
3. Calpico, Inc.
4. Carlton Industries, Inc.
5. EMED Co., Inc.
6. Seton Name Plate Co.

2.2 PIPE AND PIPE FITTINGS, GENERAL:

A. Pipe and pipe fitting materials shall be compatible with each other. Where more than one type of material or product is indicated, selection is Installer's option.

B. Ductile-Iron Pipe 3 Inches and Larger: AWWA C151, Class 51 for push-on joint pipe, Class 53 for flanged joint pipe.

1. Lining: AWWA C104, cement mortar, sealcoated.
2. Gaskets: AWWA C111.
3. Ductile-Iron and Cast-Iron Fittings: AWWA C110, ductile-iron or cast-iron, 250-psi pressure rating; or AWWA C153, ductile-iron compact fittings, 350-psi pressure rating.
   a. Lining: AWWA C104, cement mortar.
   b. Gaskets: AWWA C111, rubber.

C. Galvanized Steel Pipe (GSP) Smaller than 3 Inches:

D. Polyvinyl Chloride (PVC) pipe smaller than 3 inches: Shall be schedule 80 per ASTM D 1785.

2.3 VALVES:

A. Nonrising Stem Gate Valves 3 Inches and Larger: AWWA C500, cast-iron double disc,

bronze disc and seat rings, or AWWA C509, resilient seated; bronze stem, cast-iron or ductile-iron body and bonnet, square operating nut, 200-psi working pressure, mechanical joint ends.

B. Valve Boxes: Cast-iron box having top section and cover with lettering "WATER," bottom section with base of size to fit over valve and barrel approximately 5 inches in diameter, and adjustable cast-iron extension of length required for depth of bury of valve.

1. Provide a steel tee-handle operating wrench with each valve size. Wrench shall have tee handle with one pointed end, stem of length to operate valve, and socket fitting valve operating nut.

C. Tapping Sleeve and Tapping Valve: Provide a complete assembly, including tapping sleeve, tapping valve, and bolts and nuts. The sleeve and the valve shall be compatible with the tapping machine to be used.

1. Tapping Sleeve: Stainless Steel bolted sleeve with flanged outlet for new branch connection. Sleeve may have mechanical joint ends with rubber gaskets or have sealing rings in the sleeve body. Sleeve shall mate with the size and type pipe material being tapped. Outlet flange shall be size required for branch connection.

2.4 ANCHORAGES:

A. Clamps, Straps, and Washers: ASTM A 506, steel.

B. Rods: ASTM A 575, steel.

C. Rod Couplings: ASTM A 197, malleable iron.

D. Bolts: ASTM A 307, steel.

E. Cast-Iron Washers: ASTM A 126, gray iron.

F. Concrete Reaction Backing: Portland cement concrete mix, 3000 psi.

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

2.5 FIRE HYDRANTS:

A. Fire Hydrants, Post Type: Nonfreeze, post type, dry barrel, break-away type with 5 ¼ inch seats, meeting AWWA C502, 6-inch inlet, working pressure 200psi, tested to 400psi. Hydrants shall be bronze casing, cast-iron or cast-aluminum casing guard, and tapped drain port in valve housing. Hydrant shall be of length required for installation of inlet valve 36 inches below final grade.

B. Connections: Two 2 ½ inch and one 4 ½ inch. Nozzle section shall be able to rotate 360 degrees during installation.

2.6 METER PIT:

A. Concrete: Portland cement mix, 3000 psi.

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

B. Reinforcement: Steel conforming to the following:

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

2.7 WATER METER:

A. General: Provide water meter with registration in hundreds or thousands of gallons.

B. Water Meter - 2 Inches and Smaller: AWWA C700, disc type, bronze case.

C. Water Meter - 3 Inches and Larger: AWWA C702, compound type, bronze case.

2.8 IDENTIFICATION:

A. Plastic Underground Warning Tapes: Polyethylene plastic tape, 6 inches wide by 4 mils thick, solid blue in color with continuously printed caption in black letters "CAUTION - WATER LINE BURIED BELOW."

2.9 TRACER WIRE:

A. Wire: Solid copper wire, No. 12 or larger.

PART 3 – EXECUTION

3.1 PREPARATION OF BURIED PIPE FOUNDATION:

A. Grade trench bottom to provide a smooth, firm, stable, and rock-free foundation throughout the length of the piping.

B. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid and backfill with clean sand or pea gravel to indicated level.

C. Shape bottom of trench to fit bottom of piping. Fill unevenness with tamped sand backfill. Dig bell holes at each pipe joint to relieve the bells of all loads and to ensure continuous bearing of the pipe barrel on the foundation.

3.2 INSTALLATION OF PIPE AND PIPE FITTINGS:

A. Ductile-Iron Pipe: Install with cement-mortar-lined, ductile-iron or cast-iron, mechanical joint or push-on joint fittings and rubber gaskets in accordance with AWWA C600.

B. PVC (Polyvinyl Chloride) Pipe: Install with cement-mortar-lined, ductile-iron or cast-iron, mechanical joint or push-on joint fittings and rubber gaskets in accordance with AWWA M23. Install continuous tracer wire from connection to connection with minimum 36" excess wire in each valve box.

C. Depth of Cover: Provide minimum cover over piping of 36 inches below finished grade.

D. Water Main Connection: Tap water main with size and in location as indicated, in accordance with requirements of PPD.

E. Install tapping sleeve and tapping valve in accordance with manufacturer's installation instructions.

3.3 INSTALLATION OF VALVES:

A. General Application: Use mechanical joint end valves for 3-inch and larger buried installation. Use threaded and flanged end valves for installation in pits and inside building. Use bronze valves, with ends compatible to piping, for 2-inch and smaller installation.

B. AWWA-Type Gate Valves: Comply with AWWA C600. Install buried valves with stem pointing up and with cast-iron valve box.

3.4 INSTALLATION OF ANCHORAGES:

A. Anchorages: Provide anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches.

3.5 APPLICATION OF PROTECTIVE COATINGS:

A. Apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of installed ferrous anchorage devices.

3.6 INSTALLATION OF HYDRANTS:

A. Install fire hydrants in pavement or with concrete anchor, as indicated.

B. Centerline of pumper nozzle shall be a minimum of 18 inches and a maximum of 22 inches above final grade.

3.7 INSTALLATION OF WATER METER PIT:

A. Construct of poured-in-place or pre-cast concrete of dimensions indicated, with cover. Provide sleeves for pipe entry and exit.

B. Water Meter: Install water meter in accordance with AWWA M6, in meter pit, in location and with support as indicated. Provide 3-valve bypass around meter, full size of water service piping.

3.8 INSTALLATION OF IDENTIFICATION:

A. Install continuous plastic underground warning tape during back-filling of trench for underground water service piping. Locate 6 to 8 inches below finished grade, directly over piping.

B. Attach nonmetallic piping label permanently to main electrical meter panel.

3.9 FIELD QUALITY CONTROL:

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

B. Hydrostatic Tests: Test at not less than 1-1/2 times working pressure for 2 hours.

1. Increase pressure in 50-psi increments and inspect each joint between increments. Hold at test pressure for one hour; decrease to 0 psi. Slowly increase again to test pressure and hold for one 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 above limits.

3.10 CLEANING:

A. Clean and disinfect water distribution piping as follows:

1. Purge all new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired, prior to use.
2. Use the purging and disinfecting procedure prescribed by the authority having jurisdiction or, in case a method is not prescribed by that authority, use the procedure described in AWWA C651, or as described below:
   a. Fill the system or part thereof with a water/chlorine solution containing at least 50 parts per million of chlorine. Isolate (valve off) the system or part thereof and allow to stand for 24 hours.

b. Drain the system or part thereof of the previous solution and refill with a water/chlorine solution containing at least 200 parts per million of chlorine and isolate and allow to stand for 3 hours.
c. Following the allowed standing time, flush the system with clean, potable water until chlorine does not remain in the water coming from the system.
d. Submit water samples in sterile bottles to the authority having jurisdiction. Repeat the procedure if the biological examination made by the authority shows evidence of contamination.

3. Prepare reports for all purging and disinfecting activities.

3.11 VALVE SCHEDULE:

A. Nonrising Stem Gate Valves - 4 Inches and Larger:

MANUFACTURER	AWWA - C500	MECH JOINT - C509
American Darling	55	85
Clow Valve	F-5065	F-6100
Kennedy Valve	571X	1571X
Mueller-Hersey	A-2380-20	A-2370-20
Stockham Valve	G-743-O	G-701-O
U.S. Pipe	3460	5460
Waterous	300 Series	500 Series

B. Rising Stem Gate Valves - 3 Inches and Larger:

MANUFACTURER	AWWA - C500	FLANGED - C509
American Darling	52	82
Clow Valve	F-5072	F-6136
Kennedy Valve	566	1566
Mueller-Hersey	A-2483-6	A-2373-6
U.S. Pipe	3630	5120
Waterous	300 Series	500 Series

C. Nonrising Stem Gate Valves - 2 Inches and Smaller:

MANUFACTURER	MSS SP-80 THREADED
Hammond Valve Corp.	IB645
Jenkins Bros.	370
Milwaukee Valve Co.	1105M
Nibco	T-113 w/iron HW
Stockham Valve	B-103

D. Tapping Valves:

MANUFACTURER	
American Darling	565 or 865

Clow Valve	F-5093
Kennedy Valve	950X
Mueller-Hersey	H-667
U.S. Pipe	3860

E. Fire Hydrants, Post Type:

MANUFACTURER
Mueller-Hersey
American Darling

3.12 WATER METER SCHEDULE:

A. Disc-Type Water Meter:

MANUFACTURERS	AWWA C700
Badger Meter	Recordall, bronze
Mueller-Hersey	400, 500 Series

END OF SECTION 02660

SECTION 02800 – SITE IMPROVMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related Sections: The following sections contain requirements that relate to this Section:
   1. See Section 02200 for Earthwork.
   2. See Section 02520 for Portland Cement Concrete Paving

1.2 DESCRIPTION OF WORK

A. Site improvements includes benches, trash receptacles, bicycle racks, and traffic bollards.

1.3 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data and installation instructions site improvement materials.

B. Record Drawings: At project close-out, submit record drawings of installed site improvements and products, in accordance with requirements of Division 1.

E. Maintenance Data: Submit maintenance data and parts lists for site improvement materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual; in accordance with requirements of Division 1.

1.4 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of storm sewage system's products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

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

   1. Florida Department of Transportation Standard Specifications for Road and Bridge Construction 2000 edition, (FDOTSS).
   2. University of Florida construction standards

PART 2 - PRODUCTS

2.1 GENERAL:

A. Benches: Benches shall be as specified in the construction drawings and shall be in conformance with UF design standards.

B. Trash Receptacles: Metal type, approved by UF PPD.

C. Bicycle Racks: Bicycle racks shall be u-rack style in accordance with UF design standards. Bicycle rack locations and installation shall be in accordance with the Construction drawings and the UF construction design standards.

D. Traffic Bollards: Shall be placed and installed as shown on the Construction drawings.

PART 3 - EXECUTION

3.1 INSTALLATION OF IDENTIFICATION:

A. General: All site improvement items shall be installed in accordance with the Manufacturer's specifications and requirements. All Manufacturer's material accompanying shall be submitted to the Owner upon completion of the project, including, but not limited to, specifications, installation, maintenance, and warranty information.

3.5 FIELD QUALITY CONTROL:

A. All site improvement items shall be kept clear of construction areas to prevent damage. No items shall be installed that are permanently damaged or flawed. All minor repairs, if necessary, will be done to the site improvement items prior to project completion at the expense of the contractor.

END OF SECTION 02800

SECTION 02810 - UNDERGROUND IRRIGATION SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, including General and Supplementary Conditions, and Division 1 - General Requirements and Conditions, shall apply to the work under this section.

1.2 WORK INCLUDED

A. The Landscape Contractor (LC) shall provide all labor, materials, necessary equipment and services to complete the Underground Sprinkler System work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

B. Protection of Public Property: The LC shall, at all times, protect all materials and work against injury from any cause, and shall provide and maintain all necessary guards for the protection of the public. The LC shall be held responsible for any damage or injuries to persons or property, which may occur as a result of his/her fault or negligence during the execution of the work. The LC shall insure that his work does not interrupt established or projected drainage patterns.

C. The completed and proper construction of the landscape irrigation system including, but not limited to:

1. All piping, including mains, laterals, fittings, sleeves, connections, tees, risers, clamps, and swing joints.

2. All control, gate, globe, pressure reducing, quick coupling and other valves; including valve boxes, markers, connections, operators and other accessories.

3. Connection to automatic control system as shown on plans, including control wiring low voltage connections and electrical and communication wire connections, conduit, and coordination of 120V electrical.

4. All rotating and stationary spray and bubbler sprinkler heads; including proper nozzles as called for herein and shown on the plans and all other appurtenances and accessories for proper operations.

5. Connection of piping to the supply sources as shown on the plans.

6. All excavation, site work, relocation or replacement of utilities, backfill, compaction and restoration of all disturbed areas.

7. The contractor shall be responsible for providing a complete and operable

system for the irrigation of all areas to be landscaped on the project site. The plans and these specifications are intended to include all items obviously necessary and requisite for the proper irrigation of the project. This in no way relieves the contractor of his responsibility to furnish any additional labor, materials and equipment required for a proper system.

8. The contractor shall be responsible for adjusting head location, type and size, and any other system components to comply with the requirements of landscaping as actually intended. Such adjustments shall be made at no cost to the Owner except for, when authorized in writing, such adjustments which will be compensated at an agreed upon price.

9. The contractor shall supply, deliver, store, and protect all equipment and materials including pipe and fittings, sprinkler heads, valves, controllers, wire, and all other component parts necessary for the installation of a fully automatic irrigation system as indicated in the plans and specifications. Adequate security of materials on site shall be provided by the contractor at all times at his expense.

D. Explanation of Drawings:

1. Due to the scale of the drawings, it is not possible to indicate all offsets, fittings, sleeves, etc. which may be required. The contractor shall carefully investigate the structural and finish conditions affecting all of the work and plan his work accordingly, furnishing such offsets, fittings, and sleeves as may be required to meet such conditions.

2. The drawings are generally diagrammatic and indicative of the work to be installed. The work shall be installed in such a manner as to avoid conflicts between irrigation systems, underground utilities, plantings, and architectural features. Deviations shall be brought to the Landscape Architect's attention.

3. All work called for on the drawings by notes or details shall be furnished and installed whether or not specifically mentioned in the specifications.

4. The contractor shall not willfully install the irrigation system as shown on the drawings when it is obvious in the field that obstructions, grade differences or discrepancies in area dimensions exist that might not have been known in engineering. Such obstructions or differences should be brought to the attention of the Landscape Architect. In the event that notification is not performed, the contractor shall assume full responsibility for any revision necessary.

5. Explanation of Drawings: Conflicts between the plans, notes, details or specifications shall be immediately brought to the attention of the Landscape Architect. These discrepancies or conflicts shall be interpreted by the Landscape Architect and his decision shall be final in all cases. Should the contractor fail to notify the Landscape Architect of the

conflict(s) and by so, take advantage of the said discrepancy, the Contractor shall be held responsible for making any and all changes as directed by the Landscape Architect with no compensation for extra labor, material or equipment.

6. The contractor shall prior to trenching, verify the location of all underground utilities as are commonly encountered underground. He shall take proper precaution not to damage or disturb said improvements.

7. If, in the opinion of the Landscape Architect, the labor furnished by the contractor is incompetent, unskilled, or unreliable, his equipment inadequate, improper or unsafe, or if the contractor shall fail to continuously and diligently execute the construction, the Landscape Architect or Owner shall, in writing, instruct the contractor to remove all such causes of noncompliance and the contractor shall promptly comply.

8. The contractor shall be responsible for full and complete coverage of all irrigation areas. The Landscape Architect shall be notified of any necessary adjustments to the irrigation system. Any revisions to the irrigation system must be submitted and answered in written form, along with any change in contract price.

E. On-Site Conditions:

1. Inspection of the Site: The contractor shall acquaint himself with all on-site conditions. Should utilities not shown on the drawings be found during excavations, the contractor shall promptly notify the Owner for instructions as to further action. Failure to do so will make the contractor liable for any and all damage thereto arising from his operations subsequent to discovery of such utilities not shown on the drawings.

2. Protection of Property: The contractor shall be responsible for the preservation and protection of all site conditions to remain from damage due to this work. In the event damage does occur, all damage shall be completely repaired to its original condition at no additional cost to the Owner.

3. Trenching: All trenching or other work under the leaf canopy of any and all trees shall be done by hand or by other methods so that no branches are damaged in any way.

   Trenching around existing plant material shall be done by hand so as to minimize root disturbance.

   Building, walks, walls, and other property shall be protected from damage. Open ditches left exposed shall be flagged and barricaded by the contractor by approved means. The contractor shall restore disturbed areas to their original condition.

4. Protection and Repair of Underground Utilities: The contractor shall be responsible for requesting the proper utility company to stake the exact location of any underground lines including but not limited to electric, gas, telephone, water and cable.

   The contractor shall take whatever precautions are necessary to protect these underground lines from damage. In the event damage does occur, all damage shall be completely repaired to its original condition, at no additional cost to the Owner.

5. Private Utilities: The contractor shall request the Owner, in writing, to locate any private utilities (i.e., electrical service to outside lighting) before proceeding with any excavation. If, after such requests and necessary staking, private utilities, which were not staked, are encountered and damaged by the contractor, they shall be repaired by the Owner at no cost to the contractor. If the contractor damages staked or located utilities, they shall be repaired at the contractor's expense.

F. Change Orders: Any change or substitution in the plans must be negotiated between the LC and the Owner or Owner's Authorized Representative (OAR). Any work performed on changes or 'extras', prior to execution of a written agreement, may or may not be compensated for by the Owner at his discretion.

1.3 RELATED WORK

A. Section 02300 – Earthwork

B. Section 02920 – Grass Sodding

C. Section 02930 – Trees, Shrubs, and Groundcovers

1.4 QUALITY ASSURANCE

A. All irrigation work shall be installed by qualified personnel or a qualified irrigation subcontracting company that has experience in irrigation systems of similar size, scope, main line, system pressure, etc. as is indicated for this project.

B. All applicable ANSI, ASTM, FED, SPEC. Standards and Specifications, and all applicable building codes and other public agencies having jurisdiction upon the work.

C. The contractor shall be responsible for constructing the system in complete accordance with all local codes, ordinances and laws. Any modifications made to conform to said codes, laws and ordinances shall be completed at the contractor's expense with no additional compensation allowed.

D. Protection of Existing Plants and Site Conditions: The contractor shall take

necessary precautions to protect site conditions to remain. Should damages be incurred, this contractor shall repair the damage to its original condition at his own expense. Any disruption, destruction or disturbance of any existing plant, tree, shrub, or turf, or any structure shall be completely restored to the satisfaction of the Owner and his representatives, solely at the contractor's expense.

E. Permits and Fees: Obtain all permits and pay required fees to any governmental agency having jurisdiction over the work. Inspections required by local ordinances during the course of construction shall be arranged as required. On completion of the work, satisfactory evidence shall be furnished to Landscape Architect to show that all work has been installed in accordance with the ordinances and code requirements.

F. Approval: Wherever the terms "approve", "approval", or "approved" are used in the specifications, they shall mean the approval of the Owner or Owner's Representative in writing.

G. The Owner reserves the right to substitute, add or delete any material or work as the work progresses. Adjustment to the contract price shall be negotiated if deemed necessary by the Owner or Owner's Representative and shall be credited or deducted to the contract sum according to the unit prices provided in this proposal.

H. The Owner or Owner's Representative reserves the right to reject material or work, which does not conform to the Contract Documents. Rejected work shall be removed or corrected at the earliest possible time at contractor's expense.

I. Final Acceptance: Final acceptance of the work may be obtained from the Owner upon the satisfactory completion of all work. Acceptance by the Landscape Architect and/or Owner in no way removes the contractor of his responsibility to make further repairs, corrections and adjustments to eliminate any deficiencies which may later be discovered.

J. Guarantee: All work shall be guaranteed for one year from date of acceptance against all defects in material, equipment and workmanship to the satisfaction of the Owner. Repairs, if required, shall be done promptly at no cost to the Owner.

1. The guarantee shall also cover repair of damage to any part of the premises resulting from leaks or other defects in material. The contractor shall not be responsible for work damaged by others. Repairs, if required, shall be done promptly. The guarantee shall state the name of the Owner, provide full guarantee terms, effective and termination date, name and license number of contractor providing guarantee, address and telephone number. It shall be signed by the chief executive of the contractor and notarized. Manufacturer's warranties shall not relieve the contractor of his liability under the guarantee. Such warranties shall only supplement the guarantee.

K. The contractor shall provide full coverage in all irrigated areas and shall be responsible for additional heads and components as required, installed at his own cost.

L. Contractor shall make necessary adjustments in the layout as may be required to connect to existing stubouts, should such stubs not be located exactly as shown, and as may be required to work around existing work at no increase in cost to the Owner.

M. On-Site Observation: At any time during the installation of the irrigation system by the contractor, the Owner or Landscape Architect may visit the site to observe work underway. Upon request, the contractor shall be required to uncover specified work as directed by the Owner or Landscape Architect without compensation. Should the material, workmanship or method of installation not meet the standards specified herein, the contractor shall replace the work at his own expense.

1.5 SUBMITTALS

A. "As-Built" Irrigation Drawings:

1. Prepare an "As-Built" drawing on reproducible bases which shall show horizontal and vertical deviations from the bid documents made during construction affecting but not limited to the mainline pipe, controller locations, remote control valves, quick-coupling valves and all sprinkler heads. Drawings shall indicate and show approved substitutions of size, material and manufacturer's name and catalog number. All piping shall be dimensioned and drawn to scale. Remote control valves and isolation valves shall have (2) measurements from fixed objects. All zone valves shall be labeled with accurate G.P.M. to establish correct flow zone data to be inserted into irrigation program.

2. Store "As-Built" drawings apart from documents used for construction.

3. Maintain drawings in a clean, dry, legible condition and in good order. Do not use record document for construction purposes.

4. Make documents available at all times for inspection by Landscape Architect or Owner's Representative.

5. Label each document "AS-BUILT" in neat, large, printed letters or by rubber stamp.

6. Record information concurrently with construction progress. Do not conceal any work until required information is recorded.

7. Drawings: Legibly mark to record actual construction and installation, including:

a. Horizontal and vertical locations of underground utilities and appurtenances referenced to permanent surface improvements.

b. Field changes of dimensions and detail.

c. Changes made by Field Order or by Change Order.

d. Details not on original Contract Drawings.

8. Specifications and Addenda: Legibly mark each Section to Record changes made by Field Order or by Change Order.

9. Sepia mylar drawings to be used for Record Document submittal may be obtained for a fee from the Landscape Architect. Contractor shall transfer all record documents information outlined above to these reproducible drawings.

10. Prior to contract closeout, the contractor shall deliver the complete set of sepia mylar drawings fully updated and containing the information outlined above to the Landscape Architect for the Owner. Additionally, the contractor shall furnish three (3) blueline copies of "as-built" drawings. These drawings shall be delivered to the Landscape Architect prior to his review for Substantial Completion of the work.

B. Operations and Maintenance Manuals: The contractor shall prepare and deliver to the Landscape Architect/Owner Representative within ten (10) calendar days prior to completion of construction a minimum of three (3) hard cover binders with three rings containing the following information:

1. Index sheet stating the contractor's address and business telephone number, list of equipment with name(s) and address(es) of local manufacturer's representative(s).

2. Catalog and parts sheet on every material and equipment installed under this contract.

3. Complete operating and maintenance instruction on all major equipment.

4. Provide the Owner's maintenance personnel with written and "hands-on" instructions for major equipment and show evidence in writing to the Landscape Architect at the conclusion of the project that this service has been rendered.

PART 2 - PRODUCTS

2.1 GENERAL

A. General: All materials throughout the system shall be new and in perfect condition.

2.2 PIPING

A. The irrigation system pipe shall be as stated herein and shall be furnished, installed, and tested in accordance with these specifications. Unless otherwise stated on the plans, all pipe fittings shall be capable of withstanding a sustained pressure of at least 125 PSI

B. All secondary (circuit) irrigation lines shall be Schedule 40 PVC. Pipe shall be purple or have a purple stripe on top of the pipe. PVC piping used for the reuse water main shall be at least DR-18 or AWWA C900. The PVC piping used for the reuse water main shall have a 14 gauge insulated wire attached to the pipe for use in locating the pipe.

C. All pipe extensions for varied height shrub risers and PVC pipe sleeves under paved areas shall be Polyvinyl Chloride (PVC) Pipe, Schedule 40. Risers shall be painted green.

2.3 PVC PIPE CEMENT AND PRIMER

A. Provide solvent cement and primer for PVC solvent weld pipe and fittings as recommended by the manufacturer.

B. Solvent weld cement shall be Uni-Weld 2400 (Turf-Tite) with primer Uni-Weld 8700 HI ETCH Purple Primer, or approved equal.

C. All solvent weld joints must be primed.

2.4 THREADED CONNECTIONS

A. Threaded PVC Connections shall be made up using Teflon tape or Teflon pipe dope.

B. All connections between mainline pipe fittings and automatic or manual control valves shall be made using Schedule 80 threaded fittings and nipples.

2.5 THRUST BLOCKS

A. Main line piping shall have thrust blocks sized and placed in accordance with the pipe manufacturer's recommendations for all pipe 3” and larger. Thrust blocks shall be a standard poured concrete mix in accordance with ASTM C-150, ASTM C-33, and ASTM C-94 with a compressive strength (28 days) of 2000 PSI. Thrust blocks shall be installed at all tees, elbows, 45's, crosses, reducers, plugs, caps and valves. Contractor shall be responsible to ensure stability of all thrust blocks. No "pre-cast" or "pre-bagged" thrust blocks shall be allowed. Contractor shall protect all pipe joint connections, control wires, communication cables, and power supply wiring, from concrete by approved means.

2.6 PIPE AND WIRE SLEEVES

A. Sleeves to be installed:

1. The contractor shall install irrigation system pipe and wire sleeves conforming to the following:

a. All pipe sleeves shall be of the size indicated on the drawings.

b. All pipe sleeves shall extend a minimum of 24" beyond the edges of pavement.

c. All pipe sleeves shall be PVC Pipe Schedule 40.

d. All pipe sleeves shall be installed at the minimum depth specified for main lines, lateral lines, and electric wire.

e. Contractor shall coordinate all pipe sleeve locations and depths prior to initiating installation of the irrigation system.

2.7 SPRINKLER HEADS

A. Pop-up Spray Heads: Toro 570Z-PRZ as designated on the drawings.

B. Pop-up Rotor Heads: Hunter PGM and I-20 Series as designated on the drawings.

2.8 CONTROLLERS:

A. The irrigation system controller shall be as indicated on the drawings.

B. All controllers shall be equipped with a Mini Clik II rain sensor device.

2.9 ELECTRIC REMOTE CONTROL VALVES

A. The remote control valves shall be Rainbird PEB series valves.

B. All valves shall be tagged with Christy's "Red Hot" irrigation I.D. tags with hot stamped, factory printed numbering and lettering, corresponding to the valve's identification.

2.10 VALVE BOXES

A. In areas which may be subject to vehicle traffic, valve boxes are to be concrete with metal lids. In other areas, valve boxes shall be purple PVC with locking lid. All lids shall be marked "Irrigation Control Valve." Paint interior of valve boxes purple.

B. Acceptable Manufacturers: Ametek 12 inch "Superflexion,"; Tyler 461S; USF 7500.

C. Valve boxes shall be installed flush with finished grade as detailed on the drawings (except in beds, where they shall be installed 3” above finished grade to allow for mulch). Contractor shall assure percolation beneath the valve box by approved methods.

2.11 IRRIGATION CONTROL WIRE

A. All electrical control, common and ground wire shall be irrigation control cable, Type "UF", 600 volt, solid copper, single conductor wire with PVC insulation and bear UL approval for direct underground burial feeder wire.

1. Control wire from independent station controllers to electric valves shall be AWG Size 14/1 (minimum) and shall not be shared between valves.

2. Common and control wires shall not be shared between controllers.

3. Each controller shall have its own separate white common wire.

4. When more than one controller is used the white common wire for each controller shall be color coded with waterproof electrical tape.

5. Colored coded electrical tape shall be used at all valve connections, splices, and at controller.

6. Electrical tape shall be securely fastened to control wires at the required 20' intervals and at all valve connections, splices and at the controller.

Verification of wire types and installation procedures shall be checked to conform to local codes.

7. All wire connections and splices shall be made with 3M DB4 waterproof wire connectors. All wire connections and wire splices shall occur in valve boxes or splice boxes.

PART 3 - EXECUTION

3.1 PREPARATION

A. Layout of Mains and Laterals: Layout sprinkler mainlines and perform line adjustments and site modifications to laterals prior to excavation.

B. Coordinate all installation with landscape planting work, especially fine grading, and soil preparation for planting areas.

C. Coordinate and cooperate with all other contractors to enable the work to proceed as rapidly and efficiently as possible.

D. Layout of Sprinkler Heads: Stake sprinkler head locations and check for

uniformity of coverage and correctness of pattern.

E. Controller, Gate Valve, and Valve Location: Locate to assure ease of access for maintenance and that no physical interference with other elements of the project exist.

F. Furnish temporary support, adequate protection and maintenance of all underground and surface utilities, structures, drains, sewers, and other obstructions encountered in the progress of the work.

G. Contractor shall acquaint himself with all site conditions. Should utilities not shown on the plans be found during excavation, contractor shall promptly notify the Owner for instructions as to further actions. Failure to do so will make contractor liable for any and all damage thereto rising from his operations subsequent to discovery of such utilities not shown in plan.

H. Where the grade or alignment of the pipe is obstructed by existing utility structures such as conduit, ducts, pipe branch connections to sewer mains, main drains, water services, etc., the obstruction shall be permanently supported, relocated, removed or reconstructed by the contractor in cooperation with the Owner of such utility. No deviation from the required line or grade shall be made without the written direction of the Owner's Representative.

3.2 PIPE INSTALLATION

A. The contractor shall stake out the location of each run of pipe, sprinkler heads, and valves prior to trenching.

B. Excavation shall be unclassified and shall include all materials whatsoever encountered in the excavation of trenches for pipe installation. The trench shall be of sufficient width and depth for installation of the pipe as indicated herein. The contractor shall cause minimum disturbances to all existing conditions wherever possible; the contractor shall bore under existing pavement and sidewalks rather than cut and restore. No pavement shall be cut without the Owner's Representative's permission.

C. Pipe shall be delivered and stored on the job site with suitable protection against any damage to pipe and fittings.

D. Trenches shall be made wide enough to allow a minimum of 4 inches between parallel pipe lines. Parallel lines shall not be installed directly over one another. No lateral line shall be made of sufficient depths to provide the minimum cover from finish grade as follows:

1. 18" minimum cover over main lines.

2. 18" minimum cover over control wires from controller to valves.

3. 12" minimum cover over lateral lines to heads.

4. Maintain all warning signs, shoring, barricades, flares and red lanterns as required by the Safety Orders of the Division of Industrial Safety and any local ordinances and codes.

E. The pipe and fittings shall be carefully inspected before installation in the trench. All rocks over 2" diameter and unsuitable bearing material shall be removed from trench in strict accordance with the manufacturer's recommendations.

1. Solvent welded joints shall be made only on clean, dry, square cut, smooth pipe sections. The fittings shall be "dry" tested for proper size before solvent is applied. The assembly shall proceed in strict accordance with recommended procedures furnished by the manufacturer.

2. Solvent welded pipe sections shall be "snaked" from side to side in the trench to prevent joint rupture due to thermal contraction.

3. Pipe openings shall be plugged during construction to prevent entrance of foreign materials.

F. Backfill shall be carefully placed to avoid pipe dislocation. Backfill material shall be free of rocks, stumps, roots and other unsuitable material. In planting areas, the top six inches (6") shall be suitable planting soil. Backfill shall be placed in six inch (6") lifts and shall be thoroughly compacted by mechanical tamping except in planting areas where planting soil is used. Backfill under pavement or sidewalks shall be compacted to 98% of maximum A.A.S.H.O. T-180 density. The surface of backfilled trenches shall be even with the surrounding ground surface.

Plant locations shall take precedence over sprinkler and pipe locations. The contractor shall coordinate the routing of lines and final head locations with the placement of specimen trees and shrubs.

3.3 SPRINKLER HEAD INSTALLATION

A. Contractor shall be responsible for the exact location of all sprinkler heads, acknowledging that the plans are schematic in nature. The contractor shall accordingly place all sprinkler heads, adjust all nozzles, spray patterns, and make whatever other adjustments that may be required to give the landscaped areas full, complete and proper coverage and distribution, and to meet all manufacturer's requirements. The contractor shall make all such adjustments and additions solely at his expense.

B. Sprinkler heads located along curbs and edges of paving shall be installed 6" from back of curb or paving; except along roadways without curbs, sprinkler heads shall be located 12" from edge of pavement.

C. Sprinkler heads shall be installed as designated on the drawings. The top of all sprinkler heads shall be flush with finish grade or top of curb.

D. All sprinkler head risers above finished grade shall be staked with as per drawing and painted with exterior alkyd enamel paint flat black. Contractor shall provide sample of paint to the Landscape Architect prior to installation. Use black UV approved wire ties only.

E. Spacing of heads shall not exceed the minimum indicated on the drawings (unless directed by the Landscape Architect). In no case shall the spacing exceed the maximum recommended by the manufacturer.

F. Before sprinkler heads are set, the contractor shall flush the lines thoroughly to ensure there is no foreign matter in the lines.

3.4 CONTROLLER INSTALLATION

A. Contractor shall be responsible for installing all automatic controllers located on the plans and details for the complete and proper automatic operation of the irrigation system. All such work shall be coordinated with the building and site contractors. Electric control valves shall be connected to controller in a clockwise sequence to correspond with station settings noted on the plans beginning with Stations 1, 2, 3, etc. Electric source shall be provided by others. Contractor shall be responsible for all connections, grounding, hook-ups, materials, labor, etc. for complete automatic operation according to all applicable codes.

The location of all controllers shall be approved by the Owner prior to installation.

3.5 CONTROL WIRE INSTALLATION

A. Install control wires at least 18" below finish grade and lay to the side of the main line. Provide a minimum of 48" of looped wire slack at valves and at 300’ intervals, snake wires in trench to allow for contraction of wires. Tie color-coded wires in bundles at 20' intervals and at changes in direction. The wire shall be laid in the trench prior to the installation of the pipe.

B. All underground wire splices shall be made at electric valves in valve boxes or splice boxes, using waterproof connectors per manufacturer's instructions.

C. All wire passing under existing or future paving or construction shall be encased in Schedule 40 PVC conduit extending at least 12" beyond edges of paving and stabilized for construction.

3.6 VALVE AND VALVE BOX INSTALLATION

A. Gate Valves: Install as located and detailed on the drawings.

B. Electric Control Valves: Shall be installed in specified valve boxes at the depth

specified on the drawings. The valve box shall have 6" layer of 3/4" pea gravel installed below the bottom of the valve. The valve shall be connected to the main line with Schedule 80 PVC extensions as necessary to ensure valve is properly positioned in the valve box as shown in the details. Electric control valves shall be installed where shown and grouped together where practical (NO MORE THAN 2 ITEMS PER SERVICE TEE). The contractor shall place no closer than 3 feet from edges of sidewalks walk edges, buildings and walls and no closer than 7 feet from the back of curb along roadways or centerline of swales. The contractor shall adjust the valve to provide flow rate or rated operating pressure required for each sprinkler circuit.

D. In the event that the valve box does not extend to the base of the electric control valve because of specific field conditions or complications as verified and approved by the Owner prior to installation, the contractor shall provide and install valve box extension(s) as manufactured by Ametek.

3.7 THRUST BLOCK INSTALLATION

A. All main line pipe shall have thrust blocks installed at tees, bends, or at the end of pipe lines as detailed on the drawings. Care shall be taken to install the concrete on the fittings and away from joints of pipe. Control, power and valve wires must be kept free of concrete and placed outside and away from the thrust block. Thrust blocks shall be poured against undisturbed ground as detailed on the drawings. No precast or pre "bagged" thrust block will be allowed.

3.8 PAINT

A. Exterior alkyd enamel, flat black, shall be used on aboveground PVC risers and other designated irrigation equipment. Contractor shall provide paint sample prior to execution of painting.

3.9 TESTING

A. The contractor shall notify Landscape Architect and Owner twenty-four (24) hours in advance of testing.

B. Prior to backfilling of mainline fittings, contractor shall fill the main line piping with water, in the presence of the Owner/Architect, taking care to purge the air from it by operating all the sprinkler control valves one or more times and/or such other means as may be necessary. A small, high pressure pump or other means of maintaining a continuous water supply shall be connected to the Main Line and set so as to maintain 100 PSI in the Main Line system for two (2) hours without interruption. When this has been accomplished and while the pressure in the system is still 100 PSI, leakage testing shall be performed.

Lateral line testing shall be conducted during the operating testing of the system by checking visually the ground surface until no leaks in this portion of the system are evident. Leaks shall be repaired or paid for by the contractor at any time they appear during the warranty period.

C. Adjustment and Coverage of System: Coordinate pressure testing with adjustments and coverage test of system so both may occur at the same time. The contractor shall balance and adjust the various components of the system so that the overall operation of the system is most efficient. This includes a synchronization of the controllers, adjustments to pressure regulators, pressure relief valves, part circle sprinkler heads, and individual station adjustments of the controllers.

D. All items of construction and operation of the irrigation system are subject to the inspection and testing by the Landscape Architect and other representatives of the Owner. Any item may be rejected because of non-compliance with the plans and specifications, non-suitability, poor materials, inadequate workmanship or improper assembly or other causes which would prevent the system from functioning properly, or which in the Landscape Architect's opinion would be detrimental to the longevity of the irrigation system, or which would necessitate excessive manual labor and maintenance.

E. The contractor shall fully comply with the schedule of testing and inspection, as well as any other tests or inspections that may be ordered by the Landscape Architect or other authorized representative of the Owner. All labor, materials, and equipment required for said tests and inspections shall be furnished at the sole expense of the contractor. Work stoppages for testing, inspection and replacement or repair of any inadequate item shall not add to the allocated time of completion.

F. All repairs, replacements, adjustments and reconstruction required to pass said inspections and tests shall be at the contractor's sole expense.

G. Contractor shall be responsible for the full and proper maintenance of the irrigation including but not limited to adjustments, repairs, integration with the master control system, etc. Contractor's responsibility for maintenance (exclusive of replacements or repairs within the guarantee/warranty period) shall terminate on the date of Substantial Completion for the entire project or designated portion thereof as declared by the Landscape Architect according to the conditions of the contract, provided the contractor has provided the Landscape Architect with irrigation 'as-built' drawings, and three (3) copies of Operation and Maintenance Manuals as specified under Paragraph 1.5 of this section.

H. Final inspection shall be made when the complete system is in place, operable, and all repairs, additions, adjustments and other work is complete. At such time, the contractor shall adequately demonstrate the proper operation of the system, shall show the system's complete conformance with the plans and specifications, and demonstrate that the irrigation system gives proper and adequate coverage of all landscaped areas.

I. Final acceptance by the Landscape Architect and/or Owner in no way removes the contractor of his responsibility to make further repairs, corrections and adjustments to eliminate any deficiencies which may later be discovered (includes moving or adding additional sprinklers if needed). Moreover, the contractor shall fully honor the one (1) year warranty outlined herein.

3.10 WARRANTY

A. The contractor shall fully warrant the landscape irrigation system for a period of one (1) year after the written final acceptance and will receive a written confirmation from the Landscape Architect that the warranty period is in effect.

B. During the warranty period, the contractor will enforce all manufacturer's and suppliers warranties as if made by the contractor himself. Any malfunctions, deficiencies, breaks, damages, disrepair, or other disorder due to materials, workmanship, or installation by the contractor and his suppliers shall be immediately and properly corrected to the proper order as directed by the Owner and/or Landscape Architect.

C. Any damages caused by system malfunction shall be the responsibility of the contractor who shall make full and immediate restoration for said damages.

END OF SECTION 02810

SECTION 02826 – METAL GATES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Aluminum gates.

a. Roller gate.
b. Swing gate.

1.2 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: Material descriptions, construction details, dimensions of individual components and profiles, and finishes for the following:

1. Gates and hardware.

C. Shop Drawings: Show locations gates. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans, elevations, gate swing and other required installation and operational clearances, and details of post anchorage and attachment and bracing.

1.3 PROJECT CONDITIONS

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

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

B. Field Measurements: Verify layout information for gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

PART 2 - PRODUCTS

1.4 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. EDKO; Sugar Grove
2. Hoover Fence

1.5 SWING GATES

A. General: Comply with ASTM F 900 for the following swing-gate types:

1. Single gate.

B. Metal Pipe and Tubing: Aluminum. Comply with ASTM B 429 and ASTM F 1043 for materials and protective coatings.

C. Aluminum Sheet: Flat sheet complying with ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than strength and durability properties of alloy 5005-H15.

1. Sheet Thickness: Minimum 1/8-inch.

D. Frames and Bracing: Fabricate members from round aluminum tubing with outside dimension and weight according to ASTM F 900 for the following gate fabric height:

1. Gate Height: As indicated.

E. Frame Corner Construction: Welded.

F. Hardware: Latches permitting operation from both sides of gate, hinges, center gate stops. Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.

1.6 HORIZONTAL SLIDE GATES

A. General: Comply with ASTM F 1184 for the following slide-gate types:

1. Classification: Type II Cantilever Slide, Class 1 with external roller assemblies.

B. Metal Pipe and Tubing: Galvanized steel. Comply with ASTM F 1083 and ASTM F 1043 for materials and protective coatings.

C. Metal Pipe and Tubing: Aluminum. Comply with ASTM B 429 and ASTM F 1043 for materials and protective coatings.

D. Gates: Fabricate from round aluminum tubing with outside dimension and weight according to ASTM F 1184 for the following gate characteristics:

1. Gate Height: 42-inches, unless otherwise indicated.
2. Gate Opening Width: 10-feet unless otherwise indicated.
3. Counter Balance Width: Not less than 5 feet.

E. Support Posts: Fabricate members from round galvanized steel pipe.

1. Size: 4-inch diameter, unless otherwise indicated.

F. Rollers: Injection molded, 6-inch diameter, nominal 3-inch wide wheels with steel shaft and sealed bearings. Provide with mounting hardware to securely mount to gate.

G. Hardware: Provide mounting hardware appropriate for mounting the swing gate and roller gate system. Fabricate latches with integral eye openings for padlocking nad designed to be accessible from both sides of gate.

1. Hinges for Swing Gate: Heavy-duty, vandal-proof type.

H. Fasteners: Use fasteners fabricated from same basic metal and alloy as fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.

1. Provide tamper-proof type for exposed fasteners.

1.7 FABRICATION

A. General: Fabricate rolling gates to travel straight and true and to hang plumb.

PART 3 - EXECUTION

1.8 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance.

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

1.9 INSTALLATION, GENERAL

A. General: Install gates in accordance with manufacturer’s instructions and recommendations.

1.10 GATE INSTALLATION

A. General: Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach hardware using tamper-proof or concealed means. Adjust hardware for smooth operation and lubricate where necessary.

1.11 ADJUSTING

A. Gate: Adjust gate to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Lubricate hardware and other moving parts.

END OF SECTION 02826

SECTION 02831 – CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. Extent of fencing and gates is indicated on drawings and schedules, and by requirements of this section.

1.2 RELATED DOCUMENTS:

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

1.3 QUALITY ASSURANCE

A. Materials and methods of construction shall comply with the following standards and specifications:

1. Chain Link Fence Manufacturers' Institute.
2. American Society for Testing and Materials, (ASTM).

1.4 SUBMITTALS

A. Product Data: Submit complete materials list of items proposed for the work.

B. Certification: For all materials specified to comply with reference standards, submit Certificate of Compliance.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle materials to prevent damage and deterioration.

1.6 COORDINATION

A. Examine Drawings and Specifications for all Contracts to determine the nature of proposed construction. Perform work to conform to construction called for in such a manner as not to interfere or delay work of other Contractors.

1.7 PROJECT CONDITIONS

A. Known underground and surface utility lines are indicated on the drawings.

B. Protect existing trees, plant, lawns, and other features designated to remain as part of the landscape work.

C. Promptly repair damage to adjacent facilities caused by installation operations. Cost of repair at Contractor's expense.

D. Promptly notify the Project Engineer of unexpected conditions.

PART 2 - PRODUCTS

2.1 CHAIN LINK FABRIC:

A. Fabric shall be zinc coated steel wire fabric galvanized after weaving and shall conform to ASTM A392. Fabric shall be 11-½ gauge by 2-3/8 inch mesh. Fabric shall be attached to terminal posts with 3/16 inch by ¾ inch tension bars 7/8 inch by 14 gauge steel tension bands spaced at a maximum of 15-inch intervals. Fabric shall be attached to line post with aluminum tie wire at a maximum of 12-inch intervals. Fabric height is detailed on the Drawings.

B. Fabric Selvages: All fabric shall have twist selvage along the top and bottom of the fabric.

2.2 POSTS:

A. General: All posts shall be hot dipped galvanized inside and out, and shall have tops to exclude moisture.

B. Line posts shall be 2 inch outside diameter standard weight pipe.

C. Gate posts shall be standard weight pipe with outside diameter determined by the following chart:

Opening of Gate	Gate Frame	Gate Posts
Up to 6'-0"	1 5/8 inch diameter	3 inches nominal
6'-1" to 13'-0"	2 inch diameter	4 inches nominal
13'-1" to 18'-0"	2 inch diameter	6 5/8 inches nominal
Over 18'-0"	2 inch diameter	8 5/8 inches nominal

2.3 BRACING:

A. Terminal (end, corner, gate and pull) post shall be braced with 1-5/8 inch outside diameter standard weight pipe, installed midway between top of fabric and ground level, extending from the terminal post to the first line post. Braces are to be attached with malleable rail ends and 7/8 inch by 12 gauge braced bands, securely trussed with 3/8 inch truss rods from the line post back to the terminal post.

2.4 FITTINGS:

A. All fittings shall be of malleable or heavy pressed steel construction. Fittings shall include, but are not limited to, such items as terminal and line post dome caps, end rail caps, brace bands, tension bands, tension board, and stress rods.

2.5 GATES:

A. Gate hinges and locking devices shall be of malleable or heavy pressed steel construction. All gates shall be of welded construction, 11 ½ gauge fabric and shall include drop rods, latches for padlock use, 180 degree hinges, and applicable

cantilevered slide gate wheels, rollers and hardware. Gates 5 feet and higher shall have a horizontal brace, one pipe size smaller. Gates over 8 feet long shall have vertical braces at 8 feet on center maximum, of one pipe size smaller than the main frame. All components used in construction of gates shall be heavily galvanized by the hot dip process, and shall be galvanized after welding of corners. Gate frame galvanizing shall be inside and outside. All single gates shall receive drop rods and latches for padlock attachment.

B. Gate sizes shown on the Drawings are approximate. Gates shall be sized to fit existing field conditions, and sizes shall be noted on shop drawings.

2.6 TOP AND BOTTOM TENSION WIRE:

A. Wire shall be 7 gauge galvanized spring wire, attached to fabric at 24 inches on center with tie wires.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Erect fencing in straight lines between angle points by skilled mechanics experienced in this type of construction. Erect in accordance with the manufacturer's recommendations, Drawings, and these specifications.

B. Hang gates and adjust all hardware so that gates operate satisfactorily from open or closed position.

C. Post Spacing: All posts shall be evenly spaced 10 feet or less on centers and vertically plumb.

D. Post Setting: All posts shall be set in holes of diameter and depth as indicated in the table below. After post has been set and plumbed, the holes shall be filled with concrete mix, crowned to shed water, with minimum compressive strength of 2500 psi at 28 days.

Type Post	Fabric Height	at Top	Hole Diameter Hole Depth	Embedment
Gates	6-10 feet	12 inches	38 inches	36 inches
Line	6-10 feet	9 inches	30 inches	27 inches
Terminal	6-10 feet	12 inches	38 inches	36 inches

3.2 CLEANUP:

A. Upon completion of fencing installation, remove tools and equipment. Provide site clear, clean, free of debris, and suitable for site work operations. Repair any grading irregularities, grassing or landscape damage, or any other site degradation caused by fencing construction activity.

END OF SECTION 02820

SECTION 02910 - TOPSOIL AND PLANTING SOIL PREPARATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, including General and Supplementary Conditions, and Division 1 - General Requirements and Conditions, shall apply to the work under this section.

1.2 WORK INCLUDED

A. The Landscape Contractor (LC) shall provide all labor, materials, necessary equipment, services, and facilities to complete the work of this section, as indicated on the drawings, as specified herein or both, except for items specifically indicated as “NIC ITEMS”.

B. The work specified herein includes, but is not limited to:

1. On- or off-site topsoil.

2. Soil conditioners.

3. Planting soil mixes.

1.3 RELATED WORK

A. Section 02300 - Earthwork

B. Section 02810 - Irrigation System

C. Section 02920 - Grass Sodding

D. Section 02930 - Trees, Shrubs, and Ground Cover

1.4 QUALITY ASSURANCE

A. Coordination: The LC shall coordinate with the Landscape Architect (LA) and Owner or Owner’s Authorized Representative (OAR) in monitoring and approval of all items and areas of work required.

B. Reference Specifications and Standards - Requirements or Regulatory Agencies: Conform to applicable requirements of all agencies with jurisdiction over the site.

C. Testing Agencies:

1. The LC shall perform soil-testing services using an Agricultural Testing

Laboratory certified in the State of Florida.

2. Test reports: The LC shall submit all test reports and other certified statements of test analysis in accordance with requirements specified herein.

D. Substitutions:

1. No substitutions will be allowed, unless the LA and OAR is notified and approval by the LA or OAR is received. Written information regarding all substitutions will be required at time of substantial completion.

2. If the specified or detailed materials are not obtainable, the LC shall provide written proposal for use of equivalent material.

E. The LC's Responsibilities:

1. The LC shall furnish all labor, materials, and equipment necessary for the completion of items as shown on the plans and/or specifications.

2. Work shown on the plans and not mentioned in the specifications, or vice versa, shall be done as if shown on both, and should any actual or apparent inconsistencies or errors be found, the LC shall notify the LA as soon as they are discovered and not proceed with any work where such uncertainty exists.

1.5 SUBMITTALS

A. Review and Approval: All submittals shall be submitted by the LC to the LA a minimum of two (2) weeks prior to the installation of any of the materials. The LC shall not begin work until all submittals have been approved by the LA.

B. Certified Soil Testing Laboratory Reports and Recommendations:

1. Soil testing shall be performed by a Soils Testing Laboratory certified in the State of Florida.

2. A total of three (3) separate sets of test reports will be required to be performed and the findings and soil amendment recommendations submitted to the LA and OAR for review as follows:

a. Test report for each of the on-site topsoil samples or off-site topsoil samples.

b. Test report(s) for the proposed planting soil mix(es).

c. Test report for each of the topsoil samples mixed with the planting

soil.

3. Each of the tests shall include the following analyses:

   a. pH range;

   b. Major element analysis: Nitrogen, Phosphorus, Potassium, Calcium, Manganese, and Sulfur;

   c. Minor element analysis: Iron, Zinc, Copper, Boron, and Magnesium;

   d. Soluble-salt concentration;

   e. Sand fraction analysis: Percentage (%) passing one-inch (1"), one-fourth inch (¼"), and No. 200 sieves;

   f. Percolation rate: Inches/hour; and

   g. Organic content: As determined by a loss of ignition test.

4. Testing Laboratory recommendations: Separate soil amendment and fertilizer recommendations for each combined topsoil/planting soil test to address deficiencies and maintain plantings in optimal condition.

5. Each of the test reports shall be identified by project name, date, soil-mix type, and location on the site. The test reports shall be printed on the Testing Laboratory's letterhead and signed by the Testing Laboratory's managing Director.

6. All text shall be legible. Reports submitted by the LC that are not legible will not be accepted as valid submittals.

7. All soil samples and tests shall be submitted to the LA a minimum of one (1) week prior to the delivery of plant materials to the job site. The LC shall be responsible for any delays in maintaining the project schedule, and delivering plants to the job site, if the soil samples and/or tests are found to be inaccurate or incomplete by the LA. All soils shall be amended as required by the specifications and Testing Laboratory's recommendations prior to the commencement of planting.

C. Certificates:

1. Manufacturer's certification and/or Testing Laboratory certification that content of soil conditioners meet specification requirements.

2. Manufacturer's certificate of fertilizer's chemical composition including, but not limited to, percentage and derivation of nitrogen, phosphorus, potassium, and micro-nutrients.

3. Submit all certifications to the LA a minimum of one (1) week prior to delivery of materials to the job site.

D. Soil Conditioner and Proposed Planting Soil Mix Samples: Submit a one (1)-pound sample of each soil conditioner and/or planting soil mix proposed for incorporation into the existing on-site soil.

E. "As-Built" Landscape Drawings: The LC shall prepare, maintain, and submit complete landscape planting "As-Built" documents as stipulated in Section 02930, "Trees, Shrubs, and Ground Cover", Paragraph 1.05, 'Submittals', which shall include written notation of any pertinent soil preparation/soil mix information required for the project.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery of Packaged Materials: The LC shall deliver packaged materials to site in containers in original, unopened containers showing:

1. Weight.

2. Analysis.

3. Name of the manufacturer.

4. Trade name or trademark.

5. Protect from deterioration, contamination, adverse weather, and other damage.

B. Storage:

1. The LC shall deliver approved off-site topsoil (if required) and planting soil mixes in bulk to storage areas designated by the OAR.

2. The LC shall protect bulk delivery materials from deterioration, erosion, contamination, adverse weather, and other damage.

1.7 PROJECT CONDITIONS

A. Existing Conditions:

1. The LC shall examine the project site, verify elevations, observe the conditions under which the work is to be done, and notify the OAR and LA of any unsatisfactory conditions.

2. The LC shall not proceed with work in this section until conditions have been corrected satisfactorily.

3. Utilities:

   a. The LC shall determine location of surface and underground utilities.

   b. The LC shall exercise care in digging and other work so as to not damage existing work including underground cables and pipes.

   c. Should such underground obstructions be encountered, which interfere with his work, the LC shall notify the LA and OAR immediately.

4. The LC shall be responsible for the immediate repair of any damage caused by his work and will be responsible for any disruption of service caused by this damage. Patching and replacing damaged work will be accomplished by the Owner's designated Contractor and the cost of this will be paid by the LC.

5. The LC shall maintain grade stakes set by others until removal is approved by all parties concerned.

6. Excavations: When conditions detrimental to plant growth are encountered, such as rubble fill, road sub-base, adverse drainage conditions, or obstructions, the LC shall notify the LA and OAR prior to planting.

B. Protection: The LC shall protect and maintain, as part of the work of this section, all existing materials.

C. Sequencing and Coordination:

1. Prior to all work, the LC shall coordinate the work of this section with related work of other trades and inform the LA of any scheduling or other discrepancies relating to work to be performed.

2. The LC shall notify the LA of anticipated installation phases and date(s) at least (2) two weeks in advance.

1.8 WARRANTIES

A. Fertilizer:

1. The LC shall affix to each container of fertilizer used in connection with this work, the manufacturer's certified analysis tag or label.

2. Fertilizer analysis shall be:

a. No less than minimum requirements of specifications.

b. As guaranteed by requirements of the Florida State Fertilizer Law.

B. Peat/Humus: The LC shall certify in writing that the peat/humus used meets all requirements and criteria of the specifications.

C. Warranty Conditions: In addition to prior specified warranty conditions, warranties are to cover defects (including death and unsatisfactory growth), except for defects resulting from neglect by Owner, a result of malpractice carried out by the Owner, abuse or damage by others, or unusual phenomena and incidents which are beyond the installer's control.

1.9 METHOD OF MEASUREMENT

A. Quantities: The quantities listed in the Contract Documents are approximate only, and the LC shall verify and furnish all specified materials required to complete the work shown on the drawings and in the specifications.

B. Measurement: Associated products, equipment, and execution necessary, or incidental thereto, will not be separately measured, but will be considered as included in the measurement for trees, shrubs, ground cover, sod, and seed. The only exception will be the provision of off-site topsoil, if approved by the Owner as an additional cost item.

C. Payment: Final payment will be made when the following documents are presented to the Owner:

1. Release of lien: The LC shall furnish the Owner with release of liens from all suppliers, as well as furnishing any liens by subcontractors to the LC doing work on this project. The LC shall provide the Owner with a release of lien prior to final payment.

2. "As-built" drawings: Submitted by the LC and approved by the Owner and LA.

PART 2 - PRODUCTS

2.1 TOPSOIL

A. Source: In the event on-site topsoil does not meet the requirements specified herein, or is available in an insufficient quantity, suitable topsoil shall be imported from off-site sources if approved in writing by the Owner as an additional cost item.

B. Composition: Topsoil shall be suitable for ornamental plant growth and free from hard clods, stiff clay, hardpan, gravel, subsoil, brush, large roots, refuse or other deleterious material, and of reasonably uniform quality.

C. Mechanical Analysis:

1. Topsoil and soil mixture(s) shall meet these specifications and the following mechanical analysis:

Sieve Size	% Passing
1"	99-100
¼"	97-99
#200	less than 7

2. Materials larger than one inch (1") shall be disposed of off the site or as directed by the OAR. Existing leaf litter and plant material shall be excluded from the topsoil with less than 7% of the soil passing the 200 sieve size.

D. Soluble Salts: Maximum amount permitted is 500 ppm.

E. Weeds: The LC shall assure that the topsoil is free of any visible weeds or weed seed.

2.2 SOIL CONDITIONERS

A. Dolomitic Limestone: Approved product, designated for agriculture use.

B. Aluminum Sulfate: Manufacturer’s standard commercial grade.

C. Peat: Suitable for plant growth, capable of sustaining vigorous plant growth, and specifically pulverized for agricultural use. Peat shall be free of deleterious materials that would be harmful to plant growth, shall be free of nematodes, shall be of uniform quality, and shall have a pH value between 5.5 and 6.5 (as determined in accordance with ASTM E-70). Peat shall be sterilized to make free of all viable nut grass and other undesirable weeds.

D. Pesticides: As recommended by applicable Agricultural Public Agencies.

E. Herbicides: As recommended by applicable Agricultural Public Agencies.

F. Soil Fumigants: As recommended by applicable Agricultural Public Agencies.

G. Fertilizer:

1. The LC shall provide a complete commercial-grade fertilizer mixture complying with the laws of manufacture regulating the sale and manufacture of fertilizer in the State of Florida. Chemical designation shall be as specified with at least 50% of the nitrogen derived from a non-water-soluble organic source and all potash to be derived from triple, super phosphate forms for all plantings.

2. The following minor elements shall be included at a minimum:

1.77% Zn
4.00% Mg
0.39% Mn
0.25% Cu
0.52% Fe
0.03% B

3. Minimum percentages shall be verified by the soil test report fertilizer recommendations and revised, if necessary.

4. The chemical designation for granular fertilizer for all plantings shall be 12-8-8, unless otherwise recommended by the Testing Laboratory. The LC shall adjust specified analysis of fertilizer as required, depending upon test results of planting soil(s) and Testing Laboratory's recommendations, at no additional cost to Owner.,

5. See specification Section 02930, "Trees, Shrubs, and Ground Cover" for additional fertilizer requirements.

H. Water: Free of substances harmful to growth of plants. Water shall also be free of staining agents, as well as elements causing odors.

I. Soil Sterilizers: As recommended by State and Local Agriculture Agencies.

J. Planting-Mix Sand: Clean, white, coarse-grained (0.5 mm or greater) sand, free of substances harmful to growth of plants.

K. Gravel: Clean (washed), river run gravel and free from substances harmful to growth of plants. Gravel size shall be graduated percentage consisting of three fourths inch (¾") minimum diameter to two-inch (2") maximum diameter stones.

2.3 PLANTING SOIL MIXES

A. Composition:

1. Planting soil shall be suitable for plant growth and free from hard clods, stiff clay, hardpan, gravel, brush, large roots, nematodes, weed seeds, weeds, refuse or other deleterious material, and of reasonably uniform quality.

2. The LC shall thoroughly blend all planting soil to form a uniform planting medium suitable for exceptional plant growth.

B. Percolation: The LC shall be responsible to assure adequate percolation of all planting pits if adequate percolation cannot be achieved. The LC shall backfill the bottom six inches (6") of each planting pit with approved clean gravel and one (1) layer of soil separator fabric between gravel and soil for increased drainage percolation, if approved by the Owner at an additional cost.

C. Planting Soil Mixes:

1. Annuals and perennials: Planting soil mix to be used for all annuals and perennials shall consist of the following:

a. One-half (1/2) clean, coarse-grained sand.

b. One-fourth (1/4) approved Florida peat.

c. One-eighth (1/8) fine-milled composted pine bark.

d. One-eighth (1/8) vermiculite.

2. Shrubs and ground cover: Planting soil mix to be used for shrubs and ground cover shall consist of the following:

a. One-third (1/3) approved peat.

b. Two-thirds (2/3) approved clean, coarse-grained sand.

3. Trees: Planting soil mix to be placed as backfill around the root balls of all trees shall consist of the following:

a. One-third (1/3) approved peat.

b. Two-thirds (2/3) approved clean, coarse-grained sand.

4. Palms: Planting soil mix to be placed, as backfill shall consist entirely of clean planting-mix sand.

D. Acceptable pH Ranges:

1. All existing on or off-site topsoil and planting soil shall have a pH range of between 5.5 and 7.0. If the tested pH is not within this range, the LC shall consult the Testing Laboratory and recommend to the LA and OAR soil amendments to bring the pH of the soil within the acceptable range.

2. The planting soil mixture for Azaleas, Gardenias, Camellias, and all other plant material specified, which grow best in slightly acidic soil, shall have a pH range between 4.5 and 5.5. In the event that these pH ranges cannot be achieved, the LC shall spread three inches (3") of peat, work into the topsoil to a depth of six inches (6"), creating a 50/50 mixture.

E. Deviation from Control Mix: Not more than 20%. Should a higher degree of variation be found, the LC shall make a correction as directed by the LA and OAR, with conformance tests repeated until the mix meets specifications for pit backfill and soil preparation.

PART 3 - EXECUTION

3.1 INSPECTION

A. Discrepancies: Before proceeding with any work, the LC shall carefully check and verify all dimensions and quantities, and immediately inform the LA and OAR of any discrepancies between the drawings, specifications, and actual conditions. The LC shall not work in any area where there is a significant discrepancy until approval to proceed has been received from the LA.

B. Removal of Debris: The LC shall remove all construction materials and debris from all areas to receive planting soil, without additional expense to the Owner prior to sub-soil preparation.

C. Grading: The LC shall verify that rough grading has been completed and there are no errors that will result in the poor application or cause latent defects in the placement of the planting soil.

3.2 SITE PREPARATION

A. Preparation for Finish Grading:

1. The LC shall prepare the finish grade for trees, shrubs, and ground cover in accordance with the procedure set forth in Section 02930, “Trees, Shrubs, and Ground Cover”, Part 3.02, ‘Preparation’, Paragraph A.

2. The LC shall prepare the finish grade for grass sod in accordance with the procedure set forth in Section 02920, “Grass Sodding”, Part 3.02,

'Preparation', Paragraph A.

B. Finish Grading:

1. The LC shall perform finish grade for trees, shrubs, and ground cover in accordance with the procedure set forth in Section 02930, "Trees, Shrubs, and Ground Cover", Part 3.02, 'Preparation', Paragraph B.

2. The LC shall prepare the finish grade for grass sod in accordance with the procedure set forth in Section 02920, "Grass Sodding", Part 3.02, 'Preparation', Paragraph B.

3.3 PLACING TOPSOIL AND PLANTING SOIL

A. Existing Topsoil:

1. Upon approval of existing topsoil for use on the site, the LC shall place topsoil to the depth specified herein and related specifications.

2. The LC shall spread and smooth topsoil to two inches (2") below finish grade in areas to be sodded. The LC shall remove plant material not indicated as existing, or to be relocated, in order to adhere to sod lines. The LC shall ensure that shrub beds are slightly elevated so that sod does not impound water in the shrub bed.

3. In all parking lot landscape islands, the LC shall completely remove any existing limerock, soil cement, and/or any other construction materials prior to the placement of topsoil.

B. Planting Soil: The LC shall be responsible for providing adequate, acceptable planting soil that meets the requirements specified herein. The LC is responsible for supplying and mixing the soil amendments, transporting, and placing the planting soil in the landscaped areas.

3.4 CLEAN UP

A. Immediately clean up spills, soil, and conditioners on paved and finished surface areas.

B. Remove debris and excess materials from project site immediately.

END OF SECTION 02910

SECTION 02920 - GRASS SODDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, including General and Supplementary Conditions, and Division 1 - General Requirements and Conditions, shall apply to the work under this section.

1.2 WORK INCLUDED

A. The Landscape Contractor (LC) shall provide all labor, materials, necessary equipment, and services to complete the lawns and grass work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as “NIC ITEMS”.

B. Protection of Public Property: The LC shall, at all times, protect all materials and work against injury from any cause, and shall provide and maintain all necessary guards for the protection of the public. The LC shall be held responsible for any damage or injuries to persons or property, which may occur as a result of his/her fault or negligence during the execution of the work. The LC shall insure that his work does not interrupt established or projected drainage patterns.

C. Change Orders: Any change or substitution in the plans must be negotiated between the LC and the Owner or Owner’s Authorized Representative (OAR). Any work performed on changes or ‘extras’, prior to execution of a written agreement, may or may not be compensated for by the Owner at his discretion.

1.3 RELATED WORK

A. Section 02810 - Irrigation System

B. Section 02910 - Topsoil and Planting Soil Preparation

C. Section 02930 - Trees, Shrubs, and Ground Cover

1.4 QUALITY ASSURANCE

A. Coordination: The LC shall coordinate with the Landscape Architect (LA) and OAR in monitoring and approval of all items and areas of work required.

B. Reference Specifications and Standards:

1. Federal Specifications (FS) 0-F-241c (1), Fertilizers, Mixed, Commercial.

2. Testing Agency: Independent Testing Laboratory.

3. Florida Turf Grass Association's (FTGA) established standards.

4. Nomenclature: Conform to names given in "Standardized Plant Names", prepared by the American Joint Committee on Horticultural Nomenclature.

5. Applicable federal, state, or other governing laws and standards as specified hereafter, or as may otherwise apply.

6. Comply with requirements of Section 02910, "Topsoil and Planting Soil Preparation".

C. Source Quality Control:

1. The LC shall ship all landscape materials to the job with appropriate Florida State Department of Agriculture Bureau of Plant Industry Certificates of Inspection.

2. The LC shall provide grass sod grown in a licensed nursery in accordance with standard horticultural practices.

D. Inspection: The LA and OAR reserve the right to inspect grass sod either at place of growth or at the site prior to planting to ascertain compliance with requirements for name, variety, size, and quality. Any grass sod that is not in compliance shall be removed and replaced at the LC's expense.

E. Substitutions:

1. No substitutions will be allowed by the LC, unless the LA and OAR are notified in writing and approval by the LA or OAR is received. Written information regarding all substitutions will be required at the time of substantial completion.

2. If the specified or detailed landscape materials are not obtainable, the LC shall provide a written proposal for use of equivalent material.

1.5 SUBMITTALS

A. Review and Approval: All submittals shall be submitted by the LC to the LA a minimum of two (2) weeks prior to the installation of any of the materials. The LC shall not begin work until all submittals have been verified by the LA.

B. Installation Schedule: The LC shall submit for approval a Planting Installation Schedule to the LA and OAR showing dates for installing the grass sodding in each area of the site.

C. Certificates:

1. Sod Grower Data: The LC shall submit to the OAR at the time of sod

delivery the following:

a. Name(s) of the sod grower(s) and location(s) from which the sod is to be obtained;

b. Verification of grass sod species; and

c. Provide Florida State Department of Agriculture, Bureau of Plant Industry inspection certificates Growers Certification.

2. Manufacturer's certification of fertilizer and herbicide composition.

D. Soil Analysis Test Reports: The LC shall submit the soil laboratory's test findings and recommendations in accordance with Section 02910 "Topsoil and Planting Soil Preparation".

E. "As-Built" Drawings: The LC shall be required to prepare, maintain, and submit complete "As-Built" Landscape Planting drawings as stipulated in Section 02930, "Trees, Shrubs, and Ground Cover", Part 1.05, 'Submittals', which shall include all grass sodding "as-built" information.

F. Warranties, Certificates, and Inspection Tags:

1. The LC shall submit warranties, certificates, and inspection tags for all products and materials as defined under Section 02930, "Trees, Shrubs, and Ground Cover", Part 1.08, 'Warranties'.

2. The LC shall submit certificates of inspection for all materials and products subject to state or federal governmental inspection. Submit certification of compliance of sod type and quality with specifications.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery:

1. The LC shall time delivery so that sod will arrive at site within twenty-four (24) hours after being stripped.

2. The LC shall deliver sod on pallets.

3. The LC shall protect sod against dehydration, contamination, heating, and breaking during transportation and delivery.

4. The LC shall not deliver more sod than can be installed within twenty-four (24) hours.

5. The LC shall keep stored sod moist and under shade, or covered with

moistened burlap.

6. The LC shall not pile sod more than two feet (2') deep.

7. The LC shall not tear, stretch, or drop sod.

1.7 PROJECT CONDITIONS

A. Existing Conditions:

1. The LC shall examine the project site, verify elevations, observe the conditions under which the work is to be done, and notify the OAR and LA of any unsatisfactory conditions.

2. The LC shall not proceed with work in this specification until conditions have been corrected satisfactorily.

3. Utilities.

a. The LC shall determine location of surface and underground utilities.

b. The LC shall exercise care in digging and other work so as to not damage existing work including underground cables and pipes.

c. Should such underground obstructions be encountered which interfere with his work, the LC shall notify the LA and OAR immediately.

d. The LC shall be responsible for the immediate repair of any damage caused by his work and will be responsible for any disruption of service caused by this damage. Patching and replacing damaged work will be accomplished by the Owner's designated Contractor and the cost of this will be paid by the LC.

4. The LC shall maintain grade stakes set by others until removal is approved by all parties concerned.

5. Excavations: When conditions detrimental to plant growth are encountered, such as rubble fill, road sub-base, adverse drainage conditions, or obstructions, the LC shall notify the LA and OAR prior to grass sodding.

B. Protection:

1. The LC shall protect and maintain, as part of the work of this section, all existing plant materials designated to remain.

2. When requested by the OAR, the LC shall erect signs and barriers against vehicular traffic.

C Sequencing and Coordination:

1. Prior to all grass sod work, the LC shall coordinate the work of this section with related work of other trades and inform the LA of any scheduling or other discrepancies relating to work to be performed.

2. The LC shall notify the LA of anticipated installation date(s) at least (2) two weeks in advance of installation.

3. Prior to the starting of grass sodding, the LC shall verify that the underground sprinkler system and finish grading have been approved. Unless specified otherwise, do not commence planting until:

   a. Site grading, soil import, and preparation has been completed and approved.

   b. Substantial provision for irrigation or hand watering has been provided to maintain grass sodding.

4. The LC shall proceed with and complete the grass sodding work as rapidly as portions of the site become available, or as otherwise directed.

5. The LC will protect all materials and work against injury from any cause and will provide and maintain all necessary safeguards for protection of the public. The LC will be held responsible for any damage or injury to person or property that may occur as a result of his/her negligence in the prosecution of the work.

1.8 WARRANTIES

A. Grass Sod:

1. All grass sodding shall be established or exhibit signs of being established within thirty (30) days or less from the date of installation, or the grass sod shall be removed and replaced at no additional cost to the Owner.

2. All sodding initially installed by the LC shall be warranted in writing for a period of six (6) months from the date of Final Acceptance.

3. Replacement grass sod under this warranty shall be guaranteed for twelve (12) months from the date of installation.

B. Replacements:

1. At any stage of the planting installation operations, or during the warranty

period, any grass sod covered under this contract that is dead or showing indication of probable non-survival or lack of health and vigor, or which does not exhibit the characteristics and conditions, such as to still qualify for the minimum grade as originally specified, will be promptly replaced by the LC. Replacement grass sod shall be installed by the LC as soon as possible and maintained per the specifications for the planting of new plant material, as well as warranted, as specified above, for new plant material.

2. The LC shall perform all necessary watering, over and above that provided by the automatic irrigation system, which is necessary to establish replacement material.

3. Cost of repair for damage caused by the LC to items including, but not limited to, other plants, curbing, walks, roads, etc. will be the responsibility of the LC.

4. The LC shall coordinate replacements with the LA and OAR.

5. The LC shall make grass sod replacements during the growth season following the end of the warranty period, or as otherwise mutually agreed with the Owner.

6. The LC shall furnish and plant grass sod replacements that comply with all requirements indicated and specified for original material.

7. The LC shall replace grass sod that is in doubtful condition at the end of warranty period, unless the Owner finds it advisable to extend warranty period.

1.9 METHOD OF MEASUREMENT

A. Quantities: The quantities given in the plant list are approximate only, and the LC shall verify, furnish, and plant all grass sod required to complete the work shown on the drawings and in the specifications at no additional cost to the Owner.

B. Measurement:

1. Grass sod will be measured by the square foot, complete and in place. The types and sizes of plant material will be measured separately.

2. Associated products, equipment, and execution necessary or incidental thereto will <u>not</u> be separately measured, but will be considered as included in the measurement for grass sod.

C. Payment: Final payment will be made when the following documents are presented to the Owner:

1. Release of lien: The LC shall furnish the Owner with release of liens from all suppliers, as well as furnishing any liens by subcontractors doing work on this project. The LC shall provide the Owner with a release of lien prior to final payment.

2. The LC shall be required to prepare, maintain, and submit complete “As-Built” Landscape Planting drawings as stipulated in Section 02930, “Trees, Shrubs, and Ground Cover”, Part 1.05, ‘Submittals’, which shall include all grass sodding “as-built” information.

3. Written warranty.

PART 2 - PRODUCTS

2.1 LAWNS AND GRASSES

A. Sod Material:

1. Species: As designated on the drawings and specified below:

a. Stenotaphrum secundatum ‘Floratam’, St. Augustine Floratam.

2. Thatch: Maximum three-eighths inch (3/8”), uncompressed.

3. Other: Uniform in color, leaf texture, and density.

B. Quality:

1. Grass sod shall be freshly cultivated, well-rooted, living sod from an approved source, not stretched, broken or torn, and free from weeds, disease, insects, clover, and crabgrass and recently mowed to three-inch (3") minimum length.

2. Grass sod shall be of high-quality in accordance with standards established by the FTGA.

C. Size: Furnished in pads:

1. Length: Twenty-four inches (24") plus/minus five percent (±5%).

2. Width: Eighteen inches (18") plus/minus five percent (±5%).

3. Thickness: One and one-half inches (1½") excluding top growth and thatch.

2.2 WATER

A. Water shall be free of substances harmful to plant growth.

2.3 FERTILIZER

A. FS 0-F-241c (1), Grade A or B.

B. The chemical designation shall be 12-8-8, with at least 50% of the nitrogen from a non-water-soluble, organic source.

2.4 HERBICIDES

A. As recommended by the State Department of Agriculture.

PART 3 - EXECUTION

3.1 INSPECTION

A. Before proceeding with any work, the LC shall carefully check and verify all dimensions and quantities, and immediately inform the LA and OAR of any discrepancies between the drawings, specifications, and actual conditions. The LC shall not do work in any area where there is a significant discrepancy until approval to proceed has been received from the LA.

B. The LC shall verify that rough grading has been completed and there are no errors that will result in poor application or cause latent defects in fine grading and sodding.

C. The LC shall accept job site elevations at plus/minus two/tenths (±0.2) of a foot from finish-grade elevations.

D. The LC shall verify that approved soil mix and/or soil amendments have been spread and thoroughly incorporated into the existing soil.

3.2 PREPARATION

A. Preparation for Finish Grading:

1. Weeding: Before and during preliminary and finish grading, the LC shall dig out all weeds and grasses by the roots and dispose of off-site. Perennial weeds and grasses, and noxious or invasive weeds, encountered on the site shall also be removed.

2. The LC shall loosen rough-graded material by roto-tilling to a depth of four inches (4") to six inches (6") and re-grade by hand raking to maintain proper elevation.

3. The LC shall remove all stones over two inches (2") in size, rubbish, and

all other extraneous matter from rough grade before beginning finish grading.

4. The LC shall till fertilizer into top two inches (2") of soil at a rate of twelve (12) pounds/1,000 square feet.

5. The LC shall grade around building shall be sloped away at not less than one-fourth inch (¼") per foot, unless otherwise specified.

6. The LC shall slope grass sod areas for positive drainage. When grass sodding is adjacent to buildings, curbs, pavement, or other water-holding obstruction, grade these areas before planting to create positive surface drainage away from plants and buildings.

7. The LC shall direct surface grading to facilitate drainage runoff of water as specified on the plans. The LC shall fill low spots with the specified planting soil mixture.

8. The LC shall remove and disposal of stumps, roots, logs, and other organic, cementitious, or metallic debris not suitable for ease of planting to a depth of not less than twelve inches (12").

B. Finish Grading:

1. The LC shall grade all grass sod areas to a smooth, even, and uniform plane with no abrupt change of surface to establish the correct finish grade.

2. Leveling:

a. The LC shall level out all undulations and irregularities in the surface resulting from tillage, fertilizing, liming, or other operations. Top of base of blade should be flush with pavement.

b. Finish grade of all grass sod, after laying, shall not be higher than adjacent paving, curbs, yard boxes, and other on-grade elements of site development. All surfaces shall drain to drainage devices provided without puddling or ponding. Finish grade must be approximately two inches (2") below pavement surface, top of curbs, etc., or as dictated by grass sod type so that top of base of blade is flush with pavement, curbing, etc.

3. The LC shall provide positive surface drainage in all areas.

a. The LC shall not work soil when moisture content is so great that excessive compaction will occur, nor when it is so dry dust will form in the air.

b. The LC shall apply water, if necessary, to provide ideal moisture for filling and for planting as herein specified.

c. The LC shall properly grade low spots and pockets to drain to established drainage structures.

4. Elevation of finish grade in all areas adjacent to pavement shall be two inches (2") below grade of pavement when all work including grass sodding has been completed.

5. The LC shall be provided with a complete copy of the civil construction documents for his use in reviewing existing grading and to use in restoring the areas impacted by their work. The LC is to contact the Owner for the plans.

6. The LC shall re-establish grade levels where settlement, erosion, or other grade changes occur from the point in time when the respective area is turned over to the LC. This LC shall adjust grades, as necessary, to provide positive drainage.

7. Prior to grass sodding, the LC shall clear the surface of all stones and other objects, larger than one inch (1") in thickness or diameter, and all roots, weeds, brush, wire, and any other objects that might be a hindrance to maintenance operations.

3.3 PLANTING

A. General:

1. The extent of the grass sod work shall be verified by the LC in the field. Additional grass sod required will be adjusted utilizing square-footage unit pricing approved by the Owner prior to the commencement of the work.

2. The LC shall not perform any work until all operations involved with the installation of the sprinkler system serving the areas to be sodded has been completed and is operational, final grades have been established, and the grass sod areas have been properly graded and approved.

3. The LC shall not sod areas until the planting of trees, shrubs, and other plants are sufficiently completed in that area to eliminate the possibility of incurring damage to the lawn areas by tree and shrub planting operations.

B. Sodding:

1. The LC shall pre-water soil to wet it to a depth of two inches (2"). Soil should be damp, but not muddy.

2. The LC shall lay grass sod within twenty-four (24) hours after delivery to

site and within forty-eight (48) hours after being cut. The LC shall not expose sod to sun longer than necessary.

3. The LC shall roll out grass sod or lay squares (preferably 12"x24") carefully. The LC shall use a 2”x4” laid on its side as a “kicker” to butt against sod strips and force them into place. The LC shall fit the grass sod squares together tightly so that no joints are visible.

4. The LC shall lay the first row of grass sod in a straight line with the long dimension of pads parallel to slope contours. The LC shall stagger or offset all joints between grass sod sections. The LC shall butt side and end joints, but not stretch or overlap grass sod.

5. The LC shall peg grass sod on slope ratio of 1:3 or greater with minimum of two (2) stakes per square yard. The LC shall be responsible for stabilizing grass sod at no additional cost to Owner. The LC shall begin sodding at the bottom of slopes and any grass sod parallel to the direction of any slopes.

6. Cut grass sod with a sharp knife or spade to conform to walks, planter beds, header boards, and other characteristics.

7. Roll grass sod with a roller weighing no more than one-hundred-fifty (150) pounds per linear foot of roller width and bring new grass sod into close contact with the soil by thorough rolling.

8. Bring grass sod edge in a neat, clean manner to the edge of all paving and bed line areas. Grass sod shall be one and one-half inches (1½") to two inches (2") below pavement elevations.

9. After laying and rolling grass sod, water area thoroughly and deeply.

   a. Keep grass sod well watered during the first two (2) weeks after installation to insure good rooting into base soil.

   b. Supplement watering from irrigation system by hose, as necessary, to assure adequate water to berms and other critical areas to establish grass sod.

10. The LC shall apply granular fertilizer 16-4-8 at the manufacturer’s recommended rate five (5) days after planting.

11. The LC shall not lay grass sod within four feet (4') of existing tree trunks.

3.4 LAWN ESTABLISHMENT AND REQUIRED MAINTENANCE

A. Watering:

1. The LC shall keep grass sod moist during first week after planting.

2. After first week, the LC shall supplement rainfall to produce a total of two inches (2") per week for approved grow-in period.

B. Mowing and Edging:

1. The LC shall mow grass sod as required until Final Acceptance between two and one-half inches (2½") and three inches (3") height.

2. The LC shall not cut off more than 40% of the grass leaf in a single mowing.

3. The LC shall remove all grass clippings.

4. Edging: The LC shall neatly edge and trim around all plant beds, curbs, roadways, sidewalks, streets, trees, and plants. The LC shall maintain shapes and configurations of plant beds as shown on the landscape plans. The LC shall maintain clean, trenched edge between sod and mulch areas. The LC shall take care not to injure tree trunks or plant materials during the edging operation.

B. Weed Eradication: Between 2nd and 3rd mowing, the LC shall apply herbicide specifically recommended for the grass species uniformly at the manufacturer's recommended rate.

C. Fertilizer:

1. The LC shall apply fertilizer uniformly at the manufacturer's recommended rate two (2) days after grass sodding.

2 .The LC shall provide fertilizing applications as prescribed by agricultural soils, laboratory tests, and recommendations.

D. Adjustment:

1. The LC shall re-sod areas, where necessary, for full and even coverage.

2 The LC shall re-grade, lightly compact, and re-plant around sprinkler heads, where necessary, to maintain proper vertical positioning in relation to general grade.

3. The LC shall fill all depressions and eroded channels with sufficient soil mix to adjust grade to assure proper drainage. The LC shall compact lightly and re-plant the filled areas in accordance with the contract requirements.

4. In the event that weeds or other undesirable vegetation becomes

prevalent, it shall be the LC's responsibility to remove them.

5. Damage resulting from erosion, gullies, washouts, or other causes will be repaired by the LC by filling with topsoil, tamping, re-fertilizing, and re-sodding by the LC.

E. Acceptance: The LC shall produce a good strand of grass sod, acceptable to the LA and OAR, and shall maintain these areas until Final Acceptance. Damaged or unsatisfactorily sodded areas shall be re-sodded to the Owner's satisfaction.

3.5 CLEAN UP

A. Clean Up:

1. During landscape work, the LC shall store materials and equipment where directed. The LC shall keep pavements clean and work area in an orderly condition.

2. The LC shall keep all planted areas free of debris and insects. The LC shall cultivate, weed, and water until Substantial Completion of the work.

3. Upon completion of the grass sod work, the LC shall remove all excess subsoil, cordage, wrappings, and other extraneous materials from the site. The LC shall remove all tools, equipment, and other materials, except those necessary for maintenance work. The LC shall remove litter or other debris occurring from installation and maintenance operations on a daily basis.

3.6 SUBSTANTIAL COMPLETION

A. Procedure:

1. Review of the entire project shall be made upon written request to the LA and OAR from the LC. The written request for review shall be accompanied by the LC's list of items remaining to be completed or corrected.

2. If the site inspection discloses that all work is satisfactory and complete according to the conditions of the contract, the LA and OAR shall declare the work substantially complete.

3. If it is determined by the LA that the Contractor's work is not substantially complete, the LC shall be responsible to compensate the Owner for the additional time required by the LA and OAR to re-inspect the work. Compensation shall be based on the actual time expended according to their respective standard hourly rates.

3.7 FINAL ACCEPTANCE

A. Procedure:

1. When all outstanding substantial completion work items are completed, an inspection will be held to determine acceptability. The LC shall notify the OAR and LA in writing, at least five (5) business days prior to anticipated inspection date, and make arrangements for the inspection at a time and date convenient to all parties.

2. Prior to final approval of work, the LC shall perform the following:

   a. Re-sod areas where necessary for full and even coverage.

   b. Remove all debris from landscape areas.

   c. Re-grade, lightly compact, and re-plant around sprinkler heads, where necessary, to maintain proper vertical positioning in relation to general grade.

   d. Fill all depressions and eroded channels with sufficient soil mix to adjust grades to assure proper drainage, compact lightly, and re-plant the filled areas in accordance with drawing requirements.

   e. Perform any other operations necessary to complete maintenance and ensure that the grass sod areas are healthy, vigorous, visually-pleasing, and undamaged.

3. Upon review of all grass sodding operations, the OAR and the LA shall approve or disapprove the Final Acceptance of the LC's work in writing. Partial Final Acceptance may be given to the LC, at the OAR's discretion, providing the unacceptable work is corrected immediately thereafter.

4. If the grass sodding work is in whole, or substantially acceptable, at the time of the inspection, a written notice will be given stating that the final maintenance period and warranty period begins effective the date of the inspection.

5. After the inspection for Final Acceptance, written acceptance will be given for all work of this section, exclusive of possible replacement of grass sod subject to the warranty. If any deficiencies of requirements exist, they will be noted in writing.

6. Upon written acceptance being given, the Owner will assume all responsibilities for maintenance of the grass sod landscape work.

7. At the conclusion of the warranty period, an inspection will be made to determine the condition of warranted plant material.

   a. Remove all plant material noted as not being in a healthy-growing

condition.

b. At no additional cost, replace plant material during the following planting season with material of like kind and size in accordance with specifications for original planting.

c. The warranty period applies also to replaced material and warranty period will commence upon planting.

END OF SECTION 02920

SECTION 02930 - TREES, SHRUBS, AND GROUND COVER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, including General and Supplementary Conditions, and Division 1 - General Requirements and Conditions, shall apply to the work under this section.

1.2 WORK INCLUDED

A. The Landscape Contractor (LC) shall provide all labor, materials, plant materials, soil additives, equipment, services, and facilities required to complete all landscape planting and related work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as “NIC ITEMS”.

B. Protection of Public Property: The LC shall, at all times, protect all materials and work against injury from any cause, and shall provide and maintain all necessary guards for the protection of the public. The LC shall be held responsible for any damage or injuries to persons or property that may occur as a result of his/her fault or negligence during the execution of the work. The LC shall insure that his work does not interrupt established or projected drainage patterns.

C. Change Orders: Any change or substitution in the landscape work must be negotiated between the LC and the Owner or Owner’s Authorized Representative (OAR). Any work performed on changes or ‘extras’ prior to execution of a written agreement may or may not be compensated for by the OAR at his discretion.

D. The quantities given in the plant list are approximate only. The LC shall verify, furnish, and install all of the plants required to complete the work shown on the drawings and in the specifications at no additional cost Any discrepancies found between the plans and the plant list shall be noted at the bottom of the bid submittal, so that an accurate quantity can be incorporated into the final contract.

1.3 RELATED WORK

A. Section 02300 - Earthwork

B. Section 02810 - Irrigation System

C. Section 02910 - Topsoil and Planting Soil Preparation

D. Section 02920 - Grass Sodding

1.4 QUALITY ASSURANCE

A. Coordination: The LC shall coordinate with the Landscape Architect (LA) and OAR in monitoring and approval of all items and areas of work required.

B. Reference Specifications and Standards:

1. Florida Nurserymen and Grower's Association's (FNGA) established standards.

2. Florida Turf Grass Association's (FTGA) established standards.

3. Florida State Department of Agriculture, Bureau of Plant Industry, 'Grades and Standards for Nursery Plants', latest edition.

4. American Association of Nurserymen, 'Horticultural Standards'.

5. Nomenclature: Conform to names given in 'Standardized Plant Names', prepared by the American Joint Committee on Horticultural Nomenclature.

6. Applicable federal, state, or other governing laws and standards, as specified hereafter, or as may otherwise apply.

7. Comply with requirements of Section 02910, "Topsoil and Planting Soil Preparation".

C. Source Quality Control:

1. The LC shall ship all landscape materials to the job with appropriate Florida State Department of Agriculture, Bureau of Plant Industry, Certificates of Inspection.

2. The LC shall provide trees and shrubs grown in a licensed nursery in accordance with standard horticultural practices.

D. Inspection: The OAR reserves the right to inspect plant materials either at place of growth or at the site prior to planting to ascertain compliance with requirements for name, variety, size, and quality. Final approval shall be based upon the in-place inspection. Any plants that are not in compliance shall be removed and replaced at the LC's expense.

E. Substitutions:

1. No substitutions will be allowed unless the LA and OAR are first notified and approval by the LA or OAR is received. Written information regarding

all substitutions will be required at the time of substantial completion.

2. If the specified or detailed landscape materials are not obtainable, provide the LA and OAR with a written proposal for use of equivalent material.

F. Testing Agencies:

1. The LC shall perform soil testing services using an agricultural testing laboratory certified in the State of Florida in accordance with the requirements of Section 02910, “Topsoil and Planting Soil Preparation”.

2. Test reports: The LC shall submit all test reports and other certified statements of test analysis in accordance with requirements of Section 02910, “Topsoil and Planting Soil Preparation”.

G. Landscape Contractor’s Responsibilities:

1. The LC shall furnish all labor, materials, and equipment necessary for the completion of items as shown on the plans and specifications.

2. Work shown on the plans and not mentioned in the specifications, or vice versa, shall be done as if shown on both and should any actual or apparent inconsistencies or errors be found, the LC shall notify the LA and OAR as soon as they are discovered and not proceed with any work where such uncertainty exists.

3. Should any objectionable materials such as old concrete, asphalt, lime rock sub-base, bricks, or other debris be encountered during planting operations, they shall be removed from the site by the LC.

4. The LC is entirely responsible for the work until Final Acceptance.

5. Project supervision: The LC shall have labor crews controlled and directed by an experienced supervisor well-versed in reading blueprints and specifications pertaining to landscape installation and maintenance. **NOTE:** A supervisor shall have current plans and specifications readily available on-site at all times.

1.5 SUBMITTALS

A. Review and Approval: All submittals shall be submitted by the LC to the LA a minimum of two (2) weeks prior to the installation of any of the materials. The LC shall not begin work until all submittals have been approved by the LA.

B. Installation Schedule: The LC shall submit to the LA and OAR for approval a

planting installation schedule showing dates for starting each type of planting in each area of the site.

C. Samples: When required by Part 3.04, 'Field Quality Control', the LC shall submit samples or organic amendments to the LA and OAR accompanied by analytical data.

D. Warranties, Certificates, and Inspection Tags:

1. The LC shall submit warranties, certificates, and inspection tags to the LA and OAR for all products and materials as defined under Part 1.06, 'Warranties'.

2. The LC shall submit certificates of inspection for all materials and products subject to state or federal governmental inspection to the LA and OAR. The LC shall also submit certification of compliance of sod type and quality with specifications.

E. Test Reports and Recommendations: The LC shall provide an analysis of existing soil samples from the site and planting soil supply areas obtained from a certified soils testing laboratory (i.e., signed original copy(s) by testing laboratory only). The LC shall comply with the submittal requirements of Section 02910, "Topsoil and Planting Soil Preparation".

F. Maintenance Instructions: Prior to the end of the maintenance period, the LC shall furnish three (3) copies of written maintenance instructions to the OAR for maintenance of the installed plants throughout their full-growing season.

G. Documentation of Plant Availability: Prior to commencing work and procuring plant material, The LC shall provide the Owner and LA with written documentation that all of the plant materials can be supplied as specified within the timeframe designated by the Owner. The LC shall verify that the nursery sources, quantities, size, and specimen quality for each plant specified can be provided. If specified plant material is not obtainable, the LC shall submit written notice of non-availability together with a proposal to the **LA for an equivalent substitution. Under no circumstances shall any substitutions be made without the prior written approval of the LA.**

H. Schedule to Field Tag Plant Materials: If requested, prior to procuring plant material, the LC shall coordinate and make all arrangements with the LA and OAR to visit the nurseries for the purpose of selecting and tagging the specified plant materials. The LC shall schedule the field visits at times convenient to all parties with reasonable written notice and confirmation provided.

I. Plant Samples: If requested, the LC shall provide three (3) plants of each shrub,

ground cover, or as specified for approval by the LA and to be used as the representative size, specification, and plant type for all plant materials to be installed. Any plant materials that do not conform to the plans, specifications, or approved plant samples shall be rejected.

J. Plant Photographs: If requested, the LC shall provide two (2) sets of representative color photographs of all plant materials specified with a measuring rod included in the photograph. All photographs shall be legible with minimal dark shadows obscuring planting details. Each picture shall have the date electronically imprinted and the source, species, size, and quantity clearly labeled in waterproof ink on the back of each photograph. Photographs shall be provided as part of the documentation of plant availability and prior to scheduling field visits.

K. Fertilizer(s) sources, types, formulas, and application rates.

L. Plant samples and/or photographs (if requested).

M. Drainage gravel sample (if specified).

N. Samples of mulches, specified herein.

O. Guying methodologies. If necessary. Provide manufacturer's product literature, if different from that specified.

P. "As-Built" Record Landscape Planting Drawings:

1. The LC shall prepare "As-Built" record drawing(s) on reproducible bases procured from the LA which shall show landscape trees, shrubs, ground covers, annuals, vines, aquatics, sod, etc. The record drawings shall also indicate and show approved substitutions of size, material, and any other deviations from the construction documents.

2. The LC shall store the record drawings apart from documents used for construction.

3. The LC shall maintain the record drawings in a clean, dry, legible condition and in good order. The LC shall not use record documents for construction purposes.

4. The LC shall make the record drawings and documentation of pending changes available at all times for inspection by the LA or OAR.

5. The LC shall label each record drawing and associated document "AS-BUILT RECORD DRAWING" in neat, large, printed letters or by rubber

stamp.

6. The LC shall record information concurrently with construction progress.

7. The LC shall legibly mark the record of actual construction and installation on the record drawings including, but not limited to:

   a. Field changes of dimensions and detail;

   b. Changes made by Field Order or by Change Order;

   c. Details not on original contract drawings; and

   d. Landscape substitutions.

8. Specifications and addenda: The LC shall legibly mark each section to record changes made by Clarification, Field Order, and/or Change Order.

9. "As-Built" record drawings shall be kept updated weekly and shall be reviewed by the LA and OAR during the course of the work. If during the course of the work the record drawings are found substantially incorrect or substantially behind the progress of the work, the OAR shall have the right to hold progress payments until said drawings are brought to an acceptable level of completeness.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Preparation for Delivery:

1. The LC shall prune head and/or roots of all trees only under the direction of the LA, and as required to assure safe loading, shipment, and handling without damaging the natural form and health of the plant. In no case are trees to be topped.

2. Prior to delivery to site, the LC shall spray all trees for insects, fungus, and with a foliar anti-transparent. The LC shall deliver plant materials with foliage, limbs, trunk, and roots free of disease and pests.

3. Balled and Burlapped (B&B) plants:

   a. The LC shall dig and prepare for shipment in a manner that will not damage roots, branches, shape, and future development after replanting. Oak trees shall be root pruned thirty (30) days prior to digging and hardened off at the supplier's nursery under mist for

thirty (30) to sixty (60) days.

b. The LC shall ball trees with firm, natural balls of soil. Dry, cracked, or broken rootballs before or during planting operations will not be accepted.

c. The LC shall wrap rootballs firmly with burlap or strong cloth and tie ANSI Z-60.l. Burlap shall be all-natural burlap only, without any synthetic material.

B. Delivery:

1. Packaged materials: The LC shall deliver packaged materials to site in original, unopened containers showing:

a. Weight;

b. Analysis;

c. Name of manufacturer;

d. Trade name or trademark; and

e. The LC shall protect from deterioration, contamination, adverse weather, and other damage.

2. Plant materials: Upon delivery at the site, all plants shall conform to specifications and be checked for handling damage by the LC. Any required inspection certificates, tags, or labels shall accompany each shipment and shall be provided to the OAR and LA by the LC.

3. Planting soil mix and mulch: The LC shall deliver planting soil mixes and mulch in bulk with manufacturer's guaranteed mix, name, and conformance to State law. The LC shall store these materials in designated areas approved by the OAR.

C. Storage:

1. The LA shall protect plants upon arrival on-site from drying or possible injury.

2. The LC shall thoroughly water and properly maintain until planting.

3. The LC shall not allow plants to remain unprotected for a period exceeding four (4) hours. The LC shall store plants in the shade and

protect them from weather. The LC shall heal in trees and palms in a vertical position so that the tree canopy or fronds are not touching the ground.

D. Handling:

1. The LC shall exercise all methods customary in good and standard horticultural practices. The LC shall not drop plants nor use chains or cables on any trees or Palms. The LC shall handle trees using nylon straps with a minimum width of four inches (4").

2. The LC shall remove from the site all plant materials that are not approved, and replace with plant materials that are in accordance with the plans and specifications.

1.7 PROJECT CONDITIONS

A. Existing Conditions:

1. The LC shall examine the project site, verify elevations, observe the conditions under which the work is to be done, and notify the OAR and LA of any unsatisfactory conditions.

2. The LC shall not proceed with work in this section until conditions have been corrected satisfactorily.

3. Utilities:

a. The LC shall determine the location of surface and underground utilities.

b. The LC shall exercise care in digging and other work so as to not damage existing work including underground cables and pipes.

c. Should such underground obstructions be encountered, which interfere with his work, the LC shall notify the LA and OAR immediately.

4. The LC shall be responsible for the immediate repair of any damage caused by his work and will be responsible for any disruption of service caused by this damage. Patching and replacing damaged work will be accomplished by the Owner’s designated contractor and the cost of this will be paid by the LC.

5. The LC shall maintain grade stakes set by others until removal is

approved by all parties concerned.

6. Excavations: When conditions detrimental to plant growth are encountered, such as rubble fill, road sub-base, adverse drainage conditions, or obstructions, the LC shall notify the LA and OAR immediately prior to planting.

B. Protection:

1. The LC shall protect and maintain, as part of the work of this section, all existing plant materials (if applicable).

2. The LC shall verify that all existing trees to remain (if applicable) are properly identified and barricaded to prevent damage by their work under this and future construction. The LC shall be responsible for maintaining adequate identification and barricading of all existing plant material to remain throughout the installation and required maintenance period.

C. Sequencing and Coordination:

1. Prior to all work, coordinate the work of this section with related work of other trades, and inform the LA of any scheduling or other discrepancies relating to work to be performed.

2. The LC shall notify the OAR and LA of anticipated installation phases and date(s) at last (2) two weeks in advance.

3. Prior to the starting of planting, the LC shall verify that the underground sprinkler system and finish grading have been approved. Unless specified otherwise, the LC shall not commence planting until:

a. .Site grading, soil import, and topsoil preparation has been completed and approved.

b. Substantial provision for irrigation or hand watering has been provided to maintain plant materials.

3. The LC shall proceed with, and complete the landscape planting work, as rapidly as portions of the site become available, or as otherwise directed.

4. Coordination with lawns:

a. The LC shall plant trees and shrubs after final grades are established and prior to planting of lawns, unless approved otherwise.

b. When planting of trees and shrubs does occur after lawn work, the LC shall protect lawn areas and promptly repair damage to lawns resulting from planting operations.

5. The LC shall protect all materials and work against injury from any cause and will provide and maintain all necessary safeguards for protection of the public. The LC shall be held responsible for any damage or injury to person or property that may occur as a result of his/her negligence in the prosecution of the work.

1.8 WARRANTIES

A. Shrubs and Ground Covers: The LC shall warrant shrubs and ground covers in writing for a period of one (1) year beyond the date of final acceptance.

B. Trees and Boxed Materials: The LC shall warrant trees and boxed materials in writing for a period of one (1) year beyond the date of final acceptance.

C. Fertilizer:

1. The LC shall affix to each container of fertilizer used in connection with this work, the manufacturer's certified analysis tag or label.

2. Fertilizer analysis shall be:

a. No less than minimum requirements of the specifications.

b. As guaranteed by requirements of the Florida State Fertilizer Law.

D. Peat/Humus: The LC shall certify in writing that the peat/humus used meets all requirements and criteria of the specifications.

E. Warranty Conditions: In addition to prior specified warranty conditions, warranties are to cover defects (including death and unsatisfactory growth), except for defects resulting from neglect by Owner, a result of malpractice carried out by the Owner, abuse or damage by others, or unusual phenomena and incidents which are beyond the installer's control.

F. Replacements:

1. At any stage of the planting installation operations or during the warranty period, any plant material covered under this contract that is dead or showing indication of probable non-survival or lack of health and vigor, or which does not exhibit the characteristics and conditions, such as to still

qualify for the minimum grade as originally specified, will be promptly replaced by the LC. Replacement plants or sod shall be installed as soon as possible and maintained per the specifications for the planting of new plant material, as well as warranted as specified above, for new plant material.

2. The LC shall perform all necessary watering, over and above that provided by the automatic irrigation system, which is necessary to establish replacement material.

3. Cost of the repair for damage caused by the LC to items including, but not limited to, other plants, lawn, curbing, walks, roads, etc. will be the responsibility of the LC.

4. The LC shall coordinate replacements with the LA and OAR.

5. The LC shall make replacements during the growing season following the end of the warranty period, or as otherwise mutually agreed with the Owner.

6. The LC shall furnish and plant replacements that comply with all requirements indicated and specified for original material.

7. The LC shall replace trees and shrubs that are in doubtful condition at the end of warranty period, unless the Owner finds it advisable to extend the warranty period.

1.9 METHOD OF MEASUREMENT

A. Quantities: The quantities given in the plant list are approximate only, and the LC shall verify, furnish, and plant all plants required to complete the work, as shown on the drawings and in the specifications at no additional cost.

B. Measurement:

1. Trees, shrubs, and ground cover will be measured for payment on the basis of each plant installed complete, in place, and accepted. The types and sizes of plant material will be measured separately.

2. Associated products, equipment, and execution necessary or incidental, thereto, will <u>not</u> be separately measured, but will be considered as included in the measurement for trees, shrubs, and ground cover.

C. Payment: Final payment will be made when the following documents are presented to the Owner:

1. Release of lien: The LC shall furnish the Owner with release of liens from all suppliers, as well as furnishing any liens by subcontractors to the LC doing work on this project. The LC shall provide the Owner with a release of lien prior to final payment.

2. "As-built" record drawings: During the course of the installation, the LC shall record all changes made to the plans during installation. These changes shall be documented and provided to the Owner or OAR in accordance with Part 1.03, Paragraph P., of this specification.

PART 2 - PRODUCTS

1.10 MISCELLANEOUS MATERIALS

A. Topsoil: The LC or General Contractor (GC) shall provide topsoil in accordance with the requirements of Section 02910, "Topsoil and Planting Soil Preparation".

B. Planting Mix: The LC shall provide planting soil in accordance with Section 02910, "Topsoil and Planting Soil Preparation".

C. Fertilizer:

1. The LC shall provide a complete commercial fertilizer mixture complying with the laws of manufacture regulating the sale and manufacture of fertilizer in the State of Florida.

2. Agriform tablets: Agriform tablets shall be Agriform twenty-one (21)-gram tablets, slow release, with a chemical designation of 20-10-5, or an approved equal. The LC shall provide as specified below:

a. Trees and palms: Use twenty-one (21) gram Agriform tablets with a chemical designation of 16-10-5. The LC shall follow the manufacturer's recommended application rates, but in no case shall the application rate be less than the following:

One (1) tablet per one-half inch (½") of trunk diameter measured one foot (1') above grade. Planting pit to be backfilled halfway up around the root ball, then equally space the Agriform tablets adjacent to the root ball.

The following minor elements shall be included:

Zn	Cu
Mg	Fe
Mn	B

b. Shrubs and ground covers: Use twenty-one (21)-gram Agriform tablet with a chemical designation of 20-10-5 per the following application rates:

One (1)-gallon container: One (1) tablet.

Three (3)- and five (5)-gallon containers: Three (3) tablets.

Seven (7)-gallon container: Four (4) tablets.

Ten (10)-gallon container: Five (5) tablets.

Backfill halfway up around the root ball, equally space Agriform tablets adjacent to the root ball. The following minor elements shall be included:

Zn	Cu
Mg	Fe
Mn	B

c. Annuals: Backfill mix shall contain slow-release 10-10-10 fertilizer, or fertilizer specifically formulated for use on Annuals.

D. Peat/Humus:

1. Peat shall consist of 90% organic peat and shall be suitable for horticultural purposes.

2. Peat will be brown in color, clean, low in content of mineral and woody material, a pH 4.0 to 5.0, and shall be shredded into particles not larger than one-half inch (½") in diameter.

3. Peat shall contain no more than 35% moisture, the ash content will not exceed 10%, and it shall be free from weedy grasses, sedges, rushes, or mineral matter harmful to plant growth.

E. Mulch for Planting Areas:

1. Top mulch in planting areas shall be free of deleterious materials, debris, insects, and weed seed and shall consist of the following:

a. Eucalyptus: Shredded, loose, substantially free of mineral waste materials, and showing an acid reaction.

b. Cypress mulch: Shredded, Grade B.

c. Pine straw mulch: Baled specifically for horticultural use, free of minerals (rocks), and branches larger than one-fourth inch (¼").

2. Gravel mulch:

a. Gravel shall be clean, washed, and contain no harmful chemicals to plants.

b. Crushed, angular limestone, equally-graduated size between three-fourths inch (¾") to two inches (2"), equal percentage of each size.

c. River washed rock, equally-graduated size between three-fourths inch (¾") to two inches (2"), equal percentage of each size.

F. Dolomitic Limestone:

1. Ground limestone containing not less than 85% of total carbonate and ground to such a size that 50% will pass through a 100-mesh sieve, and 90% will pass through a 200-mesh sieve.

2. Coarser materials will be acceptable, provided the specified rates of application are increased proportionately on the basis of quantities passing the 100-mesh sieve.

G. Aluminum Sulfate: Suitable for horticultural purposes; shall be a recognized-manufacturer's standard, commercial grade.

H. Anti-Desiccant: 'Wilt-Pruf', 'Dowwax', 'Foilgard', or LA / Owner-approved equivalent delivered in manufacturer's containers.

I. Staking Material:

1.Wood stakes, braces, and battens for tree and Palm staking shall be as follows, or approved equal:

a. Construction-grade lumber, pressure-treated Pine.

b. Vertical stakes: Nominal two-inch (2") diameter x eight feet (8') long minimum, pressure-treated wood stakes, and pointed at one (1) end.

c. Braces for Palm trees: Nominal 2"x4"x8' long minimum, pressure-

treated lumber.

d. Anchor stakes: Nominal 2"x4"x3' long, pressure-treated Pine, and pointed at one (1) end.

2 Galvanized-steel plates for Palm trees shall be as follows, or approved equal: Of sufficient size to secure braces to batons with galvanized-wood screws.

3. Tree wrapping shall be as follows, or approved equal: First-quality, heavy, waterproof crepe paper manufactured for tree wrapping, or approved equal.

J. Slope Stabilization:

1. The LC shall be responsible to stabilize grades by approved methods where necessary.

2. The LC shall stabilize all sloped areas greater than 3 to 1 and areas found to be required to reduce surface erosion by the OAR with erosion-control fabric. The LC shall install erosion-control fabric according to the manufacturer's instructions.

K. Soil Filtration Fabric:

1. Soil filtration or separator material shall be used to separate the gravel layer from sub-soil in tree or Palm pits, where percolation may not be adequate (see Part 3.03, 'Preparation', within this section). The fabric shall also be used around perforated underdrains as a 'sock'.

2. The soil filtration or separator fabric shall consist of a sheet of structure composed entirely of preferentially-oriented, isotactic-polypropylene, continuous filaments thermally-bounded mostly at the crossover points and weighing 4.0 +0.3 ounce/yard.

3. Soil separator installation:

a. Roll, size, and overlap as required as indicated, and complete installation as per manufacturer's standard, printed specifications, inspections, and recommendations.

b. The LC shall be responsible for securing top edges of soil separator by an approved method.

L. Drainage Gravel:

1. Gravel shall be crushed, angular limestone.

2. Gravel shall be equally-graduated percentage in size, ranging from three-fourths inch (¾") to two inches (2") in any direction.

3. Gravel shall be installed as shown on drawings or to a minimum of four-inch (4") depth.

4. Gravel shall be washed clean and contain no chemical elements harmful to plants.

5. Drainage gravel shall be provided and installed in the bottom of tree / Palm planting pits where percolation may not be adequate (see Part 3.03, 'Preparation', within this section).

1.11 PLANT MATERIALS

A. Name and Variety:

1. As designated on drawings and plant list.

2. The LC shall provide all plant materials conforming to latest edition of "Horticultural Standards of the American Association of Nurserymen".

3. Names used are those of "Standardized Plant Names".

4. The LC shall attach appropriate identification tags to each plant for all varieties specified as 'patented', 'registered', or 'trade-marked'. The LC shall not remove tags until inspected and approved by the LA.

B. Quality:

1. Unless otherwise specified, all plants shall meet or exceed the 'Florida No. 1' standards in accordance with 'Grades and Standards for Nursery Plants' published by the State of Florida, Department of Agriculture. Plants judged not in accordance with the specified standards will be rejected.

2. Plants designated as specimen shall be 'Florida Fancy' plant material in accordance with 'Grades and Standards for Nursery Plants', published by the State of Florida, Department of Agriculture. Plants judged not in accordance with the specified standards will be rejected.

3. The LC shall provide plant materials that exhibit the following:

   a. Symmetrical, with normal habit of growth, characteristic of the species or variety.

   b. Healthy with well-developed root systems filling their containers, but not to the point of being root-bound. B&B plants shall have vigorous, fibrous feeder roots, visible outside the ball wrap.

   c. Sound, free of mechanical or cultural injury, and free of noticeable effects of disease, insects, eggs, bores, and defects such as knots, sun-scald, windburn, injuries, abrasion, or disfigurement.

C. Dimensions:

1. Measure height and spread of all plants with branches in their normal position. Height and spread dimensions specified refer the to main body of the plant and not extreme branch tip-to-tip. The measurements specified are the minimum acceptable size and are the measurements after pruning, where pruning is required.

2. When dimensions of plant materials are omitted from the plant list, the LC shall provide plants of normal stock for the type listed.

3. The caliper of tree trunks shall be taken one foot (1') above ground level.

4. Trees shall conform to the measurements specified or indicated on the drawings and shall not vary from the size specified more than 10% or have a caliper size which varies more than one-fourth inch (¼"). Where a single trunk is specified, the plant shall have a single, straight trunk for a height of not less than what is specified on the drawings.

D. Trees:

1. The LC shall provide healthy, vigorous stock grown under climatic conditions similar to conditions in the locality of the project and free of disease, insects, eggs, larvae, and defects such as knots, sun-scald, injuries, abrasions, or disfigurement.

2. The LC shall provide trees of the sizes shown and specified. Trees of larger size may be used if sizes of rootballs are increased proportionately, and if accepted by the LA and Owner.

3. Trees, unless otherwise noted, shall be nursery / tree farm-grown. Collected trees will not be accepted.

4. All trees specified as container-grown shall have been grown in a rigid container (grow bags are unacceptable) for a minimum of two (2) years prior to installation.

5. Balled and burlapped (B&B) trees:

   a. B&B trees shall have been root-pruned during the growing season prior to the installation date. The harden-off period shall commence no later than six (6) weeks prior to installation date.

   b. The minimum rootball for B&B plant material is expressed by the caliper-to-rootball diameter ratio. The number is determined by dividing the rootball diameter (inches) by caliper (inches).

   c. The rootball diameter is defined as the average widest portion of the rootball and the measure perpendicular to it. The measure shall be taken within the upper one-third (a) of the rootball.

   d. The caliper shall be measured six inches (6") from the ground on trees up to and including four inches (4") in caliper and twelve inches (12") above the ground for larger caliper trees.

   e. Properly-cured trees shall have visible feeder roots growing through the burlap. Trees delivered to the job site without visible feeder roots shall be subject to rejection by the LA.

   f. Only organic burlap and jute twine shall be used for rootball containment. Synthetic materials (lenomesh) are not acceptable substitutes and are subject to rejection by the LA. After installation, the burlap and twine shall be completely removed from the upper one-third (1/3) of the rootball and disposed of off-site by the LC.

   g. Wire baskets shall only be used during delivery to the job site, and installation and may remain in the plant pit provided the upper one-third (1/3) is removed and disposed of off-site by the LC.

   h. The following chart shall be used to determine the minimum acceptable caliper-to-rootball diameter ratio:

      Caliper-to-rootball ratio (CRB) = RB/C

      Categories:

Container	Caliper	Min. Dia. RB	CRB
7	1.25"	18"	14.4
15	1.50"	20"	13.3
	2.00"	24"	12.0
25	2.50"	28"	11.2
45	3.50"	32"	10.7
65	3.50"	36"	10.3
95	4.00"	40"	10.0
	4.50"	44"	09.8
	5.00"	48"	09.6
200	5.50"	50"	09.1

i. All trees shall be free of low and/or tight “V”-shaped crotches and damage to the trunk.

E. Shrubs and Ground Covers:

1. The LC shall provide shrubs of the sizes shown or specified. Shrubs of larger size may be used if the sizes of the roots are increased proportionately, and if accepted by the LA and Owner.

2. Plants shall have been grown in containers for a minimum of six (6) months and a maximum of two (2) years and shall have sufficient roots to hold soil together after removal from containers. Shrubs shall not be root-bound or have hardened-off root systems.

3. Plants will not be accepted if the body has become too large for the size of the container or if the plant has become root-bound.

4. Plants shall not be removed from the container until immediately before planting.

F. Ball and Burlapped Plants and Wired-Balled and Burlapped Plants: (Only When Applicable.)

1. No plant shall be accepted when the ball of soil surrounding its roots has been cracked or broken, or shows evidence of being ‘made’.

2. The diameter of the rootball must be sufficient to encompass the fibrous and feeding root systems necessary for the maximum development of the plant, and shall conform to sizes and ratios in the table of minimum ball sizes as set forth in 'Grades and Standards for Nursery Plants'.

3. Roots shall have been root-pruned during the growing season prior to the installation date. The hardened-off period shall commence a minimum of six (6) weeks before planting at the job, and such fact shall be certified on accompanying invoices. Where, in the opinion of the LA following an inspection of the grower's stock, adequate root pruning is being obtained by the grower's general cultivating practices, the LC may consider such fact as meeting this requirement, and such fact shall be certified in accompanying invoices.

4. Balls shall be firmly wrapped with burlap, or approved strong cloth. All burlap and approved strong cloth shall be biodegradable.

5. The rootballs of these plants shall be properly protected until planting.

G. Turf Materials:

1.Grass sod: Provide as per Section 02920, "Lawns and Grasses".

PART 3 - EXECUTION

3.1 INSPECTION

A. Before proceeding with any work, the LC shall carefully check and verify all dimensions and quantities, and immediately inform the LA and OAR of any discrepancies between the drawings, specifications, and actual conditions. The LC shall not perform work in any area where there is a significant discrepancy until approval to proceed has been received from the LA.

B. The LC shall verify that rough grading has been completed and there are no errors that will result in poor application or cause latent defects in fine grading and sodding.

C. The LC shall accept job site elevations at plus/minus two/tenths (±0.16) (2") of a foot from finish-grade elevations.

3.2 PREPARATION

A. Preparation for Finish Grading:

1. Weeding: Before and during preliminary and finish grading, the LC shall dig out all weeds and grasses by the roots and dispose of off-site.

Grasses not of the perennial type less than two and one-half inches (2½") high, and not bearing seeds, may be turned under. Perennial weeds and grasses are to be removed. The LC shall also remove other noxious or invasive weeds encountered on the site.

2. Annual beds (if applicable): Removal of existing grass

   a. The LC shall remove existing grass where plant beds are designated for installation on the plans. Layout the planting bed shape and excavate grass only where beds are intended to be installed.

   b. Once planting beds have been installed, the LC shall clean up the edge of any adjacent sod areas and replace and which is damaged in order to give a clean and orderly appearance to the planting beds.

3. The LC shall loosen rough-graded material by roto-tilling to a depth of four inches (4") to six inches (6") and re-grade by hand raking to maintain proper elevations.

4. The LC shall remove all stones over two inches (2") in size, rubbish, and all other extraneous matter from rough grade before beginning finish grading.

5. The grade around building shall be sloped away by the LC at not less than one-fourth inch (¼") per foot, unless otherwise specified.

6. The LC shall slope plant beds for positive drainage: When plants beds are adjacent to buildings, curbs, pavement, or other water-holding obstruction, the LC shall grade the bed(s) before planting to create positive-surface drainage away from plants and buildings.

7. The LC shall grade to facilitate drainage runoff of water as specified on the plans. Low spots shall be filled by the LC.

8. Grubbing, when necessary, shall consist of the removal and disposal of stumps, roots, logs, and other organic, cementitious, or metallic debris not suitable for ease of planting to a depth of not less than eighteen inches (18").

B. Finish Grading:

1. The LC shall grade all lawn and planting areas to a smooth, even, and uniform plane with no abrupt change of surface to establish the correct

finished grades.

2. The LC shall provide positive surface drainage in all areas.

   a. The LC shall not work soil when moisture content is so great that excessive compaction will occur, nor when it is so dry dust will form in the air.

   c. The LC shall apply water, if necessary, to provide ideal moisture for filling and for planting as herein specified.

   d. The LC shall properly grade low spots and pockets to drain to established drainage structures.

3. Elevation of finish grade in all areas adjacent to pavement shall be two inches (2") below grade of pavement when all work including mulching has been completed.

4. The LC shall be provided with a complete copy of the civil construction documents for his use in reviewing existing grading and to use in restoring the areas impacted by their work. The LC shall contact the Owner for the plans.

5. The LC shall re-establish grade levels where settlement, erosion, or other grade changes occur from the point in time when the respective area is turned over to the LC. The LC shall adjust grades, as necessary, to provide positive drainage.

C. Layout and Spacing:

1. The LA shall layout areas for multiple plantings and stake locations for individual encountered during planting, relocate and replant materials at alternate locations as directed by the LA.

2. The LC shall place and plant all plant materials in the location, spacing, and orientation provided in the design specifications. The LC shall make adjustments as directed by the LA, if necessary, to achieve project design objectives.

   a. When plant material is spaced in rows, the LC shall verify all dimensions and space plants equally within the designated areas. The LC shall adjust quantities as required. Rows shall be placed parallel to curbs.

   b. Where plant material is indicated in an informal pattern, the LC

shall space the material as indicated, maintaining consistent spacing with proper consideration for trees, irrigation sprinkler patterns, light standards, and other features.

3. The LC shall space ground cover material triangularly in straight rows at the spacing indicated on the drawings.

4. The LC shall set shrubs that are to be located adjacent to sidewalks or sod edges back from the edge to a distance equivalent to the 'on-center' dimension of that specific shrub.

5. When trees are to be planted prior to construction of finish grades, the LC shall be responsible for locating the position and finish grade relationship to the top of the root ball.

D. Fertilizing:

1. The LC shall remove or redistribute excess soil before application of fertilizer. The LC shall make allowances when establishing finish grades for earth excavated from planting pits and mulch.

2. The LC shall provide fertilizing applications as prescribed by agricultural soils, laboratory tests, and recommendations.

3. For all shrubs and trees, the LC shall place Agriform fertilizer tablets (at specified rates) in the root zones, six inches (6") to eight inches (8") below the finish grade of the soil, no greater than four inches (4") away from the root ball. Verification of tablet placement will be required during final review.

E. Liming:

1. Immediately following, or simultaneously with the incorporation of the fertilizer, the LC shall distribute lime uniformly at a rate determined by tests and incorporate into the soil to a depth of at least one inch (1") by disking, harrowing, or other accepted methods.

2. Do not apply lime under trees.

F. Pre-Emergent Herbicide: When planting beds are cleared of weeds and grass, the LC shall apply an approved pre-emergent herbicide to all shrub and ground cover beds before plant installation.

3.3 PLANTING

A. General:

1. The quantities given in the plant list are approximate only, and the LC shall verify, furnish, and plant all the plants required to complete the work shown on the drawings and in the specifications at no additional cost.

2. All plant material shall be reviewed and receive initial approval from the LA and OAR prior to its delivery to the job site, as deemed necessary by the LA and OAR. Tagging of representative samples of trees and/or shrubs by the LA does not constitute final acceptance of the remaining trees and/or shrubs which the LC is responsible for tagging.

    a. The approval methods will be by nursery site visits or by photographs as set forth under Part 1.05 herein.

    b. Approval of plant materials at this stage will not constitute final acceptance. Approval for all materials will be given only at the time of Final Acceptance by the OAR.

3. The LC shall not perform any planting until all operations involved with the installation of the sprinkler system have been completed, final grades have been established, and the planting areas have been properly graded and approved.

4. The relative position of each tree and plant is subject to approval by the LA and will, if necessary to achieve project design objectives, be relocated as directed.

5. The LC shall remove each plant from its container, scarify the roots on the bottom, and plant in such a manner that when settled it will bear the same relation to the constructed finished grade as it bore to the grade in the container before being transplanted.

    a. Filling will not be permitted around trunks and stems.

    b. Cut and remove all wire and synthetic rope used on root ball.

6. Backfill procedure:

    a. The LC shall tamp firm planting soil into the plant pits.

    b. The LC shall form a shallow basin around plants to hold enough water to saturate the root ball and prepared plant mix.

    c. The LC shall maintain tree saucers until Final Acceptance.

7. The LC shall water plants immediately after planting. The LC shall rake all basins around trees away from root ball before mulching.

8. The LC shall prune at the time of planting with due regard to the natural forms and growth characteristics of each species.

9. Pruning shall be done in a manner complying with standard horticultural practices and shall be limited to the minimum necessary to remove injured twigs and branches and to compensate for the loss of roots during transplanting. Pruning shall not result in the removal of more than one-third (1/3) of the branching structure, nor shall pruning result in alterations to the basic plant structure. Broken or damaged roots shall be cut off smoothly.

10. The LC shall be responsible for supplemental hand watering of trees and shrubs irrigated by rotor irrigation heads and trees irrigated by spray heads on an as-needed basis, but not less than three (3) times weekly, until Final Acceptance. Each time plants are watered, they shall be watered completely saturating the root ball to its full depth.

11. Place mulch between and around specified trees and all shrubs within five (5) days after any planting. For individual trees outside of planting beds, spread mulch to cover the saucer area.

12. Plantings shall be located not less than five feet (5') back from electrical transformers. Maintain a 10' clearance for transformer doors.

13. Disposal of excess soil: Use acceptable excess excavated topsoil to form watering berms around trees and palms. The LC shall dispose of excess soil off-site, or as directed by the OAR. Finish grade shall be maintained to ensure proper surface drainage away from buildings, etc. Excess soil generated by planting pits may not be spread over graded areas, except berms.

B. Planting Container-Grown Trees:

1. The LC shall maintain plants in nursery containers or properly heeled-in until time for transplanting.

2. Can / container cutting: The LC shall open canned/container stock by cutting can vertically on two (2) opposite sides of the can with approved an instrument for the purpose. An ax or spade will not be permitted.

3. The LC shall handle all plants by earth ball or container only. Handling by

the trunk or branches of the plant itself will be cause for rejection. Trees with broken balls will be rejected.

4. The LC shall layout areas and set stakes for trees at locations indicated on the drawings. The LC shall secure approval from the LA before excavating plant pits. The LC shall make necessary adjustments as directed.

5. All proposed trees shall be installed by the LC either entirely in or entirely out of planting beds. Planting bed lines are not to be obstructed. If any tree, shrub, or plant bed settles more than three inches (3") below the established finish grade, it shall be raised to the proper level by the LC and not merely filled with additional planting soil.

6. The LC shall dig each plant pit twice the diameter of the tree root ball. When hardpan or muck is encountered, the LC shall break through to clean sand and backfill with planting soil. The LC shall loosen compacted soil at the sides and bottom of the plant pits by scarifying, or other approved method. The LC shall set each tree to finish grade and fill the plant pit with prepared soil, progressively settling the soil about the root ball by water jetting and flooding to remove voids. In areas where utilities exist, the LC shall be required to hand dig plant pits.

7. The LC shall remove containers from plants and lightly scarify roots before replacement in ground. The LC shall set each tree in the center of the pit in a plumb, vertical position so that crown of ball will be two inches (2") above finish grade. Rotate to obtain best visual appearance and proper relationship to nearby buildings and adjacent plants. The LC shall hold in position until the planting mixture has been flushed into place with a slow, full-hose stream, watered, and settled into place.

8. Fertilizer: The LC shall use twenty-one (21)-gram Agriform tablets with a chemical designation of 16-10-5. The LC will follow manufacturers recommended application rates, but, in no case, will the application be less than the following: one (1) tablet per one-half inch (½") of trunk diameter measured one foot (1') above grade. Planting pit to be backfilled halfway up around the root ball, then equally space the Agriform tablets adjacent to the root ball. The following minor elements will be included:

Zn	Cu
Mg	Fe
Mn	B

9. The LC shall prepare a watering basin the same width as the tree plant ball And water thoroughly immediately following planting. The LC shall

backfill all voids which develop with additional planting soil to bring to finish grade. All basins will remain in place until Final Acceptance and then will be removed by the LC.

10. The LC shall fill all tree pits with water to test proper drainage percolation prior to planting. The LC shall excavate pits that are found to be inadequately draining to a depth sufficient for proper drainage and backfill with course sand. No allowances will be made for plants lost due to improper installation and drainage. If the LC cannot meet proper vertical drainage conditions, contact the LA immediately.

11. Staking, and wrapping: All trees shall be staked as needed unless specifically noted on the plan. Staking of trees will not relieve the LC of the responsibility of resetting plants after they have been blown over, nor will it relieve him of the responsibility for the plant guarantee if the plants die as a result of being blown over. Braces will not be attached to the tree with nails. Any method of bracing other than those set forth in the drawings and specifications must receive prior approval from the LA before installation.

12. The LC shall backfill with planting soil as specified under Section 02910, “Topsoil and Planting Soil Preparation”.

13. The LC shall stake trees as shown on drawings.

14. The LC shall mulch the watering ring of trees with a layer of mulch as specified herein.

C. Planting B&B and WB&B Trees and Large Shrubs:

1. The LA shall install the plant root ball in the pit with the trunk plumb and on undisturbed sub-grade that has been hand-tamped.

2. The LC shall place the ball with burlap intact so location of ground line at top of ball is same as at nursery where grown.

3. The LC shall remove the binding at top l/2 of planting ball and lay the top of burlap back 6 in. For wire balled trees, the LC shall remove the wire from the top ½ of the ball (18" min.) and pull the burlap back after the plant has been stabilized by partially backfilling the planting pit.

4. The LC shall not pull wrapping from under the planting ball.

5. The LC shall not plant if the planting ball is cracked, broken or showing evidence of voids before or during planting process. The LC shall replace

the plant with one of the same species, size, and specification at no cost to Owner.

D. Tree Staking:

1. The LC shall be responsible for staking all trees in accordance with the contract documents.

2. The LC shall be responsible for maintaining staked trees and palms in a plumb condition.

3. The LC shall be responsible for keeping taut all guyed plant material. The method of tightening guy wires shall be approved by the LA. Guying shall be tightened as needed, but within one (1) day of when necessary.

4. Where trees are shown to be installed in pavement area cutout planters, some of which may be fairly small in overall dimension, the LC shall adjust the tree staking detail as necessary. Stakes and guy wires shall be contained within the cut-out planter area and braced against the turned down concrete slab.

E. Bed Preparation for Ground Cover Planting Areas:

1. The LC shall completely remove all existing weeds and grass including the roots, other vegetation (by mechanical methods), construction debris, limerock, etc. and any soil which would be deleterious to plant growth. The LC shall remove unwanted materials from project site and dispose of in an appropriate and legal manner.

2 .For all areas to be planted with Annuals, the LC shall provide a four-inch (4") depth of planting soil over the entire planting bed, till into the bed, and loosen the topsoil in the entire bed by digging and turning over soil. Hand digging may be required in areas where mechanical means would cause damage to underground utilities. Vertical drill, if necessary, through compacted sub-grade to ensure drainage in beds.

F. Preparation of Shrub/Vine Planting Beds:

1. The LC shall remove all existing weeds, grass, and other vegetation including all roots (by mechanical methods) construction debris, limerock, etc. and any soil which would be deleterious to plant growth completely. The LC shall remove all unwanted materials form the project site and dispose of in an appropriate and legal manner.

2. The LA shall chemically treat all areas to be planted with pre-emergent

herbicide ten (10) days before planting is to begin.

3. For all areas to be planted, the LC shall cultivate the soil to a minimum depth of eight inches (8") of prepared planting mix over the entire bed area. Any subsoil debris shall be removed form the site. The LC shall vertically drill areas, if necessary, to promote drainage. The LC shall and dig if utilities are nearby planting site.

G. Planting of Ground Covers:

1. The LC shall space ground cover plants as shown in the plant schedule on drawings.

2. The LC shall moisten ground cover areas prior to planting. Do not set plants in dry soil.

   a. The LC shall not allow rooted plants to dry out before or during planting.

   b. Wilted plants will not be accepted.

3. The LC shall insure adequate vertical drainage in all plant beds and planters. Vertical drilling through any compacted fill to native soil shall be accomplished to insure drainage.

4. The LC shall plant rooted cuttings sufficiently deep to cover all roots.

5. Ground cover plants that have been grown in liners are to remain in liners until time for transplanting.

   a. At the time of transplanting, the soils are to contain sufficient moisture so that it does not fall from the roots when plants are lifted from the liners.

   b. The LC shall plant each plant with its proportionate amount of soil in a manner that will insure a minimum of disturbance to the root system.

6. The LC shall remove containers from ground cover, loosen, and scarify roots before placement in ground.

7. The LC shall excavate round cover pits to eight inches (8") wider and four inches (4") deeper than the plant ball. Pit will be backfilled with planting soil as specified in specification 02910 ‘Topsoil and Planting Soil

Preparation'. Four inches (4") of this mixture will be placed in the pit before placing ground cover. After placing ground cover, the remainder of the pit will be filled to grade with this mixture. The LC shall apply fertilizer at the rate described in this Section. Place fertilizer in mixture while backfilling pit. Leave plant one inch (1") above finished grade.

8. After planting, the LC shall firm-up the earth around each plant sufficiently to force out all air pockets.

9. The LC shall place a twenty-one (21)-gram Agriform tablet with a chemical designation of 20-15-5 per the following application rates:

   a. One (1) gallon container - one (1) tablet.

   b. Three (3)-gallon container - three (3) tablets.

   The LC shall backfill halfway up around the root ball, equally space Agriform tablets adjacent to the root ball. The following minor elements will be included:

Zn	Cu
Mg	Fe
Mn	B

10. The LC shall use alternate procedures in the planting of ground covers only when approved.

11. After all planting and finish grading have been completed, the LC shall top dress all ground cover areas with three inches (3") of mulch as specified under Part 2 - Products. Finish grade including mulch shall be no more than one inch (1") below pavement elevation.

12. The LC shall ensure adequate vertical drainage in all plant beds and planters. Vertical drilling, through any compacted fill to native soil shall be accomplished to ensure drainage.

H. Planting of Shrubs and Vines:

1. The LC shall plant shrubs and vines in pits at least twelve inches (12") greater in diameter than their root ball and at least six inches (6") deeper than the bottom of the ball. The LC shall fill pits with planting soil to be bottom of the ball. When the plant has been properly set, the LC shall fill the pit to the finish grade with and thoroughly settle by tamping and watering.

2. Properly set shall mean that the shrub is at the same soil depth that it was planted at the nursery and the top of the root ball is two inches (2") above the finished grade after being heeled in. Shrubs shall be set plumb and vertical and shall be handled by the root ball only.

3. The LC shall remove all vines from stakes, untie, and securely fasten to the wall, fence, or other surface next to which they are planted in a manner approved by the LA.

4. Shrubs shall be pocket planted in the following manner: The LC shall remove the container from the shrub, loosen, and scarify roots before placement in ground as specified in specification 02910 'Topsoil and Planting Soil Preparation'.

5. The LC shall backfill the pit with a mixture of two (2) parts prepared soil mix to three (3) parts existing soil. Four inches (4") of this mixture shall be placed in the pit before placing shrub. After placing shrub, the remainder of the pit shall be filled to grade with this mixture. Fertilizer shall be applied at the rate described in 3.03 (D) (7). Place fertilizer in mixture while backfilling pit. Leave plant one and one-half inches (1-1/2") above finished grade and final grade to encourage drainage.

6. The LC shall place a twenty-one (21)-gram Agriform tablet with a chemical designation of 20-15-5 per the following application rates:

   a. One (1) gallon container - one (1) tablet.

   b. Three (3)-gallon and five (5)-gallon containers - three (3) tablets.

   c. Seven (7)-gallon containers - four (4) tablets.

   d. Ten (10)-gallon containers - five (5) tablets.

   The LC shall backfill halfway up around the root ball, equally space Agriform tablets adjacent to the root ball. The following minor elements will be included:

Zn	Cu
Mg	Fe
Mn	B

7. After finish grading is completed, the LC shall add a layer of mulch to a height as specified between and around newly planted shrubs as specified under Part 2 - Products. Finish grade including mulch shall be one and one-half inches (1½") to two inches (2") below pavement

elevation.

8. The LC shall insure adequate vertical drainage in all plant beds and planters. Vertical drilling through any compacted fill to native soil shall be accomplished to insure drainage.

3.4 FIELD QUALITY CONTROL

A. The LC shall notify the LA and OAR at least two (2) days in advance so that the following minimum observations can be made as the work progresses:

1. Conditions prior to finish grading and soil preparation.

2. Conditions upon completion of finish grading and soil preparation.

3. Plants, after delivery to site and prior to planting.

4. When shrubs, vines, and trees are spotted or staked for planting prior to excavation of planting holes.

5. Specimen trees at nursery source before delivery to on-site location.

6. Lawn areas prior to sodding.

7. Specimen trees, for condition, upon delivery to job site, and for positioning progressively as work is completed.

8. Review of installation procedures at 25% completion

3.5 MAINTENANCE AND ADJUSTMENT

A. Maintenance:

1. The LA shall begin maintenance immediately after planting: Maintenance shall include, but not be limited to, watering, pruning, repairing washouts, removing debris and dead branches, weeding, maintaining mulch level, mowing, edging, tightening and repairing of guys, replacement of sick, dying, or dead plants, resetting plants to proper grades or upright positions, restoration of the planting saucer or plant bed, and all other care needed for the proper growth of the plant material. The LC shall continuously protect all areas including lawns, plant materials, supports, etc. until Final Acceptance of the work. The Owner reserves the right to back charge for maintenance required that the LC either through omission or neglect does not perform or does not perform in a timely manner. The LC shall report irrigation problems/leaks as soon as possible to the LA.

2. The root system of plants shall be watered by the LC as often as conditions require at such intervals as will keep the surrounding soil in best condition for promotion of root growth and plant life. Supplemental hand watering above the irrigation system watering is the responsibility of the LC until all plant materials are well established. Water when soil moisture is below optimum level for best plant growth. Coordinate and adjust timing of irrigation system with the irrigation contractor plant materials establish. The LC shall note that the irrigation system is not designed to accommodate establishment of trees and palms. It is the LC's responsibility to provide additional water as may be required above what is supplied by the irrigation system until all trees and palms are well established.

3. The LC shall keep planting saucers and beds free of weeds, grass, and other undesirable vegetation growth. All areas shall be 98% weed free upon final acceptance by Owner.

4. The LC shall protect planting areas and plants against trespassing and damage of any kind for the duration of the maintenance period.

5. The LC shall maintain trees, shrubs, ground covers, sod, and other plants until Final Acceptance.

6. During the warranty period, and until its completion date, any plant that is dead of not in satisfactory condition, as determined by the LA, shall be removed and replaced by the LC. Plants replaced shall be inspected and accepted and than guaranteed for an additional six (6) months after the new acceptance date.

7. All plant replacements shall be of the same kind and size as specified in the plant list. They shall be furnished and planted as specified herein. The cost shall be the responsibility of the LC.

8. Spraying and dusting:

    a. During the maintenance period and up to Final Acceptance by the OAR, the LC shall perform all seasonal spraying and dusting of trees and shrubs.

    b. The LC shall use materials and methods in accordance with the highest nursery standards and practices and as directed by the LA or OAR.

B. Adjustment:

1. If planting should occur after sod preparation, the LC shall provide proper protection for sod areas and promptly repair all damage resulting from planting operations.

2. The LC shall provide other adjustments as follows:

a. Re-sod areas, where necessary, for full and even coverage.

b. Re-grade, lightly compact, and replant around sprinkler heads, where necessary, to maintain proper vertical positioning in relation to general grade.

c. Fill all depressions and eroded channels with sufficient soil mix to adjust grade to assure proper drainage. Compact lightly and replant the filled areas in accordance with Contract requirements.

d. Replacement of plants necessary during the maintenance period shall be the responsibility of the LC.

e. In the event that weeds or other undesirable vegetation becomes prevalent, it shall be the LC's responsibility to remove them.

f. Trees or other plants which fall or are blown over during the one (1) year guarantee period will be reset by the LC at no additional expense to the Owner. The only exception being hurricane force winds.

g. Damage resulting from erosion, gullies, washouts, or other causes will be repaired by filling with topsoil, tamping, re-fertilizing, and slope stabilization by the LC.

3.6 CLEAN UP AND PROTECTION

A. Clean Up:

1. During the landscape work, the LC shall store materials and equipment where directed. The LC shall keep pavements clean and work area in an orderly condition.

2. The LC shall keep all planted areas free of debris and insects. The LC shall cultivate, weed, and water until Substantial Completion of the work.

3. Upon completion, the LC shall remove all excess subsoil, cordage,

wrappings, and other extraneous materials from the site. The LC shall remove all tools, equipment, and other materials, except those necessary for maintenance work. The LC shall remove litter or other debris occurring from maintenance operations on a daily basis.

B. Protection:

1. The LC shall provide protection against mechanical damage and protection from vehicles, including posting of signs and barricades, as might be necessary. The LC shall repair, restore, or replace any plants or planting areas which might have become damaged as a result of negligence in complying with these requirements. The LC shall protect all materials and work against injury from any cause and shall provide and maintain all necessary safeguards for protection of the public. The LC shall be held responsible for any damage or injury to person or property which may occur as a result of his/her negligence in the prosecution of the work.

3.7 SUBSTANTIAL COMPLETION AND FINAL ACCEPTANCE PROCEDURES

A. Substantial Completion Procedure:

1. Review of the entire project shall be made upon written request of the LC. The written request for review shall be accompanied by the LC's list of items remaining to be completed or corrected.

2. If all work is satisfactory and complete according to the conditions of the Contract, the LA and OAR shall declare the work substantially complete.

3. If it is determined by the LA and OAR that the LC's work is not substantially complete, the LC shall be responsible to compensate the Owner for the additional time required by the LC to re-inspect the work. Compensation shall be based on the actual time expended by the LA according to his standard hourly rates.

B. Final Completion and Acceptance Procedure:

1. Final completion of work shall mean the full and exact compliance and conformity with the provisions expressed or implied in the drawings and specifications, including the complete removal of trash and debris created by the LC.

2. When all outstanding substantial completion work items are completed, an inspection will be held to determine acceptability. The LC shall notify the OAR and LA in writing at least five (5) business days prior to

anticipated inspection date and make arrangements for the inspection at a time and date convenient to all parties. The LC shall schedule an inspection and notify all concerned parties to be present.

3. Prior to final approval of work, the LC shall perform the following:

   a. Re-sod areas where necessary for full and even coverage.

   b. Remove all debris from landscape areas.

   c. Re-grade, lightly compact, and replant around sprinkler heads, where necessary, to maintain proper vertical positioning in relation to general grade.

   d. Fill all depressions and eroded channels with sufficient soil mix to adjust grade to assure proper drainage, compact lightly, and replant the filled areas in accord with drawing's requirements.

   e. Tighten and adjust all tree guy wires.

   f. Remove watering rings and restore mulch around trees.

   g. Perform any other operations necessary to complete maintenance and ensure that plants are healthy, vigorous, visually pleasing, and undamaged.

4. Upon review of all landscape work, the Owner or his OAR and LA shall approve or disapprove the final acceptance of the Contract in writing. Partial Final Acceptance may be given to the LC, at the Owner's discretion, providing the unacceptable work is corrected immediately thereafter.

5. If the materials are in whole or substantially acceptable at the time of the inspection, a written notice will be given by the OAR stating that the final maintenance period and warranty period begins effective the date of the inspection.

6. After the inspection for Final Acceptance, written acceptance will be given by the Owner for all work of this Section, exclusive of possible replacement of plants subject to warranty.

   a. If any deficiencies of requirements exist, they will be noted in writing.

   b. The LC shall, at the completion of the Final Acceptance, re-grade

all water basins around trees and re-mulch as needed, unless otherwise noted by the OAR.

7. Upon written acceptance being given, the Owner will assume all responsibilities for maintenance of landscape work.

8. At the conclusion of the warranty period, an inspection will be made by the OAR to determine the condition of warranted plant material.

   a. The LC shall remove all plant material noted as not being in a healthy-growing condition.

   b. At no additional cost, the LC shall replace plant material during the following planting season with material of like kind and size, in accordance with specifications for original planting.

   c. The warranty period applies also to replaced material and warranty period will commence upon planting.

END OF SECTION 02930

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 STANDARDS

The following Standards are listed in this specification:

ASTM A36	Specification for Carbon Structural Steel
ASTM A153	Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A185	Specification for Welded Steel Wire Fabric for Concrete Reinforcement
ASTM A193-B7	Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature Services
ASTM A307	Specification for Carbon Steel Bolts and Studs, 60000 psi Tensile Strength
ASTM A496	Specification for Deformed Steel Wire for Concrete Reinforcement
ASTM A576	Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality
ASTM A615	Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A706	Specification for Low-Alloy Steel Deformed Bars for Concrete Reinforcement.
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C39	Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C94	Specification for Ready Mixed Concrete
ASTM C150	Specification for Portland Cement
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C192	Practice for Making and Curing Concrete Test Specimens in the Laboratory
ASTM C260	Specification for Air-Entraining Admixtures for Concrete
ASTM C309	Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C330	Standard Specification for Lightweight Aggregates for Structural Concrete
ASTM C418	Test Method for Abrasion Resistance of Concrete by Sandblasting
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete”
ASTM C881	Specification for Epoxy-Resin-Base Bonding Systems for Concrete

ASTM C1116	Standard Specification for Fiber-Reinforced Concrete and Shotcrete
ASTM C1157	Standard Performance Specification for Hydraulic Cement
ASTM C1218	Test Method for Water-Soluble Chloride in Mortar and Concrete
ASTM C1315	Specification for Liquid Membrane-Forming Compounds Having Special Properties for Coring and Sealing Concrete
ASTM D2240	Test Method for Rubber Property – Durometer Hardness
ASTM D4397	Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications
ASTM E154	Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Wall, or as Ground Cover
ASTM E1155	Standard Test Method for Determining Floor Flatness and Levelness Using the F-Number System
ASTM E1745	Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs

1.3 DESCRIPTION OF WORK

A. Extent of concrete work is shown on drawings, including schedules, notes and details which show size and location of members and type of concrete to be poured. Furnish all labor, materials, services, equipment and hardware required in conjunction with or related to the forming, delivery and pouring of all poured-in-place concrete work.

B. Concrete paving and walks are specified in Division 2.

1.4 QUALIFICATIONS

A. The concrete supplier shall have a minimum of two years experience in manufacturing ready-mixed concrete products complying with ASTM C94 requirements for production facilities and equipment. The supplier must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.

B. The concrete contractor shall have a minimum of two years experience with installation of concrete similar in material, design and extent to that indicated for this Project and whose work has resulted in construction with a record of successful - service performance.

1.5 QUALITY ASSURANCE

The Contractor is responsible for quality control and quality assurance, including workmanship and materials furnished by his subcontractors and suppliers.

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

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

2. ACI 117 - 'Specifications for Tolerances for Concrete Construction and Materials."
3. ACI 318 - " Building Code Requirements for Reinforced Concrete".
4. Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice".

B. Document Conflict and Precedence: In case of conflict among documents, including architectural and structural drawings and specifications, notify the Architect/Engineer prior to submitting proposal. In case of conflict between and/or among the structural drawings and specifications, the strictest interpretation shall govern, unless specified otherwise in writing by the Architect/Engineer.

C. Inspection and Testing of the Work: Materials and installed work may require testing and retesting, as directed by the Architect/Engineer, at any time during progress of work. Allow free access to material stockpiles and facilities. Tests, not specifically indicated to be done at the Owner's expense, including retesting of rejected materials and installed work, shall be done at the Contractor's expense. See Testing Laboratory section of the Specifications.

Inspection or testing by the Owner does not relieve the Contractor of his responsibility to perform the Work in accordance with the Contract Documents.

D. Acceptance Criteria for Concrete Strength: The strength level of an individual class of concrete shall be considered satisfactory if both the following requirements are met:

1. The average of all sets of three consecutive strength tests equal or exceed the required f'c.
2. No individual strength test falls below the required f'c by more than 500 psi.

A strength test shall be defined as the average strength of two cylinder breaks tested at the strength age indicated on the drawings for that class of concrete.

E. Responsibility for Selection and Use of Concrete Admixtures and Chemical Treatments: The Contractor shall be responsible for selecting admixtures and surface treatments that are compatible with the intended use of the concrete including all final surface treatments called for within this or other specifications or on the structural or architectural drawings. The Contractor is responsible for following the manufacturer's instructions for the use of their product including abiding by any limitations placed by the manufacturer on the use of any of its products.

F. Responsibility for Design of Formwork: The General Contractor is responsible for the design, construction, and safety of all formwork. The General Contractor shall employ a professional engineer who is licensed in the state where the project is located and is experienced in the design of formwork to design all formwork and formwork removal. Forms shall be designed to withstand all loads imposed while in place including wet weight of concrete, construction equipment, live loads, and lateral loads due to wind and wet concrete imbalance. The General Contractor is responsible for determining when forms and other temporary supports may be removed.

G. Survey for Anchor Rods: The Contractor shall use a qualified, licensed professional engineer/land surveyor to lay out the proper location of all embedded anchor rods for columns above before they are encased in concrete. The surveyed locations of such elements shall be submitted to the Architect/Engineer for record.

1.6 PREINSTALLATION CONFERENCES

A. Mix Design Conference: At least 30 days prior to submittal of concrete design mixes, the Contractor shall hold a meeting or telephone conference to review the detailed requirements for preparing the concrete mix designs. Participants shall include representatives from the Contractor, Owner's Testing Laboratory, Concrete Supplier, and Engineer.

B. Pre-Concrete Conference

1. At least 7 days prior to beginning concrete work, the Contractor shall conduct a meeting to review the proposed mix designs and to discuss required methods and procedures to produce concrete construction of the required quality. Also review requirements for submittals, status of coordinating work and availability of materials. Establish work progress schedule and procedures for materials inspection, testing and certifications. The contractor shall send a pre-concrete conference agenda to all attendees 7 days prior to the scheduled date of the conference.
2. The Contractor shall require responsible representatives of every party who is concerned with the concrete work to attend the conference, including but not limited to the following:

   Contractor's Superintendent
   Laboratory responsible for the concrete design mix
   Laboratory responsible for field quality control
   Concrete Subcontractor
   Ready-Mix Concrete Producer
   Owner's and Architect's/Engineer's Representative

3. Minutes of the meeting shall be recorded, typed and printed by the Contractor and distributed by him to all parties concerned within 5 days of the meeting. One copy of the minutes shall be transmitted to the following for information purposes:

   Owner's Representative
   Architect
   Engineer-of-Record

4. The Engineer shall be present at the conference. The Contractor shall notify the Engineer at least 7 days prior to the scheduled date of the conference.

1.7 SUBMITTALS

A. Shop Drawings: Submit shop drawings for all reinforcing steel and related accessories for the Engineer's approval. Shop drawings shall show arrangement and layout, bending and assembly diagrams, bar schedules, stirrup spacing, splicing and laps of bars and shall be prepared in accordance with CRSI Standards. Submit details for steel templates that are to be used when placing dowels for columns, plinths, or pilasters out of foundation elements or for placing anchor bolts for structural steel members.

B. Product Data: Submit manufacturer's product data with application and installation instructions for proprietary materials and items, including admixtures, patching compounds, epoxies, grouts, waterstops, joint systems, curing compounds, dry-shake finish materials, hardeners, sealers and others as requested by Architect/Engineer.

C. Samples: Submit samples of materials specified if requested by Architect/Engineer, including names, sources and descriptions.

D. Mix Designs: Submit mix designs and the Concrete Mix Design Submittal Form located at the back of this specification section for each class of concrete that is to be provided for the project as specified herein. Submit the qualifying test data that supports each mix design as required herein.

E. Material and Mill Certificates: Provide material and mill certificates as specified herein and in the Testing Laboratory section of the Specifications. The Manufacturer and Contractor shall sign the material and mill certificates certifying that each material item complies with specified requirements. Provide certification from admixture manufacturers that chloride ion content complies with specified requirements.

F. Design Calculations: Submit for record calculations of all concrete formwork and the shoring plan sealed by a registered engineer in the state where the project is located.

G. Formwork Drawings: Formwork Drawings, prepared under the supervision and sealed by a registered professional engineer in the state where the project is located, shall be submitted for Owners record and shall be reviewed by the Engineer for conformance to structural layout only. Such shop drawings shall indicate types of materials, sizes, lengths, connection details, design allowance for construction loads, anchors, form ties, braces, construction joints, reveals, camber, openings, formwork coatings and all other pertinent information.

H. International Conference of Building Official (ICBO) Technical Reports: Submit technical reports of approval from ICBO for mechanical splice and dowel bar substitute systems.

I. Construction Joints: Submit drawing of proposed construction joint locations in concrete for slab on grade, mat foundations, and walls. Submit any additional or changed reinforcing that is required at construction joints that differs from that shown on the drawings.

J. Minutes of preconstruction conference.

K. Surveys: Submit reports certifying that all anchor rods for columns above are in their proper location prior to placing of concrete.

1.8 PROVISION FOR OTHER WORK

A. Provide for installation of inserts, hangers, metal ties, anchors, bolts, angle guards, dowels, thimbles, slots, nailing strips, blocking, grounds and other fastening devices required for attachment of work. Properly locate in cooperation with other trades and secure in position before concrete is poured. Do not install sleeves in any concrete slabs, beams or columns except where shown on the drawings or upon written approval of the Architect/Engineer.

B. Protect adjacent finish materials against damage and spatter during concrete placement.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

Refer to the drawings for classes and strengths of concrete required.

A. Portland Cement: ASTM C 150, Type I or Type III, or ASTM C 1157, Type GU or HE unless otherwise approved by the Architect/Engineer. For concrete exposed to salt air or salt water, provide Type II or Type V cement.

Use one brand of cement, for each class of concrete, throughout the project, unless approved otherwise by the Architect/Engineer and the Owner's Testing Laboratory.

B. Fly Ash: ASTM C 618, Class C or F.

C. Normal Weight Aggregates: ASTM C33 and as herein specified.

D. Water: Clean, fresh, drinkable, free of oils, acids or organic matter harmful to concrete.

E. Air-Entraining Admixture: ASTM C260. Provide air entrainment as specified in Table 4.2.1.of ACI 318-99 in all concrete exposed to freezing and thawing. Interior steel troweled surfaces subjected to vehicular traffic shall not have more than 3% entrained air. Surfaces scheduled to receive hardeners shall not have more than 3% entrained air.

Subject to compliance with requirements, provide one of the following products and manufacturers:

"Darex-AEA" or "Daravair"; W. R. Grace & Co.
"MBAE90" or "Micro-Air"; Master Builders
"Sika AER"; Sika Corporation
"Air Mix" or "AEA-92"; The Euclid Chemical Company, Inc.
“Boral Air 30” or “Boral Air 40”, Boral Material Technologies, Inc.

Submit manufacturer's certification that product conforms to the requirements specified and is compatible with all other admixtures to be used.

F. Water-Reducing Admixture: ASTM C494, Type A. See maximum permissible chloride ion content in concrete specified below.

Subject to compliance with requirements, provide one of the following products and manufacturers:

"Pozzolith 322N" or "Polyheed 997"; Master Builders
"Plastocrete 161"; Sika Chemical Corp.
"Eucon WR-75 or WR-91"; The Euclid Chemical Company, Inc.
"WRDA with Hycol"; W.R. Grace & Co.
“Boral NW” or “Boral LW”, Boral Material Technologies, Inc.

Submit manufacturer's certification that product conforms to the requirements specified and is compatible with all other admixtures to be used.

G. Mid-Range Water-Reducing Admixture: ASTM C494, Type A and Type F. See maximum permissible chloride ion content in concrete specified below.

Subject to compliance with requirements, provide one of the following products and manufacturers:

“Polyheed 997”, Master Builders
“Eucon MR”, The Euclid Chemical Company, Inc.
“Sikament HP”, Sika Chemical Corp.
“Mira 70”, W.R. Grace & Co.
“Boral X15” or “Boral X20”, Boral Material Technologies, Inc.

H. High-Range Water-Reducing Admixture (Super Plasticizer): ASTM C494, Type F or Type G. See maximum permissible chloride ion content in concrete specified below.

Subject to compliance with requirements, provide one of the following products and manufacturers:

"ADVA" or "Daracem"; W.R. Grace & Co.
"Rheobuild 1000" or "Rheobuild 3000FC"; Master Builders
"Sikament"; Sika Chemical Corp.
"Eucon 37 or Eucon 537"; The Euclid Chemical Company, Inc.
“Boral SP” or “Boral RD”, Boral Material Technologies, Inc.

Submit manufacturer's certification that product conforms to the requirements specified and is compatible with all other admixtures to be used.

I. Water-Reducing, Accelerator Admixture (Non-Corrosive, Non-Chloride): ASTM C494, Type C or E. See maximum permissible chloride ion content in concrete specified below.

Subject to compliance with requirements, provide one of the following products and manufacturers:

"Polarset"; W.R. Grace & Co.
"Pozzutec 20"; Master Builders
"Accelguard 80"; The Euclid Chemical Company, Inc.
“Plastocrete 161FL”, Sika Chemical Co.
“Boral AcN”, Boral Material Technologies, Inc.

Submit manufacturer's certification that product conforms to the requirements specified and is compatible with all other admixtures to be used.

J. Water-Reducing, Retarding Admixture: ASTM C 494, Type D. See maximum permissible chloride ion content in concrete specified below.

Subject to compliance with requirements, provide one of the following products and manufacturers:

"Daratard-17"; W.R. Grace & Co.
"Pozzolith 100XR" or "Pozzolith 300R; Master Builders
"Plastiment"; Sika Chemical Co.
"Eucon Retarder 75"; The Euclid Chemical Company, Inc.
“Boral R-Series”, Boral Material Technologies, Inc.

Submit manufacturer's certification that product conforms to the requirements specified and is compatible with all other admixtures to be used.

K. Corrosion Inhibitor: 30% calcium nitrite

Products: Subject to compliance with requirements, provide the following at 8 gal/cy:

"Eucon CIA", The Euclid Chemical Co.
"DCI", W.R. Grace & Co.
"Rheocrete 222+" or "Rheocrete CNI", Master Builders
“Armatec 2000”, Sika Chemical Co.
“Boral BCN”, Boral Material Technologies, Inc.

L. Corrosion Inhibitor: Amine-Ester type

Products: Subject to compliance with requirements, provide the following at dosage rates per manufacturer’s recommendation:

"Rheocrete 222+", Master Builders

M. Calcium Chloride and Chloride Ion Content:

1. Calcium chloride or admixtures containing more than 0.5% chloride ions by weight of the admixture are not permitted.
2. The maximum water-soluble chloride ion concentration in hardened concrete at ages from 28 to 42 days contributed from all ingredients including water, aggregates, cementitious materials, and admixtures shall not exceed the limits specified in ACI 318-99 Table 4.4.1. Water-soluble chloride ion tests shall conform to ASTM C1218.

   The Concrete Supplier shall certify on the Mix Design Submittal Form that the chloride ion content in all concrete mix designs used on the project will not exceed limits stated above.

N. Certification: Written conformance to all the above mentioned requirements and the chloride ion content of the admixture as tested by an accredited laboratory will be required from the admixture manufacturer at the time of mix design review by the Engineer.

2.2 REINFORCEMENT MATERIALS

A. Reinforcement:

1. Reinforcing Steel: All reinforcing steel shall conform to ASTM A615 Grade 60 unless noted otherwise on the drawings..
2. Weldable Reinforcing Steel: All reinforcing steel required to be welded shall conform to ASTM A 706.
3. Deformed Bar Anchors: Deformed Bar Anchors shall conform to ASTM A 496 with a minimum yield strength of 75,000 PSI. Standard ASTM A 615 Grade 60 or Grade 40 reinforcing bars may not be substituted for deformed bar anchors.
4. Plain Steel Welded Wire Fabric: Welded plain-steel wire fabric shall conform to ASTM A 185 with a yield strength of 65,000 PSI. Provide in flat sheets only.
5. Joint Dowel Bars: Smooth bars used to dowel across slab-on-grade construction joints shall conform to ASTM A615, Grade 40 or A36, plain-steel bars. Cut bars true to length with ends square and free of burrs.
6. Dowel Bar Sleeves: Plastic or gage metal (26 ga. min.) sleeves with an inside diameter of 1/16 inch greater than the dowel bar that it encases, that have the strength, durability, and design to provide free movement of the dowel relative to the concrete slab and that are specifically manufactured for this purpose.
7. Tie Wire: Tie wire shall be annealed steel tie wire, minimum 16 gauge. Provide only plastic coated or stainless steel tie wire in exposed concrete structures and all architectural concrete.

B. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing

bars and welded wire fabric in place. Use wire bar type or all plastic supports complying with CRSI recommendations.

1. Slabs-on-Grade: Use supports with sand plates or horizontal runners designed for use on ground.

2.3 SPLICES

A. Tension Splices: Concrete members with mechanical anchorage splices developing 125% of the yield strength in tension shall have vertical bars with shear cut, flame cut, or saw cut ends. The following are acceptable mechanical anchorage splices:

"Cadweld-Series C", Erico Products, Inc.
"Lenton Coupler", Erico Products, Inc.
"NMB Splice Sleeve", Splice Sleeve North America"
“Bar-Grip” and “ZAP Screwlok”, BarSplice Products, Inc.
“BarLock, S-Series and L-Series”, MBT Coupler System, Inc.
“Coupler Splice System”, Dayton/Richmond, Inc.
“US/MC-SAE Mechanical Coupler”, Dayton/Richmond, Inc.
"Dywidag Threadbar Coupler" Dywidag Systems International, USA, Inc. or other Engineer-approved product.

All splices shall be approved by the International Conference of Building Officials (ICBO) and shall have the ICBO Technical Report submitted for Engineer review.

B. Splice Type and Lap Lengths: Required splice type and lap lengths are defined on the drawings. Lap splice lengths for unscheduled bars not shown otherwise on the drawings shall be 48 bar diameters minimum.

C. Dowel Bar Replacement: All reinforcing steel bars shown on the drawings crossing concrete construction joint surfaces with inserts cast flush against the form and having dowels connected to the insert in a subsequent concrete pour shall conform to the following:

1. Splice connection at insert shall develop the full tensile capacity of the reinforcing steel.
2. The following are acceptable products:

"Lenton Form Saver", tapered thread dowel and insert, Erico Products, Inc.
"Dowel Bar Splicer", dowel bar substitution and rebar splice system (DB-SAE Splicer), Dayton/Richmond, Inc.
“B.P.I. Barsplicer System”, BarSplice Products, Inc. or other Engineer-approved product.

All splices shall be approved by the International Conference of Building Officials (ICBO) and shall have the ICBO Technical Report submitted for Engineer review.

D. Hooked Anchorage Replacement: Reinforcing bar terminations shall be manufactured out of ASTM A576 material and shall develop the full yield strength of the bar when installed at the manufacturer's recommended depth. The bar shall be connected to the terminating device in such a way as to develop 125% of the yield strength of the bar. The following are acceptable products:

"Lenton Terminator", Erico Products, Inc.
"Grip-Twist Rebar Terminations", BarSplice Products, Inc. or other Engineer-approved product.

All splices shall be approved by the International Conference of Building Officials (ICBO) and shall have the ICBO Technical Report submitted for Engineer review.

2.4 FORMWORK MATERIAL

A. Forms For Exposed Finish Concrete: Unless otherwise specified, formwork for exposed concrete surfaces shall consist of plywood, metal, metal-framed plywood, or other acceptable surface. Formwork shall provide a continuous straight and smooth surface conforming to the joint system as specified on the Architect's drawings. Form material shall have sufficient thickness to withstand pressure of concrete without bow or deflection. Plywood shall be exterior grade overlaid plywood complying with U.S. Product Standard PS-1 and as follows:

1. Medium density overlay, Class 1 or better, mill-release agent treated and edge sealed.

B. Forms for Unexposed Finish Concrete: Unless otherwise specified, formwork for unexposed concrete surfaces shall be constructed with plywood, lumber, metal or other acceptable material. Lumber shall be dressed on at least two edges and one side for tight fit.

C. Nails and Fasteners: Use only galvanized nails and fasteners for securing formwork in structures exposed to weather or unconditioned spaces such as garages, canopies and porte-cocheres.

D. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal. Refer to Architectural drawings for tie hole requirements.

1. Exposed Surfaces: Furnish units that will leave no corrodible metal closer than 1 inch to the plane of the exposed concrete surface. Furnish ties that, when removed, will leave holes not larger than 1 inch in diameter in concrete surface.
2. Damproofed Surfaces: Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

3. Exposed to Weather or Unconditioned Space: Provide galvanized form ties in surfaces that will be exposed to weather or in an unconditioned space in the final structure.

E. Chamfer Strips: Provide wood, metal, PVC, or rubber strips, ¾ by ¾ inch, minimum.

2.5 RELATED MATERIALS

A. Waterstops: Provide waterstops at all construction joints and other joints in all foundation walls below grade and where shown on the drawings. Size to suit joints. Provide flat, dumbbell type or centerbulb type.

1. Rubber waterstops: Corps of Engineers CRD-C 513.

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

Greenstreak
Progress Unlimited, Inc.
Westec Barrier Technologies; Div. of Western Textile Products, Inc.
Williams Products, Inc.

2. Polyvinyl chloride (PVC) waterstops: Corps of Engineers CRD-C 572.

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

BoMetals, Inc.
Greenstreak
W. R. Meadows
Progress Unlimited, Inc.
Vinylex Corp.
Paul Murphy Plastics, Co.
Sternson Group
Tamms Industries Co.; Div. Of LaPorte Construction Chemicals of North America, Inc.
Westec Barrier Technologies; Div. Of Western Textile Products, Inc.

3. Preformed Plastic Waterstops: Federal Specifications SS-S-210A "Sealing Compound for Expansion Joints".

Manufacturers: Synko-Flex Products, Inc.

4. Bentonite Waterstop RX manufactured by American Volclay Products

B. Moisture Retarder: Provide moisture retarder cover chosen from products specified below over prepared base material where indicated.

1. Plastic Moisture Retarder: Provide a flexible, preformed sheet membrane having a water-vapor permeance rate no greater than 0.04 perms when tested in accordance with ASTM E 154, section 7 and otherwise conforming to ASTM E 1745.

    a. Provide a Class C material and wherein the moisture barrier component is not less than 10 mils thick when the concrete is to be placed by pump or conveyor. Acceptable products include the following:

    "Stego Wrap Vapor Barrier (10 mil)", Stego Industries, LLC
    "Griffolyn T-85", Reef Industries
    "Rufco D16WB", Raven Industries

    b. Provide a Class B material and wherein the moisture barrier component is not less than 15 mils thick when the concrete is to be placed by truck or buggy. Acceptable products include the following:

    "Stego Wrap Vapor Barrier (15 mil)", Stego Industries, LLC

C. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.

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

1. Waterproof paper.
2. Polyethylene film.
3. Polyethylene-coated burlap.

E. Non-slip Aggregate Finish: Provide fused aluminum oxide granules, or crushed emery, as abrasive aggregate for non-slip finish with emery aggregate containing not less than 50% aluminum oxide and not less than 25% ferric oxide. Use material that is factory-graded, packaged, rust-proof and non-glazing, and is unaffected by freezing, moisture and cleaning materials.

Subject to compliance with requirements, provide one of the following:

"Emery Non-Slip", Dayton-Superior

F. Colored, Mineral Aggregate, Dry Shake Surface Hardener: Packaged, dry, combination of materials, consisting of portland cement, graded quartz aggregate, coloring pigments (if required) and plasticizing admixtures. Use coloring pigments that are finely ground, non-fading mineral oxides, interground with cement. Color, as selected by Architect, unless otherwise indicated.

Products: Subject to compliance with requirements, provide one of the following:

"Surflex"; Euclid Chemical Co.
"Quartz Plate"; L & M Const. Chemical Co.
"Mastercron"; Chem-Rex, Inc., MBT Protection and Repair Division
"Harcol", Sonneborn-Chem-Rex
"Quartz-Tuff", Dayton Superior

Submit manufacturer's certification that product conforms to the requirements specified.

G. Liquid Membrane-Forming Curing and Curing and Sealing Compounds:

1. High Solids, Water-Based, Non-Yellowing Curing and Sealing Compound: Water based membrane-forming curing and sealing compound, acrylic type, complying with ASTM C1315, Type 1, Class A classified as low odor. Do not apply to surfaces that are to receive subsequent cementitious toppings, sealers, hardeners, ceramic tile or terrazzo or other coating or finishing products.

Products: Subject to compliance with requirements, provide one of the following:

"Super Diamond Clear Vox", Euclid Chemical Company
"Lumiseal 30 WB", L&M Construction Chemicals
"Kure 1315", Sonneborn-ChemRex

Submit manufacturer's certification that product conforms to the requirements specified and is compatible with any covering or surface treatments to be applied.

H. Evaporation Control: Monomolecular film forming compound applied to exposed concrete slab surfaces for temporary protection from rapid moisture loss in hot weather conditions.

Products: Subject to compliance with requirements, provide one of the following:

"Eucobar"; Euclid Chemical Company
"E-Con"; L & M Construction Chemical, Inc.
"Confilm"; ChemRex, Inc., MBT Protection and Repair Division
"Sure Film (J-74)", Dayton Superior
"SikaFilm", Sika Chemical Co.

Submit manufacturer's certification that product conforms to the requirements specified and is compatible with all coverings and surface treatments to be applied.

I. Bonding Compound: Polyvinyl acetate or acrylic base, for use in cosmetic and/or nonstructural repairs.

Products: Subject to compliance with requirements, provide one of the following:

1. Acrylic or Styrene Butadiene:

   "Day-Chem Ad Bond (J-40)"; Dayton Superior
   "SBR Latex"; Euclid Chemical Co.
   "Daraweld C"; W. R. Grace.
   "Acrylic Additive," Sonneborn Chem-Rex, Inc.
   "SikaLatex", Sika Chemical Co.

2. Polyvinyl Acetate (Interior Use Only)

   "Euco Weld"; Euclid Chemical Co.
   "Everweld"; L & M Construction Chemicals, Inc.
   "Superior Concrete Bonder (J-41)," Dayton Superior

J. Epoxy Products: Two component material suitable for use on dry or damp surface, complying with ASTM C 881, for use in all structural concrete repairs.

1. Products for Crack Repair:

   "Sikadur 35 Hi Mod LV"; Sika Chemical Company – injection type
   "Sikadur 52", Sika Chemical Company – injection type
   "Sikadur 55 SLV", Sika Chemical Company – gravity feed
   "Eucopoxy Injection Resin," Euclid Chemical Company
   "Sure-Inject (J-56)," Dayton Superior
   “Epofil SLV”, Sonneborn-ChemRex

2. Products for Epoxy Mortar Patches:

   "Sikadur Lo-Mod LV"; Sika Chemical Corporation.
   "Euco 452 LV," Euclid Chemical Company
   "Sure Grip Epoxy Grout (J-54)," Dayton-Superior
   “Epofil”, Sonneborn-ChemRex

3. Allowable working loads for the single installations under static loading should not exceed 25% capacity or the allowable load of the anchor rod.
4. Ultimate load values in 2000, 4000, and 6000 psi stone aggregate concrete. Ultimate loads are indicated for the embedment shown in the Embedment in Concrete column. Performance values are based on the use of high strength threaded rod (ASTM A193 Gr. 87). The use of lower strength rods will result in lower ultimate tension and shear loads.**

5. Products for Epoxying Bolts or Reinforcing Steel into Concrete: Conform to ASTM C881-90, Type IV, Grade 3,Class A, B, & C except gel times.

   "Sikadur 31 Hi-Mod Gel"; Sika Corporation

"Euclid 452 Gel“,Euclid Chemical Company
"Sure Anchor I (J-S1)”, Dayton Superior
"Epo Gel" or "Rapid Gel”, Soneborn Chem-Rex
“HSE 2421 System”, Hilti Fastening Systems
“Epcon C6 System”, ITW Ramset/Red Head
"Power-Fast Injection Gel", Powers Rawl

6. Products for Epoxying Steel Plates to Concrete: Conform to ASTM C881-90, Type IV, Grade 3, Class A, B, & C except gel times.

"Sikadur 31 Hi-Mod Gel"; Sika Corporation
"Euclid 452 Gel," Euclid Chemical Company
"Sure Anchor I (J-S1)," Dayton Superior
"Epo Gel" or "Rapid Gel," Soneborn Chem-Rex

Substitutions may be considered provided complete technical information and job references are furnished to the Engineer for approval prior to commencement of work.

K. Self-Leveling Mortars, Underlayment Compound: Freeflowing, self-leveling, pumpable cementitious base compound.

Products: Unless specified otherwise, provide one of the following:

"Sonoflow," Sonneborn Chem-Rex, Inc.
"Sikatop 111"; Sika Chemical Co.
"Flo-Top" or "Flo-Top 90"; Euclid Chemical Co.
"Levelayer I," Dayton Superior

L. Polymer Patching Mortar: Polymer and microsilica modified cementitious based compounds.

Products:

Horizontal

"Thin Top Supreme, Concrete Top Supreme," Euclid Chemical
"Sikatop 121 or 122," Sika Chemical
"Emaco R310CI," ChemRex, Inc., MBT Protection and Repair Division
“Sonopatch 100 or 300”, Sonneborn-ChemRex

Vertical or Overhead

"Verticoat/Verticoat Supreme," Euclid Chemical
"Sikatop 123," Sika Chemical
"Emaco R320CI," ChemRex, Inc., MBT Protection and Repair Division
“Sonopatch 200”, Sonneborn-ChemRex

M. High Strength Flowing Repair Mortar: For forming and pouring structural members, or large horizontal repairs, provide flowable one-part, high strength microsilica modified repair mortar with 3/8" aggregate. The product shall achieve 9000 psi @ 28-days at a 9-inch slump.

Products:

“Road Patch”, Sonneborn-ChemRex

N. Anti-Corrosive Epoxy/Cementitious Adhesive: Water-based epoxy/cementitious compound for adhesion and corrosion protection or reinforcing members (20 hour maximum open time).

Products:

"Corr-Bond," Euclid Chemical Co.
"Armatec 110," Sika Chemical Co.
“Sonoprep”, Sonneborn-ChemRex

O. Expansion Bolts in Concrete:

1. ICBO Approval: Only concrete anchors approved by the International Conference of Building Officials (ICBO) with a published Research Report shall be approved for use.
2. Type: All expansion bolts in concrete shall be only wedge type expansion or undercut bolts.
3. Interior Use: All expansion bolts, nuts and washers for use in interior conditioned environments free of potential moisture shall be manufactured from carbon steel zinc plated in accordance with Federal Specification QQ-Z-325C, Type II, Class 3.
4. Exterior or Exposed Use: All expansion bolts, nuts and washers for use in exposed or potentially wet environments, or for attachment of exterior cladding materials shall be galvanized or stainless steel. Galvanized bolts, nuts and washers shall conform to ASTM A 153. Stainless steel bolts shall be manufactured from 300 series stainless steel and nuts and washers from 300 series or Type 18-8 stainless steel.
5. Nuts and Washers: Nuts and washers shall be furnished from the manufacturer and used with the bolts.
6. Acceptable Products and Manufacturers:

   "Kwik-Bolt II" or HSL Heavy Duty Sleeve Anchor"; Hilti Fastening Systems.
   "Trubolt Wedge Anchors," ITW Ramset/Red Head
   "Power Stud," Powers-Rawl Fasteners, Inc.
   “Sleeve-All”, Simpson Strong-Tie Co., Inc.

   Other manufacturers will be acceptable only if approved by ICBO with an ICBO Research Report submitted for Engineer review.

P. Adhesive Bolts in Concrete- Sealed Capsule Type:

1. Type: Adhesive bolts in concrete shall consist of a specially prepared threaded steel rod meeting the requirements of ASTM A 307, A36, or A193-B7 and a sealed capsule containing a two part system of modified vinylester resin and hardener. Adhesive anchors containing polyester resin shall not be used.
2. Exterior Use: Adhesive bolts used in exterior, exposed, potentially wet environments and for attachment of exterior cladding materials shall have threaded rods manufactured from ASTM A 153 galvanized steel or 300 series stainless steel. Nuts and washers shall also be galvanized or stainless steel.
3. Nuts and Washers: Nuts and washers shall be furnished from the manufacturer and used with the bolts.
4. Products: Subject to compliance with requirements, provide one of the following:

   "HVA Adhesive System"; Hilti Fastening Systems.
   "Chem-Stud" or "Hammer-Capsule", Powers-Rawl Fastening, Inc.
   "Maxima 7" or "Impact", ITW Ramset/Red Head
   “VGC 50”, Simpson Strong-Tie Co., Inc.

   Other manufacturers will be acceptable only if approved by ICBO with an ICBO Research Report submitted for Engineer review.

Q. Adhesive Bolts in Concrete – Two-Part Injectable Type:

1. Type: Adhesive bolts in concrete shall consist of a threaded rod steel rod meeting the requirements of ASTM A307, A36 or A193-B7 and a two component adhesive system contained in side by side packs connected to a mixing nozzles which thoroughly mixes the components as it is injected into the hole.
2. Exterior Use: Adhesive bolts used in exterior, exposed, potentially wet environments and for attachment of exterior cladding materials shall have threaded rods manufactured from ASTM A 153 galvanized steel or 300 series stainless steel. Nuts and washers shall also be galvanized or stainless steel.
3. Nuts and Washers: Nuts and washers shall be furnished from the manufacturer and used with the bolts.
4. Products: Subject to compliance with requirements provide one of the following:

   “Epcon A7”, ITW Ramset/Red Head
   "HIT HY-150", Hilti Fastening Systems
   “Epoxy-Tie ET”, Simpson Strong-Tie Co., Inc.

R. Reglets: Where resilient or elastomeric sheet flashing or bituminous membrane are terminated in reglets, provide reglets of not less than 26 gage galvanized sheet steel. Fill reglet or cover face opening to prevent intrusion of concrete or debris.

S. Contraction Joint-Filler Material for Slabs-on-Grade: Provide a 2-component semi-rigid, 100% solids epoxy having a minimum shore A hardness of 75 when tested in accordance with ASTM D2240. Subject to compliance with requirements, provide one of the following:

"Euco 700", Euclid Chemical Co., Inc.
"Spec-Joint CJ"; Conspec Marketing and Manufacturing Co., Inc.
"Masterfill 300 I", ChemRex, Inc., MBT Protection and Repair Division

T. Bondbreaker for Construction Joints in Slabs-on-Grade: A dissipating bondbreaking compound containing no silicones, resins, or waxes, and that conforms to ASTM C309. Subject to compliance with requirements, acceptable manufacturers include the following:

“Sure-Lift”, Dayton Superior Corporation, Inc.
“Tilt-Eez”, Conspec Marketing and Manufacturing Co., Inc.

2.6 PROPORTIONING AND DESIGN OF CONCRETE MIXES

The Contractor shall submit for approval by the Engineer and Owner's Testing Laboratory, at least 15 working days prior to the start of construction, concrete mix designs and the Concrete Mix Design Submittal Form located at the end of this specification section for each class of concrete indicated on the structural drawings and in the Specifications. The Contractor shall not begin work with a particular mix until that mix design has been approved.

A. Mix Design Conference: At least 30 days prior to submittal of concrete design mixes, the Contractor shall hold a meeting or telephone conference to review the detailed requirements for preparing the concrete mix designs. Participants shall include representatives from the Contractor, Owner's Testing Laboratory, Concrete Supplier, and Engineer.

B. The Contractor, acting in conjunction with his Concrete Supplier and his Testing Laboratory, shall submit in writing, with his mix designs, the method used to select mix proportions. Either of the following methods, as outlined in ACI 318, may be used.

1. Field Experience Method
2. Laboratory Trial Mixture Method

When field experience methods are used to select concrete proportions, establish proportions as specified in ACI 301 and ACI 211. When Laboratory trial batches are used to select concrete proportions, the procedure as outlined in ACI 318 shall be followed. Prepare test specimens in accordance with ASTM C192 and conduct strength tests in accordance with ASTM C39. Proportioning without field experience or trial mixtures is not permitted.

C. Required types of concrete and compressive strengths shall be as indicated on the Structural Drawings.

D. All mix designs shall state the following information:

1. Mix design number or code designation by which the Contractor shall order the concrete from the Supplier
2. Structural member for which the concrete is designed (i.e. columns, shear walls, footings, etc.)
3. Wet and dry unit weight.
4. 28 day compressive strength
5. Aggregate type, source, size, gradation, fineness modulus
6. Cement type and brand
7. Fly ash or other pozzolan type and brand (if any)
8. Admixtures including air entrainment, water reducers, accelerators, and retarders
9. Design Slump
10. Proportions of each material used
11. Water cement ratio and maximum allowable water content
12. Method by which the concrete is intended to be placed (bucket, chute, or pump)
13. Required average strength qualification calculations per ACI 318 5.3.1 and 5.3.2. Submit separate qualification calculations for each production facility that will supply concrete to the project.
14. Documentation of Average strength (trial mix data or field test data) per ACI 318 5.3.3. When field test data is used to qualify average strength, submit separate documentation for each production facility that will supply concrete to the project.
15. Field test data submitted for qualification of average strength under ACI 318 5.3.1, 5.3.2 and 5.3.3 shall include copies of the Concrete Testing Agency's reports from which the data was compiled.
16. All other information requested in the Concrete Mix Design Submittal Form located at the end of this specification section.

E. Concrete Suppliers Record of Quality Control: The concrete supplier's past record of quality control shall be used in the design of the concrete mixes to determine the amount by which the average concrete strength fcr should exceed the specified strength f'c as outlined in ACI 318. If a suitable record of test results is not available, the average strength must exceed the design strength by the amount as specified in ACI 318. After sufficient data becomes available from the job, the statistical methods of ACI 214 may be used to reduce the amount by which the average strength must exceed f'c as outlined in ACI 318.

F. Fly Ash: Fly ash replacement of cement shall not exceed 25% (one part fly ash max. to three parts cement) by weight.

G. Aggregate: Provide aggregates from a single source for exposed concrete. For exterior exposed surfaces, do not use fine or coarse aggregates containing spalling-

causing deleterious substances. Combined aggregate gradation for slabs and other designated concrete shall be 8% - 18% for large top size aggregates (1 1/2 in.) or 8% - 22% for smaller top size aggregates (1 in. or 3/4 in.) retained on each sieve below the top size and above the No. 100.

H. Admixtures:

1. Admixtures to be used in concrete shall be subject to the approval of the Engineer and Owner's Testing Laboratory.
2. Quantities of admixtures to be used shall be in strict accordance with the manufacturers instructions.

I. Adjustments of Concrete Mixes: Mix design adjustments may be requested by the Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant. Such mix design adjustments shall be provided at no additional cost to the Owner. Any adjustments in approved mix designs including changes in admixtures shall be submitted in writing with the specified Concrete Mix Design Submittal Form to the Engineer and Owner's Testing Laboratory for approval prior to field use.

J. Chloride Ion Content: A written submittal shall be made with each mix design proposed for use on the project that the chloride ion content from all ingredients including admixtures will not exceed the limits specified in this section of the Specifications.

2.7 CONCRETE MIXES

A. Ready-Mix Concrete: Comply with requirements of ANSI/ASTM C 94, "Ready Mixed Concrete" and Testing Laboratory section of the specifications.

PART 3 - EXECUTION

3.1 FABRICATION AND CONSTRUCTION OF FORMWORK

A. Design, erect, support, brace and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic construction loads that might be applied until the concrete structure can support such loads.

B. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position. Maintain formwork construction tolerances complying with ACI 117.

C. Construct forms to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts and other

features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.

D. Construct forms so as to limit the offset between adjacent pieces of formwork facing material in accordance with the following classifications as defined in ACI 117. The offset limits shall apply to both abrupt and gradual variations in the surface.

1. Class A, 1/8 inch, for surfaces prominently exposed to public view in the completed structure
2. Class B, ¼ inch, for surfaces scheduled to receive plaster, stucco, or wainscoting.
3. Class C, ½ inch, for all other surfaces.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. 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 patch forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.

H. Chamfer exposed corners and edges as indicated, using specified chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

I. Form Ties: Unless otherwise indicated, provide ties so portion remaining within concrete after removal is 1 1/2" inside concrete and will not leave holes larger than 1" diameter in concrete surface. Refer to Architectural drawings for tie hole requirements.

J. 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.

3.2 CLEANING AND TIGHTENING

Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and all other debris just prior to concrete placement. Retighten forms and bracing prior to concrete placement as required to prevent mortar leaks and maintain proper alignment.

3.3 CLEANING AND RE-USE OF FORMS

Forms reused in the work shall be repaired and cleaned. Split, frayed, delaminated, or otherwise damaged facing material will not be acceptable for exposed surfaces. Forms intended for successive concrete placement shall have surfaces cleaned, fins and laitance removed, and joints tightened to avoid surface offsets. New form coating compound shall be applied to reused forms. Thin form-coating compounds only with thinning agent of type, and in amount, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

3.4 TOLERANCES

Unless specified otherwise, all tolerances for concrete formwork shall conform to ACI Standard 117, "Standard Tolerances for Concrete Construction and Materials". Before concrete placement the Contractor shall check lines and levels of erected formwork and make any corrections and adjustments as required to ensure proper size and location of concrete members and stability of forming systems. During concrete placement the Contractor shall check formwork and supports to ensure that forms have not displaced and that completed work will be within specified tolerances.

3.5 REMOVAL OF FORMS AND SUPPORTS

A. Records of Weather Conditions: The General Contractor shall be responsible for keeping records of weather conditions to be used in the decision on when to remove forms.

B. Formwork Not Supporting Concrete: Formwork not supporting concrete such as sides of walls and similar parts of the structure, may be removed after cumulatively (not necessarily consecutively) curing at not less than 50°F for 12 hours after placing concrete, provided the concrete is sufficiently hard so as not to be damaged by form removal operations and provided curing and protection operations are maintained. If ambient air temperatures remain below 50°F, if retarding agents are used, or if Type II and Type V portland cement is used, then this specified minimum period should be increased as required to safely remove the forms without damage to the concrete. Where such forms also support formwork for slab or beam soffits, the removal times of the latter shall govern.

3.6 FABRICATION AND DELIVERY OF REINFORCEMENT

A. Bending and Forming: Fabricate bars of indicated sizes and accurately form to shapes and lengths indicated and required, by methods not injurious to materials. Do not heat reinforcement for bending. Bars with kinks or bends not scheduled will be rejected.

B. Marking and Shipping: Bundle reinforcement and tag with suitable identification to facilitate sorting and placing. Transport and store at site so as not to damage material. Keep sufficient supply of tested, approved and proper reinforcement at the site to avoid delays. Maintain reinforcing bars free of mud, dirt, grease, or other coating.

3.7 PLACING REINFORCEMENT

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

B. Before placing and again before concrete is placed, clean reinforcement of loose rust and mill scale, earth, ice and other materials which reduce or destroy bond with concrete.

C. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers, as required. Exercise particular care to maintain proper distance and clearance between parallel bars and between bars and forms. Provide metal spreaders and spacers to hold steel in position. Support steel at proper height upon approved chairs.

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

E. Support of Spread Footing Reinforcing Steel

1. Bottom Steel: Support bottom reinforcing mat on slab bolsters designed for soil supported slabs that provide the specified clearance to the bars. Spacing between supports shall not exceed 4'-0" centers each way.
2. Top Steel: Support top reinforcing on steel angle frames braced in both directions or on special standee support bars. Spacing between supports shall not exceed 4'-0" centers each way. The depth of the supports shall provide the specified clearance from the bars to the top of the concrete. The design of the support steel shall be the responsibility of the Contractor.

   The design of the support steel shall be the responsibility of the Contractor.

F. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh plus two inches and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction. Welded wire fabric shall be furnished and placed in flat sheets only.

G. Coordinate with other trades and expedite materials and labor to avoid omissions and delay.

H. Install waterproof membrane or moisture barrier as specified prior to placing steel for concrete slabs-on-grade.

I. Extend reinforcement continuous through construction joints unless otherwise shown on the drawings or, if approved on the shop drawings, provide dowels of sufficient length to develop the full tension or compression strength of the bar as applicable.

J. Slab-on-Grade Joint Dowel Bars: Support slab-on-grade joint dowel bars independently of support for slab reinforcement on soil supported slab bolsters or specially manufactured cradles such that dowel bar remains parallel to slab surface and at right angles to joint during concreting operations. Lightly coat the exposed end of the dowel with a paraffin-base lubricant, asphalt emulsion, form oil, or grease or use a dowel bar sleeve specifically manufactured for the purpose of preventing a bond between the dowel and the concrete.

K. Provide and place additional reinforcing steel at all sleeves and openings in beams, slabs and walls as specified on the drawings. Where sleeves or openings not shown on the drawings interrupt the reinforcement, consult with Engineer for instructions for placing and splicing of bars. Provide required additional reinforcing steel at no additional cost to the Owner.

3.8 REINFORCING STEEL SPACING AND COVERAGE

A. Reinforcing Steel Coverage: Reinforcing steel coverage should conform to the requirements specified below. Cover specified shall be considered minimums that may require increasing where reinforcing steel intersects for different member types. Cover in structural members not specified below shall conform to the requirements of ACI 318-99 Section 7.7 unless specified otherwise on the drawings.

1. Foundation Members

a.	Foundation Retaining Walls	- 2" both faces
b.	Sump Walls, Pit Walls	- 2" both faces
c.	Spread Footings, Combined Footings	- 3" bottom and sides, 2" top
d.	Interior Slab on Grade	- 1" top cover for one layer of steel - 1" top cover, 3" bottom cover for two layers of steel
e.	Exterior Slab on Grade	- 2" top cover for one layer of steel - 2" top cover, 3" bottom cover for two layers of steel

B. Reinforcing Steel Spacing: Comply with the requirements of ACI 318-99, Section 7.6.

3.9 SPLICING REINFORCING STEEL

A. Provide splice type (tension lap splice, compression lap splice, compression end bearing splice, or mechanical anchorage tension splice) as indicated on the drawings.

Splice reinforcing bars only at locations shown on the structural drawings and approved shop drawings. Unauthorized or unscheduled splices not approved by the Engineer in writing will not be accepted.

B. All lap splices in reinforcing steel shall be contact lap splices unless detailed otherwise on the drawings.

C. Maintain proper cover between reinforcing bars at splices.

D. Lap unscheduled reinforcing bars not otherwise specified a minimum of 48 bar diameters at splices. Lap welded wire fabric a minimum of one full wire mesh plus two inches.

3.10 WELDING REINFORCING STEEL

A. Welding reinforcing steel is permitted only where specifically shown on the drawings. All welding shall conform to AWS D1.4 "Structural Welding Code - Reinforcing Steel". Only weldable reinforcing steel conforming to ASTM A706 or deformed bar anchors conforming to ASTM A496 shall be permitted. ASTM A615 bars may not be welded for structural use.

B. Scheduled or detailed reinforcing steel shall not be tack welded for any reason.

3.11 SLUMP LIMIT

A. The slump, as measured in the field where concrete cylinders are taken, shall be within plus or minus 1 inch of the design slump noted on the Mix Design Submittal Form. Water may be added to the concrete in the field only to the extent that the prescribed water-cement ratio noted in the Mix Design Submittal Form is not exceeded.

3.12 JOINTS IN CONCRETE

A. Construction Joints: Locate and install construction joints as indicated on the drawings or if not shown on drawings, located so as not to impair strength and appearance of the structure, as acceptable to Architect/Engineer.

1. Keyways: Provide keyways with a depth of one tenth of the member thickness (1 1/2" minimum or as shown on the drawings) in construction joints only where shown on the drawings.
2. Joint Construction: Place construction joints in the center one third of grade beams and as shown on the drawings for slabs-on-grade and walls unless shown otherwise. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise shown on the drawings. Dowels that cross construction joints shall be supported during concreting operations so as to remain parallel with the

slab or wall surface and at right angles to the joint. Submit all construction joint locations as a shop drawing submittal.

3. Waterstops: Provide waterstops in construction joints as indicated on the Architectural and Structural Drawings. Install waterstops to form continuous diaphragm in each joint. Make provisions to support and protect exposed waterstops during progress of work. Fabricate field joints in waterstops in accordance with manufacturer's printed instructions.
4. Isolation Joints in Slabs-on-Ground: Construct isolation joints (without dowels) in slabs-on-ground at points of contact between slabs on ground and vertical surfaces only where specifically detailed on the drawings. Provide construction joints with dowels at all locations unless isolation joints are detailed.
5. Contraction (Control) Joints in Slabs-on-Ground: Maximum joint spacing shall be 36 times the slab thickness or 20 feet, whichever is less and at a minimum on column lines unless otherwise noted on the drawings. Use one of the two following methods (sawed or formed) to create the joints.

    a. Sawed Joints
        i. Primary Method: Early-Entry, dry-cut method, by Soff-Cut International, Corona, CA (800) 776-3328. Finisher must have documented successful experience in the use of this method prior to this project. Install cuts within 1 to 4 hours after final finish as soon as the concrete surface is firm enough to not be torn or damaged by the blade at each saw cut location. Use 1/8 inch thick blade, cutting 1 1/4” inch into the slab.
        ii. Optional Method (where Soff-Cut System method equipment is not available): Use a conventional saw to cut joints within 4 to 12 hours after finishing as soon as the concrete has hardened sufficiently to prevent aggregates from being dislodged by the saw. Complete cutting before shrinkage stresses become sufficient to produce cracking. Use 1/8 inch thick blade, cutting to a depth of 1/4 of the slab thickness but not less than 1 inch.
    b. Formed Joints: Form contraction joints by inserting premolded plastic hardboard or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. The depth is to be 1/4 the slab thickness, but not less than 1 inch. Tool slab edges round on each side of insert. After concrete has cured, remove inserts and clean groove of loose debris.
    c. Joint Filler
        i. Remove dirt and debris from the joint by vacuuming immediately prior to filling joint. Clean the joint of curing compounds and sealers.
        ii. Filler material shall be applied to the joints when the building is under permanent temperature control, but no less than 90 days after slab construction.

iii. Strictly following the manufacturer's recommended procedure for installing filler material.

d. The Contractor shall protect the joints from damage caused by wheeled traffic or other sources during construction until a joint-filler material (if specified) has been installed.

3.13 INSTALLATION OF EMBEDDED ITEMS

A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto. Install reglets to receive top edge of foundation sheet waterproofing where specified by the Architect, and to receive thru-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, relieving angles and other conditions.

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

C. Do not install sleeves in concrete slabs, pier caps, footings or walls except where shown on the structural drawings or approved by the Architect and Engineer.

D. Securely fasten embedded plates, angles, anchor bolts and other items to be built into the concrete to the formwork or hold in place with templates. Insertion of these items into concrete after casting is prohibited.

3.14 CONCRETE PLACEMENT

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

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

C. Comply with ACI 301 and as herein specified.

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

2. 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.
3. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309 recommended practices.
4. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.
5. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.
6. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
7. Bring slab surfaces to correct level with straightedge and strikeoff. Use highway straightedges, bull floats or darbies to smooth surface free of humps or hollows before excess moisture or bleedwater appears on the surface. Do not disturb slab surfaces prior to beginning finishing operations.
8. Maintain reinforcing in proper position during concrete placement operations.
9. Placing Concrete by Pump: If concrete is placed by using a pump, the grout used for pump priming must not become a part of the completed structure unless an engineered grout design mix and grout location are approved in advance by the Engineer.

3.15 FINISH OF FORMED SURFACES

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

B. Smooth Form Finish: Provide smooth form finish for formed concrete surfaces exposed-to-view, or that are to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, painting, veneer plaster or other similar system or to a surface that is to receive a smooth rubbed finish or grout cleaned finish. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections exceeding 1/8 inch in height removed and smoothed.

C. Smooth Rubbed Finish: Provide smooth rubbed finish to scheduled or specified concrete surfaces, which have received smooth form finish treatment, not later than one day after form removal. Moisten concrete surfaces and rub with carborundum brick or other abrasive until a uniform color and texture is produced. Do not apply cement grout other than that created by the rubbing process.

D. Grout Cleaned Finish: Provide grout cleaned finish to scheduled or specified concrete surfaces which have received smooth form finish treatment.

1. Combine one part portland cement to 1-1/2 parts fine sand by volume, and 50:50 mixture of acrylic or styrene butadiene based bonding admixture and water to consistency of thick paint. Proprietary additives may be used at Contractor's option. Blend standard portland cement and white portland cement, amounts determined by trial patches, so that final color of dry grout will closely match adjacent surfaces.
2. Thoroughly wet concrete surfaces and apply grout to coat surfaces and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least 36 hours after rubbing.

E. Related 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 indicated.

3.16 MONOLITHIC SLAB FINISHES

Comply with recommendations in ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

A. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds for tile, portland cement terrazzo and other bonded applied cementitious finish flooring material, and as otherwise indicated. After placing slabs, plane surface to tolerance specified below. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set, with stiff brushes, brooms or rakes.

B. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo, and as otherwise indicated. After screeding, consolidating and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using float blades or float shoes only, 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 as specified below. Cut down high spots and fill low spots. Uniformly slope surfaces to

drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

C. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint or other thin film finish coating system. After floating, begin first trowel finish operation by hand or power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with a level surface to a tolerance as specified below. Grind smooth surface defects which would telegraph through applied floor covering system.

D. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply trowel finish as specified above, then immediately follow with slightly scarifying surface by fine brooming.

E. Non-Slip Broom Finish: Apply non-slip broom finish to ramps less than 6% slope, exterior concrete platforms, steps and ramps and elsewhere as indicated. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

F. Non-slip Aggregate Finish: Apply non-slip aggregate finish to concrete stair treads, platforms, ramps and elsewhere as indicated on the Architect's or Structural Drawings.

After completion of float finishing, and before starting trowel finish, uniformly spread 25 lbs. of dampened non-slip aggregate per 100 sq. ft. of surface. Tamp aggregate flush with surface using a steel trowel, but do not force below surface. After broadcasting and tamping, apply trowel finishing as herein specified.

After curing, lightly work surface with a steel wire brush, or an abrasive stone, and water to expose non-slip aggregate.

G. Colored, Mineral Aggregate Surface Hardener: Provide colored, mineral aggregate surface hardener to monolithic slab surface indicated.

Apply dry shake materials for colored wear-resistant finish at rate of not less than 100 lbs. per 100 sq. ft., unless greater amount is recommended by material manufacturer.

Cast a trial slab approximately 20 feet square to determine actual application rate, color and finish as acceptable to Architect/Engineer.

Immediately following first floating operation, uniformly distribute approximately 2/3 of required weight of dry shake material over concrete surface, and embed by means of power floating. Follow floating operation with second shake application, uniformly distributing remainder of dry shake material at right angles to first application, and embed by power floating.

After completion of broadcasting and floating, apply trowel finish as herein specified. Cure slab surface with curing compound recommended by dry shake hardener manufacturer. Apply curing compound immediately after final finishing.

H. Finish of Top of Spread Footings and/or Mat Foundations

1. Top Surface below Finished Slab: The top of the footing or mat shall be screeded level and smooth with a flatness F-number, FF15 (overall), FF10 (minimum local) and a levelness F-number, FL12 (overall), FL10 (minimum local).
2. Top Surface as Finished Slab: The top surface of a footing or mat that is to serve as the finished slab in the building shall be leveled, cured, and surface prepared as specified for the finished floor construction appropriate to the space usage as defined in the Architectural Drawings.

3.17 CONCRETE FINISH MEASUREMENT AND TOLERANCES

A. Definitions:

1. Flatness - a measure of a concrete surfaces curvature or deviation from a planar surface. Concrete surfaces that are not flat are wavy or bumpy.
2. Levelness - A measure of a concrete surfaces tilt or inclination from a horizontal plane. Concrete surfaces that are not level are sloped or tilted.
3. FF Flatness F-Number - The flatness F-Number FF measures floor curvature or flatness and for any floor section or overall floor area is defined as follows:

$$F_F = \frac{4.57}{(3 \times Sq) + \bar{q}}$$

Where $\bar{q}$ is the mean value and Sq the standard deviation of all floor q readings. A q reading is defined as the difference in slope between three successive points along any test measurement line on the floor surface that are twelve inches apart.

4. FL Levelness F-Number - The levelness F-Number FL measures floor inclination from a horizontal plane and for any floor section or overall area is defined as follows:

$$F_L = \frac{12.5}{(3 \times Sz) + \bar{z}}$$

Where $\bar{z}$ is the mean value and Sz the standard deviation of all floor z readings. A z reading is defined as the difference in elevation between two successive points along any test measurement line on the floor surface that are 10 feet (120") apart.

Measurement of F_L is not applicable for floors that are intentionally inclined or cambered, for elevated structural floors that can deflect from the time the floor is poured to the time it is measured, and for unshored form surfaces.

B. Measurement Standard: All floors should be measured for flatness and levelness according to ASTM E 1155 "Standard Test Method for Determining Floor Flatness and Levelness Using the F-Number System".

C. Time Period for Measurement and Reporting: Measurement of the finished concrete surface profile for any test section shall be made when requested by the Owner's Representative at his option. All measurements shall be made by the Owner's Testing Laboratory or designated party within 24 hours after completion of finishing operations. For structural elevated floors measurement shall also be made prior to removal of forms and shores. The Contractor shall be notified immediately after the measurements of any section are complete and a written report of the floor measurement results shall be submitted within 72 hours after finishing operations are complete. The Contractor shall take immediate action to correct any work that is outside specified tolerances as outlined later in this section.

D. Measuring Equipment: The concrete surface profile shall be measured using equipment manufactured for the purpose such as a Dipstick Floor Profiler as manufactured by the Edward W. Face Company in Norfolk, Virginia, F-Meters manufactured by Allen Face & Company in Norfolk, Virginia, optical, or laser means or other method specified in ASTM E 1155.

E. Two-Tiered Measurement Standard: Each floor test section and the overall floor area shall conform to the two-tiered measurement standard as specified herein.

1. Minimum Local Value (MLV). The minimum local FF/FL values represent the absolute minimum surface profile that will be acceptable in any one floor test section.
2. Specified Overall Value (SOV). The specified overall FF/FL values represent the minimum values acceptable for all combined floor test sections representing the overall floor.

SOV and MLV FF/FL values are specified later in this section for each portion of the structure.

F. Floor Test Sections: For purposes of this specification a floor test section is defined as the smaller of the following areas:

1. The area bounded by column and/or wall lines.
2. The area bounded by construction and/or control joint lines.
3. Any combination of column lines and/or control joint lines.

Test sample measurement lines within each test section shall be multidirectional along two orthogonal lines as defined by ASTM E 1155.

The precise layout of each test section shall be determined by the Owner's testing agency and shall be submitted for Architect/Engineer review and approval.

G. Tolerance on Floor Elevations: Construction tolerance on absolute floor elevation from the specified elevation as shown on the drawings shall be as specified below, taken from ACI 117:

1. Slab-on-Grade Construction - + 3/4"
2. Top surfaces of formed slabs measured prior to removal of supporting shores - + 3/4".
3. Top surfaces of all other slabs - + 3/4"

The tolerance on relative elevation difference between points on the floor shall be defined by the FL Levelness F-Number as prescribed below.

H. Construction Requirements to Achieve Specified Floor Finish Tolerances:

1. Forms shall be properly leveled, in good condition and securely anchored including special attention to ends and transitions.
2. Bearing surfaces for straightedges such as form edges or previously poured slabs shall be kept clean of laitance, sand, gravel, or other foreign elements.
3. Screeds shall be maintained in good condition with true round rolling wheels and level cutting edges. The use of optical sighting equipment such as lasers is recommended for checking levelness and straightness. The Contractor shall promptly adjust or replace equipment when test results indicate substandard work.
4. Highway straightedges are recommended for use in lieu of bullfloats for all slab placement and finishing operations.

I. Contractor Responsibility for Concrete Floor Finish Requirements: Floor finish requirements shown below (flatness and levelness tolerances) are minimum requirements that apply unless stricter requirements are contained in instructions for installation of applied floor products in which case the Contractor is responsible for attaining the values prescribed by the manufacturer of such products.

J. Concrete Floor Finish Tolerance for Slab-on-Grade Construction:

1. Concrete Placement: Concrete shall be placed and screeded to predetermined marks set to elevations prescribed on the drawings.
2. Tolerance:

a. Slabs in nonpublic areas, mechanical rooms, surfaces to received raised computer flooring, surfaces to have thick-set tile or a topping:
Specified Overall Value - F_F20/F_L15
Minimum Local Value - F_F15/F_L10
b. Carpeted Areas:

Specified Overall Value - F_F25/F_L20
Minimum Local Value - F_F17/F_L15

c. Exposed slabs in public spaces, slabs to receive thin-set flooring:
Specified Overall Value - FF35/FL25
Minimum Local Value - F_F24/F_L17

K. Concrete Floor Finish Tolerance - Unshored Metal Deck on Shored or Unshored Steel Beam or Open-Web Joist Floor Construction:

1. Concrete Placement: Concrete over metal deck shall be placed and screeded level and flat to the tolerance specified below, maintaining at least the minimum slab thickness at all locations as specified on the drawings. The Contractor shall increase the slab thickness as required to compensate for metal deck deflection, and in unshored beam construction, beam deflection in excess of actual beam camber in order to achieve a level and flat floor within specified tolerances.

2. Tolerance:

a. Slabs in nonpublic areas, mechanical rooms, surfaces to received raised computer flooring, surfaces to have thick-set tile or a topping:
Specified Overall Value - FF20
Minimum Local Value - FF15

b. Carpeted Areas:
Specified Overall Value - FF25
Minimum Local Value - FF17

c. Exposed slabs in public spaces, slabs to receive thin-set flooring:
Specified Overall Value - FF30
Minimum Local Value - FF24

Eighty percent (80%) of the final floor surface shall fall within an envelope of 0.75" centered about the mean elevation of all the readings. (± 0.375 about mean). The mean elevation of all readings shall not deviate from the specified design grade by more than ± 0.375".

Slabs specified to slope shall have a tolerance from the specified slope of 3/8" in 10 feet at any point as required by ACI 117.

3. Extra Concrete: The contractor shall include in his bid any additional concrete required to achieve the specified slab surface finish tolerance and to compensate for metal deck deflection, and for beam deflection in excess of actual beam camber.

4. Concrete Placement at Column Bays Supported on Transfer Girders or Trusses: Concrete in floor areas supported by transfer girders or trusses shall be placed and screeded to predetermined marks placed over the metal deck slab conforming to elevations as specified on the drawings. At least the

minimum slab thickness, as specified on the drawings, shall be maintained throughout the slab surface. The Contractor shall conform to the F_F values specified above.

L. Remedial Measures for Slab Finish Construction Not Meeting Specified Tolerances:

1. Application of Remedial Measures. Remedial measures specified herein are required whenever either or both of the following occur:

   a. The composite overall values of FF or FL of the entire floor installation measure less than specified values.
   b. Any individual test section measures less than the specified absolute minimum FF or FL value.

2. Modification of Existing Surface:

   a. If, in the opinion of the Architect/Engineer or Owner's Representative, all or any portion of the substandard work can be repaired without sacrifice to the appearance or serviceability of the area, then the Contractor shall immediately undertake the approved repair method.
   b. The Contractor shall submit for review and approval a detailed work plan of the proposed repair showing areas to be repaired, method of repair and time to effect the repair.
   c. Repair method(s), at the sole discretion of the Architect/Engineer or Owner's Representative, may include grinding (floor stoning), planing, retopping with self leveling underlayment compound or repair topping, or any combination of the above.
   d. The Architect/Engineer or Owner's Representative maintains the right to require a test repair section using the approved method of repair for review and approval to demonstrate a satisfactory end product. If, in the opinion of the Architect/Engineer or Owner's Representative, the repair is not satisfactory an alternate method of repair shall be submitted or the defective area shall be replaced.
   e. The judgment of the Architect/Engineer or Owner's Representative on the appropriateness of a repair method and its ability to achieve the desired end product shall be final.
   f. All repair work shall be performed at no additional cost to the Owner and with no extension to the construction schedule.

3. Removal and Replacement:

   a. If, in the opinion of the Architect/Engineer or Owner's Representative, all or any portion of the substandard work cannot be satisfactorily repaired without sacrifice to the appearance or serviceability of the area, then the Contractor shall immediately commence to remove and replace the defective work.

b. Replacement section boundaries shall be made to coincide with the test section boundaries as previously defined.

c. Sections requiring replacement shall be removed by sawcutting along the section boundary lines to provide a neat clean joint between new replacement floor and existing floor.

d. The new section shall be reinforced the same as the removed section and doweled into the existing floor as required by the Engineer. No existing removed reinforcing steel may be used. All reinforcing steel shall be new steel.

e. Replacement sections may be retested for compliance at the discretion of the Architect/Engineer or Owner's Representative.

f. The judgment of the Architect/Engineer or Owner's Representative on the need for replacement shall be final.

g. All replacement work shall be performed at no additional cost to the Owner and with no extension to the construction schedule.

3.18 CONCRETE CURING AND PROTECTION

A. General:

1. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Maintain concrete with minimal moisture loss at a relatively constant temperature for the period necessary for hydration of the cement and hardening of concrete. In hot, dry and windy weather protect concrete from rapid moisture loss exceeding 0.2 lb./sq. ft. x hr before and during finishing operations with an evaporation control material. Apply in accordance with manufacturer's instructions after screeding and bull floating, but before power floating and troweling.

2. Curing shall commence as soon as free water has disappeared from the concrete surface after placing and finishing. The curing period shall be 7 days for all concrete except high early strength concrete which shall be cured for 3 days minimum.

   Alternatively, curing times may be reduced if either of the following provisions is complied with:

   a. If tests are made of cylinders kept adjacent to the structure and cured by the same methods, curing measures may be terminated when the average compressive strength has reached 70% of the specified 28 day compressive strength.

   b. If the temperature of the concrete is maintained at a minimum of 50°F for the same length of time required for laboratory cured cylinders of the same concrete to reach 85% of the 28 day compressive strength, then curing may be terminated thereafter.

3. Curing shall be in accordance with ACI 301 procedures. Avoid rapid drying at the end of the curing period.

B. Curing Formed Surfaces: Where wooden forms are used, cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. When forms are removed, continue curing by one or a combination of the methods specified below, as applicable.

1. Sides of Exterior Retaining Walls: Moist cure in forms or by one or a combination of methods 1, 2 or 3 specified below. Use a liquid membrane-forming dissipating resin curing compound conforming to ASTM C309, type 1, class A or B for method 3.

C. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping and other flat surfaces by one or a combination of the methods specified below, as applicable. The Contractor shall choose a curing method that is compatible with the requirements for subsequent material usage on the concrete surface.

1. Floors Directly Exposed to Vehicular or Foot Traffic not in Parking Areas: Apply two coats of a high-solids, liquid membrane-forming curing and sealing compound conforming to ASTM C1315, type 1, Class A in accordance with method 3 as specified below.
2. Floors that are to receive subsequent cementitious toppings, sealers, hardeners, ceramic tile or terrazzo or other coating or finishing products: Cure using methods 1, 2 or 3 as specified below. Use a water-based dissipating resin type curing compound conforming to ASTM C309, type 1, class A or B for method 3.
3. All Other Surfaces: Cure using methods 1,2 or 3 as specified below. Use a water-based dissipating resin type curing compound conforming to ASTM C309, type 1, class A or B for method 3.

D. Curing Methods

1. Method 1 - Moisture Curing: Provide moisture curing by one of the following methods:

   a. Keep concrete surface continuously wet by covering with water.
   b. Continuous water-fog spray.
   c. Covering concrete surface with specified absorptive 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. Method 2 - Moisture-Cover Curing: Provide moisture-cover curing as follows:

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

3. Method 3 - Curing and Sealing Compound: Provide curing/hardener or liquid membrane-forming curing or curing and sealing compound as follows:

   Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Do not allow to puddle. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period. Apply second coat for sealing 2 to 3 hours after the first coat was applied.

   Do not use membrane-forming curing and sealing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring (such as ceramic or quarry tile, glue down carpet), paint or other coatings and finish materials., Dissipating resin type cures are acceptable in these locations.

3.19 HOT WEATHER CONCRETING

A. Definition:

1. Conditions warranting hot weather concreting practices are defined as any combination of high air temperature, low relative humidity and wind velocity tending to impair the quality of fresh or hardened concrete or otherwise result in abnormal properties. If conditions cause an evaporation rate of 0.2 lb./sq. ft./hr. as calculated by Figure 2.1.5 in ACI 305R-99, then precautions shall be taken to prevent plastic shrinkage cracks from occurring.
2. The maximum acceptable concrete temperature at the truck discharge point shall be 95°F.

B. Specification: Hot weather concreting practices specified below shall be followed, all or in part as required, to limit the concrete temperature at the truck discharge point to 95°F or lower.

C. Records: Under hot weather conditions, the Contractor shall keep records of outside air temperature, concrete temperature at truck discharge and general weather conditions.

D. Hot Weather Concreting Requirements: The following items, all or in part as required, shall be followed to limit the concrete temperature to 95°F or lower and to minimize the possibility of plastic shrinkage cracks from developing.:

1. Design the concrete mixes specifically for hot weather conditions replacing some cement with fly ash or other pozzolan and using a water reducing retarding admixture (ASTM C 494 Type D).
2. Use the largest size and amount of coarse aggregate compatible with the job.

3. Use sunshades and/or windbreaks.
4. Delay construction of indoor slabs-on-grade until the walls and roof are constructed.
5. Cool and shade aggregate stockpiles.
6. Use ice as part of the mixing water or cool the water with liquid nitrogen.
7. Limit the number of revolutions at mixing speed to 125 maximum.
8. Reduce time between mixing and placing as much as possible.
9. Do not add water to ready-mixed concrete at the job site unless it is part of the amount required initially for the specified water-cement ratio and the specified slump.
10. Schedule concrete placement for early morning, late afternoon, or night.
11. Have all forms, equipment and workers ready to receive and handle concrete.
12. Maintain one standby vibrator for every three vibrators used.
13. Keep all equipment and material cool by spraying with water including exteriors of forms, reinforcing steel, subgrade, chutes, conveyors, pump lines, tremies, and buggies.
14. Protect slab concrete at all stages against undue evaporation by applying a fog spray or mist above the surface or applying a monomolecular film. Where high temperatures and/or placing conditions dictate, use water-reducing retarding admixture (Type D) in lieu of the water-reducing admixture (Type A) as directed by the Owner's Testing Laboratory.
15. Provide continuous curing, preferably with water, during the first 24 hours using wet burlap, cotton mats, continuous spray mist, or by applying a curing compound meeting ASTM C 1315. Continue curing for 3 days minimum.
16. Cover reinforcing steel with water soaked burlap so that steel temperature will not exceed ambient air temperature immediately before placement of concrete.
17. As soon as possible, loosen forms and run water down the inside. When forms are removed, provide a wet cover to newly exposed surfaces.

3.20 COLD WEATHER CONCRETING

A. Definition:

1. Concrete shall not be placed when the outside air temperature is 40°F or less unless cold weather concreting practices are followed as specified below.
2. Cold weather concreting practices should also be followed whenever the following conditions exist for more than three successive days:

   a. the average daily air temperature is less than 40°F, and
   b. the air temperature is not greater than 50°F for more than one half of any 24 hour period.

   The average daily air temperature is the average of the highest and lowest temperature occurring during the period from midnight to midnight.

3. The temperature of concrete mixed and delivered to the job site shall conform to the following requirements:

Air Temperature	Min. Concrete Temperature
Above 30°F	60°F
0°F to 30°F	65°F
Below 0°F	70°F

4. The minimum temperature of concrete during placement and curing shall be 55°F.
5. The maximum concrete temperature heated by artificial means at point of placement shall not exceed 90°F.

B. Records: Under cold weather conditions, the Contractor shall keep records of outside air temperature, concrete temperature as placed and general weather conditions.

C. Cold Weather Concreting Requirements: The following items, all or in part as required, should be followed to assure acceptable concrete in cold weather conditions:

1. Design the concrete mix suitable for cold weather. Use air entrainment (where not prohibited) and obtain high early strength by using a higher cement content, a high early strength cement (Type III), or a specified non-chloride accelerator (ASTM C 494 Type C or E).
2. Protect the concrete during curing period using insulating blankets, insulated forms, enclosures and/or heaters.
3. Concrete cured in heated enclosures shall have heaters vented to prevent exposure of concrete and workmen to noxious gases.
4. Frozen subgrade shall be thawed prior to concrete placement and snow and ice shall be removed from forms.
5. Concrete shall be protected and cured at 50°F for seven days minimum if normal concrete (Type I cement) is used and for three days minimum if high early strength concrete (concrete with Type III cement, 100 pounds cement added per cubic yard concrete, or a non-chloride accelerator added).
6. Concrete not loaded during construction shall be protected a minimum of 3 days for normal concrete and 2 days for high early strength concrete to obtain safe form stripping strength. Concrete fully loaded during construction shall be protected for whatever time period is required to obtain the required strength as determined by nondestructive strength tests (Windsor probe, Swiss Hammer Test) on the in-place concrete.
7. Heat the mixing water and then blend hot and cold water to obtain concrete no more than 10°F above the required temperature.
8. Heat the aggregates by circulating steam in pipes placed in the storage bins for air temperatures consistently below 32°F. When either water or aggregate is heated to over 140°F combine them in the mixer first to obtain a maximum temperature of the mixture not to exceed 140°F in order to prevent flash set of the concrete.

9. Uniformly thaw aggregates far in advance of batching to prevent moisture variations in the stockpile.
10. Cover warmed stockpiles with tarps to retain heat.
11. Place air entraining admixture in the batch after the water temperature has been reduced by mixing with cooler solid materials.
12. Use wind screens to protect concrete from rapid cooling.
13. Place vertical pump lines inside the building, if possible, for concrete being pumped.
14. Maintain artificial heat as low as possible to reduce temperature stresses during cooling.
15. Avoid water curing of concrete except for parking garage structures. Apply the required curing compound to unformed surfaces as soon as possible to prevent drying of concrete from heated enclosures.
16. Delay form stripping as long as possible to help prevent drying from heated enclosures and to reduce damage to formed surfaces caused by premature stripping.
17. Provide triple thickness of insulating materials at corners and edges vulnerable to freezing.
18. Wrap protruding reinforcing bars with insulation to avoid heat drain from the warm concrete.
19. Gradually reduce the heat at the end of the heating period to reduce likelihood of thermal shock.

3.21 SHRINKAGE AND TEMPERATURE REINFORCEMENT

Provide shrinkage and temperature reinforcement (as required by ACI 318) at right angles to main top and bottom bars for all structural slabs unless detailed otherwise on the drawings.

3.22 PLACEMENT OF WELDED WIRE FABRIC

Wherever welded wire fabric is specified as reinforcement in slabs, it shall be continuous and properly lapped one full wire spacing plus 2" across the entire concrete surface and not interrupted by beam or girders.

3.23 PLACEMENT OF COLUMN DOWELS AND ANCHOR BOLTS

Dowels for columns, plinths, and pilasters and anchor bolts shall be accurately set using 1/8" thick steel templates.

3.24 REINFORCEMENT IN COMPOSITE METAL DECK SLAB

A. Minimum Reinforcement: Composite metal deck slabs shall be reinforced as indicated on the drawings. All slabs, whether scheduled or not, shall be reinforced at a minimum with either welded wire fabric or reinforcing bars as shown in the table below:

Concrete Above Deck	Reinf. Area (sq. in./ft.)	WWF	Bars
3 1/2"	0.029	6 x 6 – W2.0 x W2.0	#3 @ 18 E. W.
4 1/2"	0.040	6 x 6 – W2.0 x W2.0	#3 @ 18 E. W.
5"	0.045	6 x 6 – W2.9 x W2.9	#3 @ 18 E. W.
6"	0.054	6 x 6 – W2.9 x W2.9	#3 @ 18 E. W.

B. Extra Reinforcement Over Girders:

Provide

1. #3 at 12" on center x 3'-0" long tied to (2)-#5 continuous cross bars chaired at 48" centers to provide 3/4" top cover to reinforcement.

C. Placement of Slab Reinforcement:

1. Minimum (Temperature) Welded Wire Fabric Reinforcement: Provide 3/4" clear cover from the top of the slab to welded wire fabric reinforcement. Support welded wire fabric on #4 supports bars parallel to the deck flutes at 48” on center that are supported by high chairs at 48” on center. High chairs shall be manufactured specifically for metal deck (CRSI Type HCM).

3.25 REINFORCEMENT AROUND OPENINGS IN COMPOSITE METAL DECK SLABS

For all openings in metal deck not framed with structural steel and greater than 10" in width in either direction, provide 1 - #5 x opening width plus 4'-0" in a direction perpendicular to deck ribs at each side of opening with bars bearing on top of ribs and 2 - #5 x deck span plus 1'-0" past nearest support beam at each side of opening chaired 3/4" up from bottom of nearest deck rib running beside the opening from support to support.

3.26 REINFORCEMENT IN TOPPING SLABS

Provide welded smooth wire fabric minimum 6 x 6 W1.4 x W1.4 in all topping slabs unless specified otherwise on the drawings.

3.27 REINFORCEMENT IN HOUSEKEEPING PADS

Provide welded smooth wire fabric 6 x 6 W2.9 x W2.9 minimum in all housekeeping pads supporting mechanical equipment unless detailed otherwise on the drawings.

3.28 MISCELLANEOUS CONCRETE ITEMS

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

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads and landings and associated items. Cast-in safety inserts and accessories as shown on drawings. Screed, tamp and finish concrete surfaces as scheduled.

E. Installation of Adhesive Anchors Using Injectable Epoxy or Adhesive: A representative of the adhesive manufacturer shall be present for the first three holes that are drilled and filled with adhesive. After drilling the hole to the diameter and depth recommended by the manufacturer, clean the hole with a wire or nylon brush. Blow the dust out of the hole using compressed air with a nozzle that reaches to the bottom of the hole. When using adhesive from a new pack, the adhesive that is discharged from the mixing nozzle should be a uniform gray color before any adhesive is installed in the hole. Fill the hole with adhesive starting from the very bottom of the hole until the hole is about 2/3 full. Do not leave an air pocket at the bottom of the hole. Insert the anchor rod or dowel by slowly twisting it into the hole.

3.29 CONCRETE SURFACE REPAIRS

A. Definition - Defective Areas:

1. Formed Surfaces: Concrete surfaces requiring repairs shall include all honeycombs, rock pockets and voids exceeding 1/4" in any dimension, holes left by tie rods or bolts, cracks in excess of 0.01" and any other defects that affect the durability or structural integrity of the concrete.
2. Unformed Surfaces: Concrete surfaces requiring repair shall include all surface defects such as crazing, cracks in excess of 0.01" wide or cracks which penetrate to reinforcement or through the member, popouts, spalling and honeycombs.

B. Classification:

1. Structural Concrete Repair: Major defective areas in concrete members that are load carrying (such as shear walls, beams, joists and slabs), are highly stressed, and are vital to the structural integrity of the structure shall require

structural repairs. Structural concrete repairs shall be made using a two part epoxy bonder, epoxy mortar or specified polymer repair mortar. Location of structural concrete repairs shall be determined by the Engineer.

2. Cosmetic Concrete Repair: Defective areas in concrete members that are non-load carrying and minor defective areas in load carrying concrete members shall require cosmetic concrete repair when exposed to view and not covered up by architectural finishes. Cosmetic concrete repairs may be made using a polymer repair mortar and compatible bonding agent. The location of cosmetic concrete repair required shall be determined by the Architect/Engineer. Stains and other discolorations that cannot be removed by cleaning and are exposed to view will require cosmetic repair. Cosmetic concrete repair in exposed-to-view surfaces will require Architect's approval prior to patching operation.
3. Slab Repairs: High and low areas in concrete slabs shall be repaired by removing and replacing defective slab areas unless an alternate method, such as grinding and/or filling with self-leveling underlayment compound or repair mortar is approved by the Architect/Engineer. Repair of slab spalls and other surface defects shall be made using epoxy products as specified above and as determined by the Engineer. The high strength flowing repair mortar may be used for areas greater than 1 inch in depth.

3.30 QUALITY CONTROL TESTING DURING CONSTRUCTION

See Testing Laboratory Services section of these Specifications for concrete materials and cast-in-place concrete inspection and test requirements.

3.31 INVESTIGATION OF LOW CONCRETE STRENGTH TEST RESULTS

A. Contractor Responsibility for Low Strength Concrete

1. If the average of any three consecutive strength tests falls below the required f'c for a class of concrete but no individual strength test is more than 500 psi below f'c, the Contractor shall immediately notify the Engineer by telephone or e-mail and take immediate steps to increase the average of subsequent strength tests.
2. If any individual strength test falls more than 500 psi below the required f'c, the Contractor shall immediately notify the Engineer by telephone or e-mail and take immediate steps to assure that the load-carrying capacity of the structure is not jeopardized.

B. Additional Field Tests to Confirm Low Concrete Strengths

1. The cost of all investigations of low-strength concrete shall be borne by the Contractor.
2. Non-Destructive Tests: If any individual strength test falls more than 500 psi below the required f'c, the Engineer may request that non-destructive tests such as Swiss Hammer, Windsor Probe, or other appropriate methods be

performed on the concrete in question. See the Testing Laboratory Services section of the Specifications for additional details.

3. Core Tests: If the likelihood of low-strength concrete is confirmed and it has been determined that the load-carrying capacity of the structure is significantly reduced as a result, the Engineer may request that core tests be taken from the area in question. There shall be a minimum of three cores taken for each strength test more than 500 psi below the required f'c. See the Testing Laboratory Services Section of the Specifications for additional details
4. Acceptance Criteria for Core Test: Concrete in an area represented by core tests shall be considered adequate if the average of three cores is equal to at least 85% of the required f'c and no single core is less than 75% of the required f'c. If approved by the Engineer, locations of erratic core strengths may be retested to check testing accuracy.
5. Load Test: If the concrete strength is not considered adequate based on core tests and the structural adequacy remains in doubt, the Engineer may order a load test as specified in ACI 318 be conducted for the questionable portion of the structure.
6. Strengthening of the Structure or Demolition: If the structural adequacy of the affected portion of the structure remains in doubt following the load test, the Engineer may order the structure to be strengthened by an appropriate means or demolished and rebuilt at the Contractor's expense.

END OF SECTION 03300

SECTION 03331 - CAST-IN-PLACE ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies cast-in-place architectural concrete, including formwork, reinforcement accessories, concrete materials, concrete mix design, placement procedures, and finishes.

1. Location: All exposed cast-in-place concrete.

1.2 DEFINITION

A. Cast-in-Place Architectural Concrete: Concrete that is exposed to view on surfaces of the completed structure or building and that requires special concrete materials, formwork, placement, or finishes to obtain specified architectural appearance.

B. Design Reference Sample: Sample designated by Architect in the Contract Documents that reflects acceptable surface quality and appearance of cast-in-place architectural concrete.

1.3 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

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

C. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

D. Shop Drawings: Show formwork construction including form-facing joints, rustications, construction and contraction joints, form joint-sealant details, form tie location and patterns, inserts and embedments, cutouts, cleanout panels, and other items that visually affect cast-in-place architectural concrete.

E. Samples: For each of the following materials:

1. Form-release agent.
2. Form ties.
3. Cement.
4. Chamfers and rustications.
5. Curing compound.

F. Samples for Verification: Architectural concrete samples, cast vertically, approximately 18 by 18 by 2 inches, of finishes, colors, and textures to match the design reference sample. Include Sample sets showing the full range of variations expected in these characteristics.

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

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

1. Cementitious materials and aggregates.
2. Admixtures.
3. Curing compounds.

I. Placement Schedule: Submit concrete placement schedule before start of architectural concrete placement operations. Include location of all joints including construction joints.

J. Preinstallation Conference: Minutes of preinstallation conference.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced cast-in-place architectural concrete contractor who has specialized in installing cast-in-place architectural concrete similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

1. Manufacturer must be certified according to the National Ready Mixed Concrete Association's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the 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-1 or an equivalent certification program recognized by ASTM C 1077.

D. Source Limitations for Cast-in-Place Architectural Concrete: Obtain each color, size, type, and variety of concrete material and concrete mix from one manufacturer with resources to provide cast-in-place architectural concrete of consistent quality in appearance and physical properties.

E. ACI Standards: Comply with ACI 303.1, "Specification for Cast-in-Place Architectural Concrete"; ACI 301, "Specification for Structural Concrete"; and ACI 117, "Specifications for Tolerances for Concrete Construction and Materials," unless more stringent provisions are indicated.

F. Mockups: Before casting architectural concrete, build mockups 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 the completed Work:

1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
3. Demonstrate curing, cleaning, and protecting of cast-in-place architectural concrete, finishes, and contraction joints, as applicable.
4. In presence of Architect, damage part of the exposed surface of cast-in-place architectural concrete for each finish, color, and texture required, and demonstrate materials and techniques proposed for repairs to match adjacent undamaged surfaces.
5. Obtain Architect's approval of mockups before casting architectural concrete.
6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed.
8. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

PART 2 - PRODUCTS

1.5 FORM-FACING MATERIALS

A. General: Comply with Division 3 Section "Cast-in-Place Concrete" for formwork and other form-facing material requirements.

B. Form-Facing Panels for As-Cast Finishes: Steel, glass-fiber-reinforced plastic, or other approved nonabsorptive panel materials that will provide continuous, true, and smooth architectural concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

C. Chamfer Strips: Metal, rigid plastic, elastomeric rubber, or dressed wood, 3/4 by 3/4 inch, minimum; nonstaining.

D. Form Joint Tape: Compressible foam tape, pressure sensitive, AAMA 810.1, minimum 1/4 inch thick.

E. Form Joint Sealant: Elastomeric sealant complying with ASTM C 920, Type M or S, Grade NS, that adheres to form joint substrates.

F. Sealer: Penetrating, clear, polyurethane wood form sealer formulated to reduce absorption of bleed water and prevent migration from wood of set-retarding chemicals.

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

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

H. Surface Retarder: Chemical liquid set retarder, for application on form-facing materials, capable of temporarily delaying final hardening of newly placed concrete surface to depth of reveal specified.

I. Form Ties: Factory-fabricated, removable ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish ties with tapered tie cone spreaders that, when removed, will leave holes 1 inch in diameter on concrete surface.

1.6 REINFORCEMENT ACCESSORIES

A. General: Comply with Division 3 Section "Cast-in-Place Concrete" for steel reinforcement and other requirements for reinforcement accessories.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Where legs of wire bar supports contact forms, use all-plastic bar supports.

1.7 CONCRETE MATERIALS

A. General: Refer to Division 3, Cast-In-Place Concrete section for concrete materials and mix designs.

B. Water: Potable, complying with ASTM C 94 except free of wash water from mixer washout operations.

1.8 CURING MATERIALS

A. Clear, Waterborne, Liquid Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

PART 3 - EXECUTION

1.9 FORMWORK

A. General: Comply with Division 3 Section "Cast-in-Place Concrete" for formwork, embedded items, and shoring and reshoring.

B. In addition to ACI 303.1 limits on form-facing panel deflection, limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class A, 1/8 inch.

C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-in-place surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood rustications, keyways, reglets, recesses, and the like, for easy removal.

1. Do not use rust-stained, steel, form-facing material.

D. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

E. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

F. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

G. Seal form joints and penetrations at form ties with form joint tape or form joint sealant to prevent mortar leaks.

H. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

I. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

1.10 REINFORCEMENT AND INSERTS

A. General: Comply with Division 3 Section "Cast-in-Place Concrete" for fabricating and installing steel reinforcement.

B. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

1.11 REMOVING AND REUSING FORMS

A. Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.

1. Schedule form removal to maintain surface appearance that matches approved mockups.

B. Leave formwork, for beam soffits, joists, slabs, and other structural elements, that supports weight of concrete in place until concrete has achieved 28-day design compressive strength. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

C. Clean and repair surfaces of forms to be reused in the Work. Do not use split, frayed, delaminated, or otherwise damaged form-facing material. Apply new form-release agent.

D. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for architectural concrete surfaces.

1.12 JOINTS

A. Construction Joints: Install construction joints true to line with faces perpendicular to surface plane of cast-in-place architectural concrete so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated.
2. Use bulkhead forms with keys of plywood, wood, or expanded galvanized steel sheet, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete. Align construction joint within rustications attached to form-facing material.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
6. Use bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

B. Contraction Joints: Form weakened-plane contraction joints true to line with faces perpendicular to surface plane of cast-in-place architectural concrete so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1.13 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement, unless approved by Architect.

C. Deposit concrete continuously between construction joints. Deposit concrete to avoid segregation.

D. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.

1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.

2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing concrete mix constituents to segregate.

E. 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, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F and not more than 80 degrees F at point of placement.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise indicated and approved in concrete mix designs.

F. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 degrees 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.

1.14 FINISHES

A. Smooth-Formed Finish with Light Sandblast: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch in height. Do not apply rubbed finish to smooth-formed finish.

1. Apply light sandblast finish to formed surfaces to match Architect’s sample.

B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces.

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

C. Maintain uniformity of special finishes over construction joints, unless otherwise indicated.

1.15 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures according to ACI 301.

B. Begin curing immediately after removing forms from concrete. Cure by one or a combination of the following methods that will not mottle, discolor, or stain concrete:

1. Moisture Curing: Keep exposed surfaces of cast-in-place architectural concrete continuously moist for not less than seven days with the following materials:

a. Water.
b. Continuous water-fog spray.
c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Curing Compound: Mist concrete surfaces with water. Apply curing compound uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

1.16 FIELD QUALITY CONTROL

A. General: Comply with Division 3 Section "Cast-in-Place Concrete" for field quality-control requirements.

1.17 REPAIRS, PROTECTION, AND CLEANING

A. Repair and cure damaged finished surfaces of cast-in-place architectural concrete when approved by Architect. Match repairs to color, texture, and uniformity of surrounding surfaces and to repairs on approved mockups.

1. Remove and replace cast-in-place architectural concrete that cannot be repaired and cured to Architect's approval.

B. Protect corners, edges, and surfaces of cast-in-place architectural concrete from damage; use guards and barricades.

C. Protect cast-in-place architectural concrete from staining, laitance, and contamination during remainder of construction period.

D. Clean cast-in-place architectural concrete surfaces after finish treatment to remove stains, markings, dust, and debris.

E. Wash and rinse surfaces according to concrete finish applicator's written recommendations. Protect other Work from staining or damage due to cleaning operations.

1. Do not use cleaning materials or processes that could change the appearance of cast-in-place architectural concrete finishes.

END OF SECTION 03331

SECTION 03450 - PLANT-PRECAST ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Precast architectural concrete units.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide precast architectural concrete units and connections capable of withstanding design loads within limits and under conditions indicated.

1.3 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

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

C. Design Mixes: For each concrete mix.

D. Shop Drawings: Detail fabrication and installation of precast architectural concrete units. Indicate member locations, plans, elevations, dimensions, shapes, cross sections, limits of finish, and types of reinforcement, including special reinforcement.

1. Comprehensive engineering analysis signed and sealed by a professional engineer registered and licensed in the State of Florida and responsible for its preparation.

E. Samples: Six samples of finish, color, and texture indicated; approximately 12 by 12 by 2 inches.

F. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

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

1. Concrete materials.
2. Reinforcing materials and prestressing tendons.
3. Admixtures.
4. Water-absorption test reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed precast architectural concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Fabricator Qualifications: A firm that complies with the following requirements and is experienced in manufacturing precast architectural concrete units similar to those indicated for this Project and with a record of successful in-service performance.

1. Professional Engineer Qualifications: A professional engineer registered in the state of Florida and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of precast architectural concrete that are similar to those indicated for this Project in material, design, and extent.

a. Engineer shall assume responsibility for engineering precast architectural concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

2. Participates in PCI's Plant Certification program and is designated a PCI-certified plant for Group A, Category A1--Architectural Cladding and Load Bearing Units or in APA's Plant Certification Program for Production of Architectural Precast Concrete Products and is designated an APA-certified plant.
3. Has sufficient production capacity to produce required units without delaying the Work.
4. Is registered with and approved by authorities having jurisdiction.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

D. Design Standards: Comply with ACI 318 and the design recommendations of PCI MNL 120, "PCI Design Handbook--Precast and Prestressed Concrete."

E. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver precast architectural concrete units to Project site in such quantities and at such times to ensure continuity of installation. Store units at Project site to prevent cracking, distorting, warping, staining, or other physical damage, and so markings are visible.

B. Lift and support units only at designated lifting and supporting points as shown on Shop Drawings.

1.6 SEQUENCING

A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

1.7 REINFORCING MATERIALS

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

B. Supports: Manufacturer's bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place according to CRSI's "Manual of Standard Practice," PCI MNL 117.

1.8 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type III, white, of same type, brand, and source.

B. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C 33, with coarse aggregates complying with Class 5S.

C. Coloring Admixture: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures, temperature stable, nonfading, and alkali resistant.

D. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 117.

E. Admixtures: Types recommended by the precast manufacturer for installation indicated.

1.9 BEARING PADS

A. Provide bearing pads for precast architectural concrete units as follows:

1. Elastomeric Pads: AASHTO M 251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, 50 to 70 Shore A durometer, minimum tensile strength 2250 psi per ASTM D 412.
2. High-Density Plastic: Multimonomer, nonleaching, plastic strip.

1.10 CONCRETE MIXES

A. Normal-Weight Concrete Mixes: Proportion mixes by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 5000 psi.
2. Maximum Water-Cementitious Materials Ratio: 0.45.

B. Prepare design mixes for each type of concrete required.

1. Limit use of fly ash and silica fume to not exceed, in aggregate, 25 percent of portland cement by weight.

C. Design mixes may be prepared by a qualified independent testing agency or by qualified precast plant personnel at precast architectural concrete fabricator's option.

D. Limit water-soluble chloride ions to the maximum percentage by weight of cement permitted by ACI 318.

E. Water Absorption: 12 to 14 percent by volume, tested according to PCI MNL 117.

F. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 117.

1.11 FABRICATION

A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in

place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.

B. Furnish loose steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing precast architectural concrete units to supporting and adjacent construction.

C. Reinforcement: Comply with recommendations in CRSI's "Manual of Standard Practice" and PCI MNL 117 for fabricating, placing, and supporting reinforcement.

1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete.
2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
3. Place reinforcement to maintain at least 3/4-inch minimum coverage. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.

D. Reinforce precast architectural concrete units to resist handling, transportation, and erection stresses.

E. Mix concrete according to PCI MNL 117 and requirements in this Section. After concrete batching, no additional water may be added.

F. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units. Comply with requirements in PCI MNL 117 for measuring, mixing, transporting, and placing concrete.

G. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items. Use equipment and procedures complying with PCI MNL 117.

H. Comply with ACI 306.1 procedures for cold-weather concrete placement.

I. Comply with ACI 305R recommendations for hot-weather concrete placement.

J. Identify pickup points of precast architectural concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each precast architectural concrete unit on a surface that will not show in finished structure.

K. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture.

L. Discard precast architectural concrete units that are warped, cracked, broken, spalled, stained, or otherwise defective unless repairs are approved by Architect.

1.12 FABRICATION TOLERANCES

A. Fabricate precast architectural concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished panel complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.

1.13 FINISHES

A. Finish: Match Architect's sample.

1. Finish exposed top and bottom surfaces of precast architectural concrete units to match face-surface finish.

1.14 SOURCE QUALITY CONTROL

A. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 117 requirements.

B. Defective Work: Precast architectural concrete units that do not comply with requirements, including strength, manufacturing tolerances, and finishes, are unacceptable. Replace with precast concrete units that comply with requirements.

PART 3 - EXECUTION

1.15 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Do not install precast concrete units until supporting concrete has attained minimum design compressive strength.

1.16 INSTALLATION

A. Install clips, hangers, and other accessories required for connecting precast architectural concrete units to supporting members and backup materials.

B. Install precast architectural concrete. Provide temporary supports and bracing as required to maintain position, stability, and alignment as units are being permanently connected.

1. Install bearing pads as precast concrete units are being erected.
2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.

3. Remove projecting hoisting devices and use sand-cement grout to fill voids within recessed hoisting devices flush with surface of concrete.

C. Anchor precast architectural concrete units in position by bolting, welding, grouting, or as otherwise indicated. Remove temporary shims, wedges, and spacers as soon as possible after anchoring and grouting are completed.

1.17 ERECTION TOLERANCES

A. Install precast architectural concrete units level, plumb, square, true, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 117, Appendix I.

1.18 REPAIRS

A. Repair exposed exterior surfaces of precast architectural concrete units to match color, texture, and uniformity of surrounding precast architectural concrete if permitted by Architect.

B. Remove and replace damaged precast architectural concrete units if repairs do not comply with requirements.

1.19 CLEANING

A. Clean exposed surfaces of precast concrete units after erection to remove weld marks, other markings, dirt, and stains.

1. Wash and rinse according to precast concrete fabricator's written recommendations. Protect other work from staining or damage due to cleaning operations.
2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes.

END OF SECTION 03450

SECTION 03520 - LIGHTWEIGHT CONCRETE ROOF INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes cast-in-place lightweight insulating concrete for roof decks.

1.2 DEFINITIONS

A. Lightweight Concrete Roof Insulation: Low-density concrete, with an oven-dry unit weight not exceeding 50 lb/cu. ft., placed with or without embedded rigid insulation, and classified as follows:

1. Cellular Lightweight Concrete: Low-density concrete made with portland cement, water, and air-producing foaming agents.

1.3 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: For each type of product specified. Include mixing and application instructions for each type of lightweight insulating concrete.

1. Include lightweight insulating concrete design designations of a qualified testing and inspecting agency evidencing compliance with requirements.

C. Shop Drawings: Include plans, sections, and details showing roof slopes, insulation thickness, roof penetrations, roof perimeter terminations and curbs, control and expansion joints, and roof drains.

D. Design Mixes: For each lightweight insulating concrete mix, including as-cast unit weight, oven-dry unit weight, and compressive strength.

E. Material Test Reports: From a qualified independent testing agency evidencing compliance with requirements of the following based on comprehensive testing of current materials:

1. Thermal insulation value per ASTM C 177
2. Mix design compressive strength per ASTM C 495

3. Mix design wet and dry density range per ASTM C 495
4. Expanded polystyrene (EPS) density per ASTM C 578

F. Material Certificates: In lieu of agency test reports, when permitted by Architect, signed by lightweight insulating concrete manufacturer certifying that each material item complies with requirements.

G. Research Reports or Evaluation Reports: Reports of the model code organization acceptable to authorities having jurisdiction that evidence lightweight insulating concrete's compliance with building code in effect for Project.

1. Submit a sample copy of the warranty covering the proposed lightweight insulating concrete system.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an certified, experienced Installer who has completed lightweight insulating concrete work similar in material, design, and extent to that indicated for this Project and who is acceptable to and certified by the manufacturer of primary materials.

B. 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 C 1077 and ASTM E 329, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.

C. Fire-Test-Response Characteristics: Where indicated, provide lightweight insulating concrete identical to that tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: As indicated by design designations in UL "Fire Resistance Directory" or in the listing of another testing and inspecting agency acceptable to authorities having jurisdiction.

D. FM Listing: Provide lightweight insulating concrete evaluated by Factory Mutual as part of a roof assembly and listed in FM Research Corp.'s "Approval Guide" for Class 1 fire rating and Class 1-90 windstorm ratings.

E. Provide lightweight aggregates containing no detectable asbestos as determined by the method specified in EPA's 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original undamaged packages or acceptable bulk containers.

B. Store packaged materials to protect them from elements or physical damage.

C. Do not use cement that shows indications of moisture damage, caking, or other deterioration.

1.6 PROJECT CONDITIONS

A. General: Comply with manufacturer’s instructions and recommendations.

1.7 ROOF SYSTEM GUARANTEE

A. Roof System Guarantee: Upon successful completion of the project, and after all post installation procedures have been completed, furnish the Owner with the roofing system manufacturer’s fifteen (15) year warranty. The insulation system warranty shall include the composite roof deck system consisting of lightweight concrete roof insulation system. All repair or replacement costs covered under the guarantee shall be borne by the insulation system manufacturer. The guarantee shall be a term type, without deductibles or limitations on coverage amount, and be issued at no additional cost to the Owner. Specific items covered during the term of the insulation system warranty include:

1. The actual resistance to heat flow through the roof insulation will be at least 80% of the design thermal resistance, provided that the roofing membrane is free of leaks.
2. The roof insulation will remain in a re-roofable condition should the roof membrane require replacement (excluding damage caused by fastener pullout during removal of the old membrane.)
3. The Insulating Concrete Warranty will not limit, by geographic location, the owners rights for claims, actions, and/or proceedings.
4. The roof insulation material will not cause structural damage to the building as a result of expansion from thermal or chemical action.

B. Refer to Specification Section 07540, Thermoplastic Membrane Roofing for roof system guarantee requirements, which affect this Section.

PART 2 - PRODUCTS

1.8 LIGHTWEIGHT INSULATING CONCRETE ROOFING SYSTEM

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

1. Cellular Lightweight Concrete:

a. Celcore Inc.
b. Elastizell Corporation of America.
c. Siplast Inc.

1.9 MATERIALS

A. Portland Cement: ASTM C 150, Type I, Type II, or Type III.

B. Insulation: Expanded polystyrene insulation board having a nominal density of one pound per cubic foot defined as Type 1 by ASTM C 578 and containing approximately 3% open area. The insulation shall carry the Factory Mutual approval label and the Underwriters Laboratories Classified label.

C. Foaming Agent: ASTM C 869 and ASTM C 796.

D. Water: Clean, potable and free of deleterious amounts of acid, alkali, and organic mateials.

E. Metal Deck: Refer to the Structural Drawings.

1.10 CELLULAR LIGHTWEIGHT CONCRETE

A. General: Design mix to produce lightweight concrete roof insulation with the following minimum physical properties using the minimum amount of water necessary to produce a workable mix.

1. Wet Density: 34 to 48 lb/cu. ft. at point of placement, when tested according to ASTM C 138.
2. Dry Density: 26 to 32 lb/cu. ft., when tested according to ASTM C 495.
3. Compressive Strength: Minimum 200 psi, when tested according to ASTM C 495.

PART 3 - EXECUTION

1.11 EXAMINATION

A. General: Comply with materials manufacturer’s instructions and recommendations regarding surface preparation, cleaning or other corrective measures to insure surfaces to receive lightweight insulating concrete are acceptable to the installer.

1. Do not begin placement of materials until surfaces are acceptable to the installer.

1.12 MIXING AND PLACING

A. General: Install lightweight insulating concrete materials according to manufacturer's recommendations. Mix and place lightweight insulating concrete according to manufacturer's instructions, using equipment and procedures to avoid segregation of mix and loss of air content.

1. Install the Lightweight Insulation System to provide for an average/minimum thermal value of R-19.
2. Install the Lightweight Insulation System to provide for a minimum positive roof slope of 1/4 inch per foot. See the structural drawings for slope provided by the roof framing system.
3. Avoid roof-top traffic over the roof insulation system until one can walk over the surface without creating surface damage.

1.13 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing agency, acceptable to Architect, to take samples and conduct tests to evaluate lightweight insulating concrete. Do not use same testing service that provided initial mix designs.

1. Take samples according to ASTM C 172, except as modified by ASTM C 495.
2. Determine as-cast unit weight during each hour of placement, according to ASTM C 138.
3. Determine compressive strength and oven-dry unit weight according to ASTM C 495. Make a set of at least 6 molds for each day's placement, but not less than 1 set of molds for each 5000 sq. ft. of roof area.

B. Report test results to Architect and lightweight insulating concrete producer within 24 hours of completion of each test.

C. Additional Tests: Make additional tests when test results indicate as-cast unit weight, compressive strength, oven-dry unit weight, or other requirements have not been met.

1. Retest in-place lightweight insulating concrete according to ASTM C 513 for compressive strength and oven-dry unit weight.

1.14 DEFECTIVE WORK

A. Refinish, or remove and replace, lightweight insulating concrete surfaces that are excessively scaled or too rough to receive roofing, according to current published requirements of roofing manufacturer.

B. Remove and replace lightweight insulating concrete that fails to meet compressive strength and oven-dry unit weight requirements.

END OF SECTION 03520

SECTION 04810 - UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:

1. Concrete masonry units.
2. Face brick.
3. Ties and anchors.
4. Embedded flashing.
5. Miscellaneous masonry accessories.

1.2 DEFINITIONS

A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops the following net-area compressive strengths (f'm) at 28 days. Determine compressive strength of masonry by testing masonry prisms according to ASTM C 1314.

1. For Brick Unit Masonry: f'm = 2000 psi.

1.4 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: For each different masonry unit, accessory, and other manufactured product specified.

C. Shop Drawings: Show fabrication and installation details for the following:

1. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

D. Samples for Initial Selection: For the following:

1. Unit masonry Samples in small-scale form showing the full range of colors and textures available for each different exposed masonry unit required.
2. Colored mortar Samples showing the full range of colors available.

E. Samples for Verification: For the following:

1. Full-size units for each different exposed masonry unit required, showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.
2. Colored mortar Samples for each color required, showing the full range of colors expected in the finished construction. Make samples using the same sand and mortar ingredients to be used on Project.
3. Weep holes/vents in color to match mortar color.
4. Accessories embedded in the masonry.

F. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents, unless such deviations are specifically brought to the attention of the Architect and approved in writing.

G. Qualification Data: For firms and persons specified in "Quality Assurance" Article.

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

1. Each type of masonry unit required.

    a. Include size-variation data for brick, verifying that actual range of sizes falls within specified tolerances.
    b. Include test results, measurements, and calculations establishing net-area compressive strength of masonry units.

2. Mortar complying with property requirements of ASTM C 270.
3. Grout mixes complying with compressive strength requirements of ASTM C 476. Include description of type and proportions of grout ingredients.

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

1. Each type of masonry unit required.

a. Include size-variation data for brick, verifying that actual range of sizes falls within specified tolerances.
b. Include test data, measurements, and calculations establishing net-area compressive strength of masonry units.

2. Each cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.
3. Each combination of masonry unit type and mortar type. Include statement of net-area compressive strength of masonry units, mortar type, and net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
4. Each material and grade indicated for reinforcing bars.
5. Each type and size of joint reinforcement.
6. Each type and size of anchor, tie, and metal accessory.

J. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1093 to conduct the testing indicated, as documented according to ASTM E 548.

B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

C. Source Limitations 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.

D. Preconstruction Testing Service: Engage a qualified independent testing agency to perform the following preconstruction testing:

1. Clay Masonry Unit Test: For each clay masonry unit indicated, per ASTM C 67.
2. Mortar Test: For mortar properties per ASTM C 270.
3. Grout Test: For compressive strength per ASTM C 1019.

E. Sample Panels: Before installing unit masonry, build sample panels, using materials indicated for the completed Work, to verify selections made under sample Submittals and to demonstrate aesthetic effects. Build sample panels for each type of exposed unit masonry assembly in sizes approximately 48 inches long by 48 inches high by full thickness.

1. Locate panels in the locations indicated or, if not indicated, as directed by Architect.
2. Clean exposed faces of panels with masonry cleaner indicated.
3. Where masonry is to match existing, erect panels adjacent and parallel to existing surface.
4. Protect approved sample panels from the elements with weather-resistant membrane.
5. Maintain sample panels during construction in an undisturbed condition as a standard for judging the completed Work.

6. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.

    a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels, unless such deviations are specifically approved by Architect in writing.

7. Demolish and remove sample panels when directed.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

1. Protect Type I concrete masonry units from moisture absorption so that, at the time of installation, the moisture content is not more than the maximum allowed at the time of delivery.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 PROJECT CONDITIONS

A. Protection of Masonry: During construction, 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 down both sides and hold cover securely in place.
2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

C. 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 from 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 onto 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 substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 degrees F and above and will remain so until masonry has dried, but not less than 7 days after completing 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.

1. When ambient temperature exceeds 100 deg F, or 90 deg F with a wind velocity greater than 8 mph, do not spread mortar beds more than 48 inches ahead of masonry. Set masonry units within one minute of spreading mortar.

PART 2 - PRODUCTS

1.8 CONCRETE MASONRY UNITS

A. General: Provide shapes indicated and as follows:

1. Provide square-edged units for outside corners, unless indicated as bullnose.

B. Concrete Masonry Units: ASTM C 90 and as follows:

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
2. Weight Classification: Normal weight.
3. Provide Type II, nonmoisture-controlled units.
4. Size (Width): As indicated.
5. Exposed Faces: Manufacturer's standard color and texture.

1.9 BRICK

A. General: Provide shapes indicated and as follows for each form of brick required:

1. Provide units without cores or frogs and with exposed surfaces finished for ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces.

B. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.

1. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
2. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

C. Type 1 Brick: ASTM C 216, Grade SW, Type FBS.

1. Product and Manufacturer – Basis of Design:

a. Gainesville Range; Burns Brick Co.
b. 103 Flashed Smooth; Burns Brick Co.

2. Size: Manufactured to the following actual dimensions:

   a. Modular: 3-1/2 to 3-5/8 inches wide by 2-1/4 inches high by 7-1/2 to 7-5/8 inches long.

D. Type 2 Brick: Salvaged units provided by the University.

1.10 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 or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207.

D. Mortar Cement: ASTM C 1329.

E. Masonry Cement: ASTM C 91.

1. For pigmented mortar, use a colored cement formulation as required to produce the color as selected from manufacturer's standard formulations.

F. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

1. White-Mortar Aggregates: Natural white sand or ground white stone.
2. Colored-Mortar Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.

G. Aggregate for Grout: ASTM C 404.

H. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.

I. 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.

J. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.

K. Water: Potable.

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

1. Colored Portland Cement-Lime Mix:

a. Eaglebond; Blue Circle Cement.
b. Color Mortar Blend; Glen-Gery Corporation.
c. Centurion Colorbond PL; Lafarge Corporation.
d. Lehigh Custom Color Portland/Lime; Lehigh Portland Cement Co.

2. Mortar Cement:

a. Magnolia Superbond Mortar Cement; Blue Circle Cement.
b. Lafarge Mortar Cement; Lafarge Corporation.

3. Colored Mortar Cement:

a. Magnolia Superbond Mortar Cement; Blue Circle Cement.

4. Colored Masonry Cement:

a. Magnolia Masonry Cement; Blue Circle Cement.
b. Centurion Colorbond; Lafarge Corporation.
c. Lehigh Custom Color Masonry Cement; Lehigh Portland Cement Co.

5. Cold-Weather Admixture:

a. Accelguard 80; Euclid Chemical Co.
b. Morseled; W. R. Grace & Co., Construction Products Division.
c. Trimix-NCA; Sonneborn, Div. of ChemRex, Inc.

1.11 MASONRY JOINT REINFORCEMENT

A. General: ASTM A 951 and as follows:

1. Hot-dip galvanized, carbon-steel wire for exterior walls.
2. Wire Size for Side Rods: W1.7 or 0.148-inch diameter.
3. Wire Size for Cross Rods: W1.7 or 0.148-inch diameter.
4. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units where indicated.

B. For multiwythe masonry, provide types as follows:

1. Adjustable (2-piece) type with single pair of side rods and cross ties spaced not more than 16 inches on center. and with separate adjustable veneer ties engaging the cross ties. Cross ties are either U-shaped with eyes or rectangular. Space side rods for embedment within each face shell of backup wythe and size adjustable ties to extend at least halfway through outer wythe but with at least 5/8-inch cover on outside face.

a. Use where facing wythe is of different material than backup wythe.

1.12 TIES AND ANCHORS, GENERAL

A. General: Provide ties and anchors, specified in subsequent articles, made from materials that comply with this Article, unless otherwise indicated.

B. Hot-Dip Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.

C. Steel Sheet, Galvanized after Fabrication: ASTM A 366/A 366M cold-rolled, carbon-steel sheet hot-dip galvanized after fabrication to comply with ASTM A 153.

D. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

1.13 BENT WIRE TIES

A. General: Rectangular units with closed ends and not less than 4 inches wide. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units or hollow units laid with cells horizontal.

1. Where coursing between wythes does not align, use adjustable ties composed of 2 parts; 1 with pintles, the other with eyes; with maximum misalignment of 1-1/4 inches.
2. Where wythes are of different materials, use adjustable ties composed of 2 parts; 1 with pintles, the other with eyes; with maximum misalignment of 1-1/4 inches.

B. Wire: Fabricate from 3/16-inch-diameter, hot-dip galvanized steel wire.

1.14 ADJUSTABLE MASONRY-VENEER ANCHORS

A. General: Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:

1. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.

B. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie section and a metal anchor section complying with the following requirements:

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

a. Screw-Attached, Masonry-Veneer Anchors:

1) D/A 213; Dur-O-Wal, Inc.
2) 315-D with 316; Heckman Building Products, Inc.
3) DW-10; Hohmann & Barnard, Inc.

C. Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene washer, No. 10 diameter by length required to penetrate steel stud flange by not less than 3 exposed threads, and with the following corrosion protective coating:

1. Organic polymer coating with salt-spray resistance to red rust of more than 800 hours per ASTM B 117.

1.15 MISCELLANEOUS ANCHORS

A. Anchor Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of diameter and length indicated and in the following configurations:

1. Headed bolts.
2. Nonheaded bolts, bent in manner indicated.

B. Postinstalled Anchors: Anchors as described below, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Type: Chemical anchors.

1.16 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Fabricate from the following metal complying with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim" and below:

1. Stainless Steel: 0.0156 inch thick.

1.17 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

B. Preformed Control-Joint Gaskets: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

1. Styrene-Butadiene-Rubber Compound: ASTM D 2000, Designation M2AA-805.
2. PVC: ASTM D 2287, Type PVC-65406.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Cavity Drainage Material: 2-inch- thick, free-draining mesh; made from polyethylene strands and shaped to avoid being clogged by mortar droppings.

1. Available Products: Subject to compliance with requirements, cavity drainage materials that may be incorporated into the Work include, but are not limited to, the following:

a. CavClear Masonry Mat; CavClear.
b. Mortar Net; Mortar Net USA, Ltd.
c. Mortar Stop; Polytite Manufacturing Corp.

1.18 MASONRY CLEANERS

A. Job-Mixed Detergent Solution: Solution of 1/2-cup dry measure tetrasodium polyphosphate and 1/2-cup dry measure laundry detergent dissolved in 1 gal. of water.

B. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Available Products: Subject to compliance with requirements, products that may be used to clean unit masonry surfaces include, but are not limited to, the following:

a. Cleaners for Red and Light-Colored Brick Not Subject to Metallic Staining with Mortar Not Subject to Bleaching:

1) 202 New Masonry Detergent; Diedrich Technologies, Inc.
2) Sure Klean No. 600 Detergent; ProSoCo, Inc.

b. Cleaners for Red and Dark-Colored Brick Not Subject to Metallic Staining:

1) 200 Lime Solv; Diedrich Technologies, Inc.
2) Sure Klean No. 101 Lime Solvent; ProSoCo., Inc.

c. Cleaners for Brick Subject to Metallic Staining:

1) 202V Vana-Stop; Diedrich Technologies, Inc.
2) Sure Klean Vana Trol; ProSoCo, Inc.

1.19 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, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification.

1. Mortar Type: N.

D. Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required. Limit pigments to the following percentages of cement content by weight:

1. For mineral-oxide pigments and portland cement-lime mortar, not more than 10 percent.

E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates combined with selected cementitious materials.

1. Mix to match Architect's sample.

F. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type that will comply with Table 5 of ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143.

1.20 SOURCE QUALITY CONTROL

A. Engage a qualified independent testing agency to perform source quality-control testing indicated below:

1. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.

B. Brick Tests: For each type and grade of brick indicated, units will be tested according to ASTM C 67.

PART 3 - EXECUTION

1.21 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Before installation, examine rough-in and built-in construction to verify actual locations of piping connections.

1.22 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 widths of masonry units, using units of widths indicated.

B. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide a continuous pattern and to fit adjoining construction. Where possible, use full-size units without cutting. 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.

C. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

1. Mix units from several pallets or cubes as they are placed.

D. Wetting of Brick: Wet brick before laying if the initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at the time of laying.

1.23 CONSTRUCTION TOLERANCES

A. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and the following:

B. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/4 inch in 20 feet, nor 1/2 inch maximum.

C. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, nor 1/2 inch maximum.

D. For conspicuous horizontal lines, such as exposed lintels, sills, parapets, and reveals, do not vary from level by more than 1/4 inch in 20 feet, nor 1/2 inch maximum.

E. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.

F. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thickness by more than 1/8 inch.

1.24 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thickness and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

1. As indicated on Drawings.

C. Stopping and Resuming Work: In each course, rack back one-half-unit length for one-half running bond or one-third-unit length for one-third 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 before laying fresh masonry.

D. 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.

1.25 MORTAR BEDDING AND JOINTING

A. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than the joint thickness, unless otherwise indicated.

B. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

1.26 BONDING OF MULTI-WYTHE MASONRY

A. General: Use masonry joint reinforcement installed in horizontal mortar joints to bond wythes together.

B. Corners: Provide interlocking masonry unit bond in each wythe and course at corners, unless otherwise indicated.

1. Provide continuity with masonry joint reinforcement at corners by using prefabricated "L" units as well as masonry bonding.

C. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:

1. Provide continuity with masonry joint reinforcement by using prefabricated "T" units.

1.27 CAVITIES

A. Keep cavities clean of mortar droppings and other materials during construction. Strike joints facing cavities flush.

1. Use wood strips temporarily placed in cavity to collect mortar droppings. As work progresses, remove strips, clean off mortar droppings, and replace in cavity.

1.28 MASONRY JOINT REINFORCEMENT

A. General: Provide continuous masonry joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches on center.

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 reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

1.29 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

1. Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.
2. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches on center vertically and 36 inches on center horizontally.

1.30 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to wall framing and concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:

1. Fasten anchors through sheathing to wall framing and to concrete and masonry backup with two metal fasteners of type indicated.
2. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
3. Space anchors not more than 16 inches on center vertically and 24 inches on center horizontally with not less than 1 anchor for each 2.67 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.

1.31 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joints in unit masonry where indicated. Build-in related items as masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.

B. Form control joints in concrete masonry as follows:

1. Fit bond-breaker strips into hollow contour in ends of concrete masonry units on one side of control joint. Fill resultant core with grout and rake joints in exposed faces.
2. Install preformed control-joint gaskets designed to fit standard sash block.
3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake joint.

4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete.

C. Form expansion joints in brick made from clay or shale as follows:

1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints, if any.
2. Build flanges of factory-fabricated, expansion-joint units into masonry.
3. Build in joint fillers where indicated.
4. Form open joint of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Division 7 Section "Joint Sealants." Keep joint free and clear of mortar.

1.32 LINTELS

A. Install steel lintels where indicated.

B. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.

1. Provide precast lintels made from concrete matching concrete masonry units in color, texture, and compressive strength and with reinforcing bars indicated or required to support loads indicated. Cure precast lintels by the same method used for concrete masonry units.
2. Provide prefabricated or built-in-place masonry lintels. Use specially formed bond beam units with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

1.33 FLASHING, WEEP HOLES, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Unless otherwise indicated, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.

C. Install flashing as follows:

1. At multiwythe masonry walls, including cavity walls, extend flashing from exterior face of outer wythe of masonry, through outer wythe, turned up a minimum of 8 inches, and through inner wythe to within 1/2 inch of the interior face of the wall in exposed masonry. Where interior surface of inner wythe is concealed by furring, carry flashing completely through inner wythe and turn flashing up approximately 2 inches, unless otherwise indicated.
2. At masonry-veneer walls, extend flashing from exterior face of veneer, through veneer, up face of sheathing at least 8 inches, and behind air-infiltration barrier or building paper.
3. At lintels and shelf angles, extend flashing a minimum of 4 inches into masonry at each end. At heads and sills, extend flashing 4 inches at ends and turn flashing up not less than 2 inches to form a pan.
4. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Division 7 Section "Joint Sealants" for application indicated.
5. Extend sheet metal flashing 1/2 inch beyond face of masonry at exterior and turn flashing down to form a drip.
6. Install metal drip edges beneath flashing at exterior face of wall. Stop flashing 1/2 inch back from outside face of wall and adhere flashing to top of metal drip edge.
7. Install metal flashing termination beneath flashing at exterior face of wall. Stop flashing 1/2 inch back from outside face of wall and adhere flashing to top of metal flashing termination.
8. Cut flashing off flush with face of wall after masonry wall construction is completed.

D. Install weep holes in the head joints in exterior wythes of the first course of masonry immediately above embedded flashing and as follows:

1. Space weep holes 16 inches on center.
2. Place cavity drainage material immediately above flashing in cavities.

E. Trim wicking material used in weep holes flush with outside face of wall after mortar has set.

F. Install vents in vertical head joints at the top of each continuous cavity at spacing indicated. Use plastic weep hole/vents to form vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

G. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

1.34 FIELD QUALITY CONTROL

A. Engage a qualified independent testing agency to perform field quality control testing indicated below.

1. 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. of wall area or portion thereof.

C. Mortar properties will be tested per ASTM C 780.

D. Grout will be sampled and tested for compressive strength per ASTM C 1019.

E. Brick Tests: For each type and grade of brick indicated, units will be tested according to ASTM C 67.

F. Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units will be tested according to ASTM C 140.

G. Prism-Test Method: For each type of wall construction indicated, masonry prisms will be tested per ASTM C 1314, and as follows:

1. Prepare 1 set of prisms for testing at 7 days and 1 set for testing at 28 days.

1.35 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, 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 sealant application.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before 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 before applying cleaners; remove cleaners promptly by rinsing the surfaces thoroughly with clear water.
5. Clean brick by the bucket-and-brush hand-cleaning method described in BIA Technical Notes No. 20, using job-mixed detergent solution.
6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain on exposed surfaces.
8. Clean limestone units to comply with recommendations in the Indiana Limestone Institute of America's "Indiana Limestone Handbook."

1.36 MASONRY WASTE DISPOSAL

A. Recycling: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Disposal as Fill Material: Dispose of clean masonry waste, including broken masonry units, waste mortar, and excess or soil-contaminated sand, by crushing and mixing with fill material as fill is placed.

1. Crush masonry waste to less than 4 inches in each dimension.
2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Division 2 Section "Earthwork."
3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

C. Excess Masonry Waste: Remove excess, clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04810

SECTION 05120 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 STANDARDS

The following Standards are listed in this specification:

ASTM A6	Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, Sheet Piling
ASTM A36	Standard Specification for Carbon Structural Steel
ASTM A53	Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A123	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardwork
ASTM A325	Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A370	Standard Test Methods and Definitions for Mechanical Testing of Steel Products
ASTM A449	Standard Specification for Quenched and Tempered Steel Bolts and Studs
ASTM A500	Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A529	Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality
ASTM A563	Standard Specification for Carbon and Alloy Steel Nuts
ASTM A572	Standard Specification for High Strength Low-Alloy Columbium-Vanadium Structural Steel
ASTM A780	Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A992	Standard Specification for Steel for Structural Shapes for Use in Building Framing
ASTM C1107	Standard specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM D4745	Standard Specification for Filled Compounds of Polytetrafluoroethylene (PTFE) Molding and Extrusion Materials
ASTM F436	Standard Specification for Hardened Steel Washers
ASTM F959	Standard Specification for Compressible Washer-Type Direct Tension Indicators for use with Structural Fasteners”

ASTM F1554	Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
ASTM F1852	Standard Specification for "Twist-Off" Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASCE 7-98	Minimum Design Loads for Buildings and Other Structures
OSHA	29 CFR Part 1926, Part R, Safety Standards for Steel Erection

1.3 DESCRIPTION OF WORK

A. Extent of structural steel work is shown on drawings including schedules, notes and details that show size and location of members, typical connections, and type of steel required. Furnish all labor, materials, services, equipment and appliances required in conjunction with or related to the furnishing, fabrication, delivery, and erection of all structural steel defined below. Include all supplementary parts, members and connections necessary to complete the structural steel work, regardless of whether all such items are specifically shown or specified on the drawings.

B. Structural steel shall be defined as that work prescribed in Section 2.1 of the AISC Code of Standard Practice and the following items: all steel supports for elevator guide rails, and catwalks (including support members and attached structural steel shapes and plates such as hangers).

C. Miscellaneous metal fabrications, architecturally exposed structural steel, metal stairs and ladders, cold-formed metal framing, and metal deck are specified elsewhere in these Specifications.

1.4 QUALIFICATIONS

A. Fabricator: The structural steel fabricator shall have not less than 5 years experience in the successful fabrication of structural steel similar to this project.

The structural steel fabricator must participate in the AISC Quality Certification Program and be designated an AISC Certified Plant in Category Sbd, Conventional Steel Building Structures.

B. Erector: The structural steel erector shall have not less than 2 years successful experience in the erection of structural steel of a similar nature to this project.

C. Professional Engineer: A professional engineer who is legally authorized to practice in the 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 projects with structural steel framing that are similar to that indicated for this Project in material, design, and extent.

1.5 QUALITY ASSURANCE

The Contractor is responsible for quality control, including workmanship and materials furnished by his subcontractors and suppliers.

A. Codes and Standards: Comply with provisions of following, except as otherwise indicated. Certain sections in this specification contain requirements that are more restrictive and/or different than contained in the standards listed. In such cases, the requirements of this specification shall control.

1. All federal (OSHA), state and local laws that govern safety requirements for steel erection and other requirements if more stringent than the codes and standards enumerated below. OSHA requirements include regulation 29 CFR 1926, Part R, “Safety Standard for Steel Erection”.
2. AISC "Code of Standard Practice for Steel Buildings and Bridges," adopted March 7, 2000, except as noted herein.
3. AISC "Load and Resistance Factor Design Specification for Structural Steel Buildings," dated December 1, 1993, and supplements thereto as issued.
4. AISC "Specification for Structural Joints using ASTM A325 or A490 Bolts” approved by the Research Council on Structural Connections, June 23, 2000.
5. ANSI/AWS D1.1 "Structural Welding Code - Steel".
6. "Steel Structures Painting Manual", Volumes 1 and 2, Society for Protective Coatings, formerly Steel Structures Painting Council.

B. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS "Structural Welding Code - Steel". All welding shall be performed in accordance with a written Welding Procedure Specification (WPS) as required in ANSI/AWS D1.1 that is approved by the Engineer.

C. Source Quality Control: Materials and fabrication procedures are subject to inspection and tests in the mill, shop, and field by the Owner's testing laboratory. Such inspections and tests will not relieve the Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements. The Contractor shall promptly remove and replace materials or fabricated components that do not comply.

D. Question about Contract Documents: The Contractor shall promptly notify the Architect/Engineer whenever design of members and connections for any portion of the structure are not clearly indicated or when other questions exist about the Contract Documents. Such questions shall be resolved prior to the submission of shop drawings.

E. Testing Laboratory Services: See Testing Laboratory Services section of these Specifications for requirements relating to structural steel.

Inspection or testing by the Owner does not relieve the Contractor of his responsibility to perform the Work in accordance with the Contract Documents.

1.6 SUBMITTALS

A. Product Data: Submit producer's or manufacturer's specifications and installation instructions for following products; include laboratory test reports and other data to show compliance with specifications (including the specified standards):

1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.
2. High-strength bolts (each type), including nuts and washers, including certified copies of mill reports covering chemical and physical properties.
3. Shrinkage-resistant grout.
4. Unfinished bolts and nuts.
5. Welding electrodes (each type).
6. Structural steel primer paint.
7. Inorganic or other protective paint.
8. Shear studs.
9. Direct tension indicators.

B. Shop Drawings:

1. General Requirements: Submit shop drawings prepared under the supervision of and sealed by, for connection design only, a professional engineer licensed in the state where the project is located detailing fabrication of structural steel components. Structural steel shop drawings shall include the following minimum information:

   a. 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. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify the type of high-strength bolted connection (slip-critical, direct-tension, or bearing connections).
   b. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed by others.

2. All fabricated material and connections shall fit within architectural constraints.
3. The omission from the shop drawings of any materials required by the Contract Documents shall not relieve the Contractor of the responsibility of furnishing and installing such materials, even though the shop drawings may have been reviewed and approved.

C. Calculations: The design of all steel connections for the project shall be performed under the direct supervision of a professional engineer licensed in the state where the project is located, employed by the fabricator. The fabricator's engineer shall submit complete design calculations showing all information as specified in Part 2-Connections. The Engineer reserves the right to reject all shop drawings submitted without complete design calculations.

D. Test Reports: Submit copies of reports of tests conducted on all material and on shop and field bolted and welded connections. Include data on type(s) of tests conducted and test results. See Testing Laboratory Services section of these Specifications for additional requirements.

E. Qualification Data:

1. Submit qualification data for firms and persons specified in Article 1.03 “Qualifications” 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.
2. Submit Welding Procedure Specifications (WPS) in accordance with ANSI/AWS D1.1 for all welded joints. Submit test reports showing successful passage of qualification tests for all non-prequalified WPSs.
3. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests as specified in section 1.05-B. If recertification of welders is required, retesting will be at Contractor's responsibility.

F. Substitutions:

1. Substitutions for the member sizes, type(s) of steel connection details or any other modifications proposed by the Contractor will be considered by the Architect/Engineer only under the following conditions:

    a. That the request has been made and accepted prior to the submission of shop drawings. All substitutions shall be clearly marked and indicated on the shop drawings as a substitute.
    b. That there is a substantial cost advantage or time advantage to the Owner; or that the proposed revision is necessary to obtain the required materials or methods at the proper times to accomplish the work in the time scheduled.
    c. That sufficient sketches, engineering calculations, and other data have been submitted to facilitate checking by the Architect/Engineer, including cost reductions or savings in time to complete the work.
    d. In no case shall such revisions result in additional cost to the Owner.

1.7 DELIVERY, STORAGE AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration. Do not store materials on structure in a manner that might exceed allowable loads on or cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed by Architect/Engineer.

B. Furnish all fuel, maintenance, and equipment required for hoisting and placement of materials under this contract.

C. Process, pay for and maintain all permits and certificates of on-site inspection required for derricks, cranes and hoisting equipment. No derrick, crane or hoisting equipment shall be operated without a certificate of operation and a certificate of on-site inspection, as required by governing authorities.

1. In addition to the above, all hoisting equipment shall be installed, operated and maintained in accordance with all applicable regulations of authorities having jurisdiction.
2. The Contractor shall furnish street storage and sidewalk crossing permits.

1.8 JOB CONDITIONS

The Contractor shall coordinate the fabrication and erection of all structural steel work with the work of other trades.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Structural Steel: All hot rolled steel plates, shapes, sheet piling, and bars shall be new steel conforming to ASTM A6.

Structural steel shall comply with the provisions of the following ASTM Specifications as appropriate for the grades and types, and at the locations as specified on the drawings:

1. Structural Steel Wide Flange and WT Shapes - High Strength Steel, ASTM A992. ASTM A572, Grade 50 may be acceptable as a substitute for A992.
2. M-Shapes, S-Shapes, and Channels - Carbon Steel, ASTM A36.
3. Angle Shapes – Carbon Steel, ASTM A36.
4. Structural Steel Plates and Bars - Carbon Steel, ASTM A36.
5. Steel Pipe - ASTM A53 (Type E or S) Grade B(Fy = 35 ksi).
6. Square and Rectangular HSS – ASTM A500, Grade B (Fy = 46 ksi).
7. Connection Material: Unless noted otherwise on the drawings, column stiffener plates and doubler plates at moment connections shall be the same grade of steel as the beam connecting the column (highest grade if more than one grade is used). All other connection material except as noted otherwise on the drawings including bearing plates, gusset plates, stiffener plates, filler plates, angles, etc. shall be A36 steel unless a higher or matching grade of steel with the members connected is

required by strength or stiffness calculations and provided the resulting sizes are compatible with the members connected.

B. Structural Bolts and Threaded Fasteners: Structural bolts and threaded fasteners shall comply with the following ASTM Specifications as appropriate for the types and at the locations as specified on the drawings:

1. ASTM A325 Type 1.
2. Alternative Design Fasteners: Fasteners that incorporate a design feature intended to indicate a predetermined tension or torque (load indicator bolts or “twist-off” bolts) shall conform to the requirements of section 2(d) of the RCSC “Specification for Structural Joints Using ASTM A325 or A490 Bolts”. Bolts that are manufactured to conform to ASTM A325 shall additionally conform to ASTM F1852.

   Subject to conformance with specified requirements, acceptable manufacturers include but are not limited to:

   a. Nucor Fastener, A Division of Nucor Corporation, Conway, AR and St. Joe, IN
   b. Lake Erie Screw Corp., Lakewood, OH.
   c. Vermont Fasteners Manufacturing, Swanton, VT

3. Threaded Round Stock: ASTM A36
4. Bolts and Nuts, High Strength Bolts: Bolts and nuts for all high strength bolts shall be heavy hex head conforming to ANSI Standards B18.2.1 and B18.2.2 respectively. Nuts shall conform to ASTM A563.
5. Washers: All washers shall be circular, flat and smooth and shall conform to the requirements of Type A washers in ANSI Standard B23.1. Washers for high strength bolts shall be hardened and conform to ASTM F436.
6. Galvanized Bolts: Provide bolts, nuts and washers that are hot dip galvanized according to ASTM A153, Class C when used to connect steel called for on the drawings or in the specifications as hot dip galvanized after fabrication.
7. Direct Tension Indicators: Compressible washer-type direct-tension indicators conforming to ASTM F959.

   Subject to conformance with specified requirements, acceptable manufacturers include but are not limited to:

   a. Applied Bolting Technology, Ludlow, VT.
   b. Turnasure, LLC., Langhorne, PA.

8. Bolt Lubrication: All bolts shall be well lubricated at time of installation. Dry, rusty bolts will not be allowed.
9. New Bolts: All bolts shall be new and shall not be reused.

C. Electrodes for Welding: Comply with AWS D1.1, "Structural Welding Code - Steel" with a minimum Charpy V-notch toughness of 20 ft-lbs at 0° F. Electrodes for various welding processes shall be as specified below:

1. SMAW: E70XX low hydrogen
2. SAW: F7X-EXXX
3. GMAW: ER70S-X
4. FCAW: E7XT-X

Electrodes shall be compatible with parent metal joined.

D. Shear Connectors (Headed Studs): Shear connectors and their installation shall meet all requirements specified in Section 7 of AWS D1.1 "Structural Welding Code-Steel".

Sizes of shear connectors shall be as specified on the drawings.

E. Anchor Rods:

1. All anchor rods shall conform to ASTM F1554, Grade 55
2. Anchor rods used with galvanized baseplates shall be galvanized.
3. Nuts: All nuts with anchor rods shall be heavy hex head conforming to ASTM A563.
4. Washers: Washers for all base plates shall be 1/4" thick plates extending minimum 1" from edge of base plate holes on each side with holes 1/16 inch larger than the nominal bolt diameter. Washers shall conform to ASTM A36 steel.

F. Structural Steel Primer Paint: SSPC-Paint 25; red iron oxide, zinc oxide, raw linseed oil and alkyd primer, surface prepared according to SSPC-SP-2 (Hand Tool Cleaning) unless noted otherwise in this specification. Refer to Architect's drawings and specifications for final paint finish requirements of structural steel. Primer paint shall be compatible with final paint requirements.

G. Non-Shrink Grout: Provide grout type(s) as specified on the drawings:

1. Non-Metallic Non-Shrink Grout: Premixed, non-corrosive, non-staining product containing Portland cement, silica sands, shrinkage compensating agents, and fluidity improving compounds. Conform to ASTM C1107. Provide the minimum strength as shown below as determined by grout cube test at 28 days. :

   a. 6,000 PSI for supporting concrete 3000 psi and less.
   b. 8,000 PSI for supporting concrete greater than 3000 psi and less than or equal to 4000 psi.
   c. Unless noted otherwise on the drawings, grout strength on supporting concrete greater than 4000 psi shall be 8000 psi.

Subject to conformance with specified requirements, acceptable non-shrink grouts include:

"14k Hy Flow" and "Sonogrout 10k" as manufactured by Sonneborn-ChemRex, Inc.

"Crystex" and “Duragrout” as manufactured by L&M Construction Chemicals, Inc.

"Sure Grip High Performance Grout," and “1107 Advantage Grout” as manufactured by Dayton-Superior Corporation.

"Masterflow 555", “Masterflow 928” and "Set Grout" as manufactured by ChemRex, Inc., MBT Protection and Repair Division. "Five Star Grout" as manufactured by U.S. Grout Corp.

"NS Grout" and "Hi-Flow Grout" as manufactured by The Euclid Chemical Company.

H. Hot Dip Galvanizing:

1. Scope: Hot dip galvanize after fabrication all structural steel items and their connections permanently exposed to exterior conditions or that are within areas of unconditioned airspace, whether specified on the drawings or not.

   Examine the architectural and structural drawings for other items required to be hot dipped galvanized.

   Galvanize all nuts, bolts, and washers used in the connection of such steel. Field welded connections shall have welds protected with "Z.R.C. Cold Galvanizing Compound" as manufactured by Z.R.C. Products Company.

2. Surface Preparation: All steel to be hot dip galvanized shall undergo the following surface preparation as specified by the Steel Structures Painting Council (SSPC), Volume 2.

3. Zinc Coating: The zinc coating for steel shapes and plates shall conform to ASTM A123.

I. Galvanizing Repair Paint: Galvanizing repair paint shall be "ZRC Cold Galvanizing Compound" as manufactured by ZRC Chemical Products or a paint complying with SSPC-Paint 20.

2.2 FABRICATION

A. 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 Specification and as indicated on approved final shop drawings.
2. Milled surfaces of built-up sections shall be completely assembled or welded before milling.
3. Fitted stiffeners shall be fabricated neatly between flanges, and the ends of stiffeners shall be milled or ground to secure an even bearing against abutting surfaces. All milled or ground joints shall bear throughout their contact length.

B. Dimensional Tolerances: Dimensional tolerances of fabricated structural steel shall conform to Section 6.4 of the AISC Code of Standard Practice.

C. Camber:

1. Camber of structural steel members is indicated on the drawings.
2. Where indicated on the drawings in a camber diagram, cantilever or double cantilever beams shall be cambered for the main span and cantilever end separately, either by a staged cold bending process or by the application of heat.
3. Cambers indicated on the drawings are intended to be final cambers at time of erection.

D. Splices in Structural Steel: Splicing of structural steel members in the shop or the field is prohibited without prior approval of the Engineer. Any member having a splice not shown and detailed on approved shop drawings will be rejected.

E. Cutting: Manual oxygen cutting shall be done only with a mechanically guided torch. An unguided torch may be used provided the cut is not within 1/8 inch of the finished dimension and final removal is completed by means such as chipping or grinding to produce a smooth surface quality free of notches or jagged edges. All corners shall be smooth and rounded to a minimum 1/2" radius.

F. Holes for Other Work: Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members as shown on the contract documents, and/or the final shop drawings.

1. Provide specialty items as indicated to receive other work.
2. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

G. Lifting and Erection Devices: The fabricator shall be responsible for designing, detailing and furnishing all lifting devices and erection aids required for erection. Such devices shall be removed after erection if they interfere with architectural finish requirements.

2.3 WELDING

A. Code: All shop and field welding shall conform to all requirements in the "Structural Welding Code - Steel", ANSI/AWS D1.1, as published by the American Welding Society (AWS).

B. Welder Certification: All shop and field welders shall be certified according to AWS procedures for the welding process and welding position used.

C. Welding Procedure Specification: All welding shall be performed in accordance with a Welding Procedure Specification (WPS) as required in AWS D1.1 and approved by the Owner's Testing Laboratory and the Architect/Engineer The WPS variables shall be within the parameters established by the filler-metal manufacturer.

2.4 BOLTING

A. Minimum Bolt Diameter: Minimum bolt diameter shall be 3/4 inch.

B. Connection Type: Unless noted otherwise on the drawings, all bolted connections shall be snug-tightened using high-strength bolts in standard holes (hole diameter nominally 1/16 inch greater than the nominal bolt diameter) with threads included in the shear planes. Notwithstanding, the contractor shall be responsible to adhere to provisions of AISC Specification Section J1.11, which lists circumstances under which certain connections require fully-tightened high strength bolts.

C. Fastener Tension:

1. High strength bolts in snug-tightened joints shall be tightened to a snug tight condition only. Do not pretension bolts in snug-tightened joints the same as if they were in slip-critical joints. The snug-tightened condition is defined as the tightness that exists when all plies are in firm contact. This may usually be attained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench.
2. High strength bolts in slip-critical and pretensioned joints shall be tightened to achieve the minimum bolt tension as specified in the AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts" when all the fasteners of a joint are tight.

   Any of the four methods to tighten bolts specified in the AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts" may be used to achieve the minimum bolt tension. The tightening procedure that uses direct tension indicator washers shall conform to the requirements of ASTM F959.

D. Minimum Strength of Bolted Connections: Except as specified below in "Connections" or noted otherwise on the drawings, all shop and field bolted connections shall develop the full tensile strength of the member. All members with bolted moment connections, noted on the drawings with "MC", shall be bolted to

develop the full flexural capacity of the member, unless noted otherwise on the drawings.

2.5 CONNECTIONS

A. Typical connection details are indicated on the drawings.

B. Design Procedure:

1. Unless noted otherwise or specifically detailed on the drawings, end connections of beams, girders, and trusses shall be designed as flexible and the connection shall accommodate end rotations of the unrestrained beams. Restrained end connections, noted on the drawings as “MC”, shall be designed for the combined effect of bending moment and shears induced by the rigidity of the connection. Forces to be used in the design are described below.
2. The design of all steel connections for the project except those specifically detailed on the drawings, shall be performed under the direct supervision of a qualified professional engineer licensed in the state where the project is located, employed by the fabricator.
3. The fabricator's licensed professional engineer shall submit complete design calculations for each connection, including connections completely detailed on the drawings (if any). Such calculations shall show details of the assembled joint with all bolts and welds required. Where predesigned connections are taken directly from the AISC Manual or related publications, calculations need not be submitted provided the project design conditions precisely match those assumed in the referenced publications, all data extracted from the tables is clearly identified with the table number, and such connections are so indicated in the calculations submitted.
4. The fabricator, his detailer and supervising engineer shall coordinate all connection requirements with the erector. The fabricator is responsible to detail connections that contain the adjustability and all other requirements that allow the erector to erect the structural steel in conformance to all specified tolerances.
5. The fabricator’s licensed professional engineer shall seal all design calculations.
6. The Engineer reserves the right to reject all shop drawings submitted without complete design calculations. Failure to adhere to the requirements of this section obligates the Contractor to take responsibility for any and all resulting delays in the detailing and fabrication of structural steel.

C. Flexible (Simple) Beam Connections:

1. All typical beam simple connections shall conform to requirements of the AISC specifications. Refer to the drawings for typical connection types.

2. Seated Beam Connections and Stiffened Seated Beam Connections shall not be used unless indicated on the drawings or unless Engineer approval is obtained to verify capacity of supporting member for the resulting eccentricity. The fabricator must verify and bear responsibility that the use of such connections does not interfere with architectural or MEP requirements.
3. Simple Beam Design Capacity: Design the connection to support, at a minimum, the design reaction shown on the plans. Notify the engineer and request a reaction for any beam where no reaction is shown.

    a. Minimum reaction capacity shall be 10.0 kips service load or 15 kips factored load and each connection shall contain not less than the minimum number of bolts shown in the AISC connection tables for each beam size.

D. Restrained (Moment) Connections:

1. Refer to the drawings for Moment Connection Details.
2. Design Reactions for Moment Connected Beams: Shear connections for moment-connected beams shall be designed for the reaction shown on the drawings.
3. Design and Furnishing of Reinforcement in Moment Connected Joints: As part of the design responsibility outlined above, the fabricator shall design and furnish all additional reinforcement in moment connected joints to resist the specified design forces unless otherwise specifically detailed on the drawings. Column sections shall be investigated for web shear, web yielding, web buckling, and tension. Stiffeners and/or doubler plates shall be furnished as required by the AISC Specification Section K1.

E. Tightening of Bolts in Welded Moment Connections. At moment connections where beams are complete-joint penetration welded directly to columns or girders in the field, welds shall be made after installation of erection bolts to draw the pieces together and before the final shear connection bolts are tightened

F. Column Splices: Bearing and Fit-Up of Column Compression Joints: Compression joints of all columns shall have bearing surfaces finished to a common plane by milling, sawing, or other suitable means. Lack of contact bearing must not exceed 1/16" or corrective measures as defined by AISC Specification M4.4 shall be required.

G. Base Plates and Bearing Plates:

1. Attachment to Column: Unless shown otherwise on the drawings, all baseplates and bearing plates shall be welded all around to the column with minimum fillet welds as specified in AISC Specification Table J2.4.
2. Setting Base Plates: Baseplates shall be set to the elevation indicated on the drawings and leveled using steel shims (plastic shims will not be

allowed) or by three leveling screws with weldments at the plate edges. Plates shall be grouted using specified non-shrink non-metallic grout after all protruding plates have been trimmed. Tighten anchor bolts after supported members have been positioned and plumbed.

3. Anchor Rod Holes in Baseplates: Hole sizes in baseplates for anchor rods shall be made oversize as described in the AISC Manual of Steel Construction.

H. Struts and Braces: Connections for all struts, hangers, and braces shall have connections designed to develop the full allowable tensile strength of the member.

I. Stiffeners: Provide stiffeners finished to bear under all load concentrations on supporting members, on all members framing over columns, at beam column joints (as required by the AISC Specification Section K1) and where shown on the drawings.

J. Steel Shelf Angles: Shelf angles supporting veneer shown on the drawings to be continuous shall be furnished in approximately 8'-0" lengths with two supports per section. Provide a 1/4" gap at each joint. The gap shall not be welded. Locate joints halfway between supports. Shelf angles shall be continuous around corners with corner joint complete penetration welded.

2.6 SURFACE PREPARATION AND SHOP PRIME PAINTING

A. Specification: Surface preparation, paint, and painting practices shall conform to the "Steel Structures Painting Manual", Volumes 1 and 2, as published by the Society for Protective Coatings (formerly the Steel Structures Painting Council (SSPC)).

B. Scope: All steel shall be shop primed.

1. Shop paint surfaces that are to remain exposed to view in the final construction.
2. Shop paint any steel other than weathering steel that, in the final construction, will not be in a controlled environment and is therefore subject to moisture or high humidity infiltration and that has not been specified to be galvanized.
3. Shop paint any steel that is shown on the drawings to receive a finished paint system as defined in Specification Section 9900.
4. Extend shop paint to 2" from location of welds on surfaces that are to be field welded.
5. Extend shop paint to no closer than 2" from location of bolts on surfaces that are to receive high strength slip-critical bolts unless the paint system is certified as a Class A or greater coating.

Coordinate all shop painting of structural steel with Architect's painting requirements as specified on the architectural drawings and in the specifications.

The fabricator shall complete structural steel assemblies, including welding of units before starting shop-priming operations.

C. Surface Preparation and Primer Paint - Shop Painted Steel:

1. Surface Preparation: Prepare the surface of all structural steel specified to be shop painted as required by the paint manufacturer or the Society for Protective Coatings specifications, but not less than the following:

   a. SSPC-SP 2, “Hand Tool Cleaning” or SSPC-SP 3, “Power Tool Cleaning”
   b. SSPC-SP 6, “Commercial Blast Cleaning” shall be applied to the faying surfaces of connections that are noted on the drawings as slip-critical connections requiring a Class B surface or a Class A surface if the faying surface is not to be masked per Section 2.06.B.5. Apply this surface preparation to the area surrounding all bolt holes including the area up to 2” outside the outer-most holes.

2. Priming: Immediately after surface preparation, apply primer to all structural steel specified to be shop primed in strict accordance with manufacturers instructions and the Society for Protective Coatings specifications. Apply paint at a rate to conform to the manufacturer’s written instructions and to provide a dry film thickness of not less the 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and all exposed surfaces. Apply two coats to surfaces that are inaccessible after assembly or erection. Change the color of the second coat to distinguish it from the first coat.
3. Finish Coat: Coordinate shop primer paint requirements with architectural drawings and specifications. The primer selected must be compatible with any specified finish coat.

D. Touch-Up Painting: The General Contractor shall provide for cleaning and touch-up painting of welds, bolted connections, and abraded areas. Apply paint to exposed areas using same materials and surface preparation as used for shop painting. Paint shall be applied by brush or spray with minimum dry film thickness of 1.5 mils.

PART 3 - EXECUTION

3.1 ERECTION

A. The Erection work shall comply with the requirements of AISC Specification Section M4.

B. Inspection: Erector shall examine areas and conditions under which structural steel work is to be installed and notify the Contractor and the Architect/Engineer in writing of conditions detrimental to proper and timely completion of the work.

C. Surveys: The General Contractor shall employ a qualified land surveyor to insure accuracy in structural steel erection.

D. Temporary Shoring and Bracing:

1. The lateral-load resisting system and connecting diaphragms are identified on the drawings. Comply with the provisions of the Code of Standard Practice regarding stability of the structure during the erection process.
2. Design and provide all required shoring and bracing to safely withstand all loads as specified in the Code of Standard Practice unless larger loads are required by the local building code or specified herein. Provide all bracing, any additional structural members, and increase member sizes and/or connections shown on the drawings as required to accommodate the erection loads, methods, sequence of erection, and equipment.

    a. For all projects located along the hurricane coastline as defined by the ASCE 7 load standard and erected during hurricane season (June 1 through October 31), also design the shoring and bracing to withstand the wind loads not less than as defined by the ASCE 7 load standard for Exposure C conditions and as modified herein. The design wind pressure shall be based on design wind velocities taken as the basic wind speed in ASCE 7 times the factor noted in the table below.

Construction Period	Factor
Less than six weeks	0.75
From six weeks to one year	0.80
From one year to two years	0.85
From two to five years	0.90

    b. For all projects located in seismic areas, also design for seismic loads if required by the local building code or building official.

3. Provide all required erection bracing and supports to hold structural steel framing securely in position until the lateral-load resisting or stability-providing system is completely installed.

E. Anchor Rods: Furnish anchor rods and other connectors required for securing structural steel to foundations and other in-place work.

F. Field Modifications to Structural Steel: Errors in shop fabrication or deformation resulting from handling and transportation that prevent the proper assembly and structural fitting of parts shall be reported immediately to the Architect/Engineer, and approval of the method of correction shall be obtained. Approved corrections shall be

made at no additional cost to the Owner. Do not use cutting torches, reamers, or other devices in the field for unauthorized correction of fabrication errors.

G. Miscellaneous Framing: Provide supplemental structural steel support framing for metal deck where normal deck bearing is interrupted by columns, or other framing members or floor openings whether shown or not on the architectural, mechanical, or structural drawings.

H. Removal of Erection Aids and Devices: The erector shall remove all erection aids and devices that interfere with architectural finish or MEP requirements.

I. Touch-Up Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas that have been shop painted. Apply paint to exposed areas using same material and surface preparation as used for shop painting. Apply by brush or spray to provide minimum dry film thickness of 1.5 mils.
2. Immediately after erection, clean and repaint field welds, bolted connections and abraded areas that have been galvanized. Prepare surfaces by power disk sanding to bright metal and apply specified galvanizing repair paint in accordance with ASTM A780.

J. Shear Connector Installation:

1. Composite Beams:

a. Studs shall be welded in the field (not the shop) using automatically timed stud welding equipment.
b. The top flange of the beams must be unpainted and free of heavy rust, mill scale, dirt, sand or other foreign material which will interfere with the welding operation.
c. The metal deck must be free of dirt, sand, oil, or other foreign material and must be dry and free of moisture. Metal deck must rest tightly on the beam flange. Welding must take place through only one thickness of deck.
d. Stud Spacing: Studs shall be spaced on uniformly loaded beams having deck flutes across the span, beginning with one stud per flute spaced evenly along the span. Additional studs shall be spaced beginning from the ends of the beam and repeating until all studs are placed. Beams with concentrated loads shall be spaced as shown on the drawings with studs placed in the zones indicated, in the same manner as described above. Girders with deck flutes parallel to the span shall have studs placed uniformly within the zones indicated on the drawings.
e. Maximum Stud Spacing:
(1) Beams Perpendicular to Deck Span: The maximum spacing of studs shall be 36” o.c.

(2) Beams or Girders Parallel to Deck Span: The maximum spacing of studs shall be 36" o.c.

f. Minimum Studs for All Composite Beams and Girders: All floor and roof beams and girders supporting composite deck shall have shear studs spaced in a zone along the length as specified in (e) above whether indicated on the drawings or not.

g. Shear Studs on Cantilever Beams: Shear studs marked on plan for cantilever beams shall be placed only on the interior span with minimum studs as specified in (g) above placed on the cantilever end.

2. Steel Plates Embedded in Concrete:

a. Studs shall be welded using automatically timed stud welding equipment.

b. Plates must be unpainted and free of heavy rust, mill scale, dirt, sand or other foreign material that will interfere with the welding operation.

K. Clean Up: Clean up all debris caused by the Work of this Section, keeping the premises neat and clean at all times.

L. Tests and Inspections: Refer to Testing Laboratory Services section of this specification for required tests and inspections.

END OF SECTION 05120

SECTION 05310 - STEEL ROOF DECK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 STANDARDS

The following Standards are listed in this specification:

ASTM A611	Standard Specification for Structural Steel (SS), Sheet, Carbon, Cold-Rolled
ASTM A653	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM B633	Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel

1.3 SCOPE OF WORK

A. Supplier: The metal deck supplier shall furnish all metal deck materials and accessories indicated on the Architectural, Structural, and Mechanical Drawings required to produce a complete job including but not necessarily limited to deck units, cover plates, metal deck edge closures, cell closures, cant strips, sump pans, and all related accessories.

B. Erector: The Subcontractor responsible for erecting the metal deck shall provide all labor and equipment as required to place all metal deck components and accessories as described above.

1.4 QUALIFICATIONS

The metal deck supplier shall be a manufacturer with a minimum of two years successful experience and with a minimum of two successful jobs of a comparable size and scope to this project.

1.5 QUALITY ASSURANCE

The Contractor is responsible for quality control, including workmanship and materials furnished by his subcontractors and suppliers.

A. Codes and Standards: Comply with provisions of the following codes and standards except as otherwise indicated or specified:

1. "Design Manual for Composite Decks, Form Decks, and Roof Decks", as published by the Steel Deck Institute (SDI).
2. "Specification for the Design of Cold Formed Steel Structural Members", as published by the American Iron and Steel Institute (AISI).
3. "Structural Welding Code – Sheet Steel", D1.3 as published by the American Welding Society (AWS).

B. Qualification of Field Welding: Qualify welding processes and welding operators in accordance with AWS procedures.

C. Underwriters Label: Provide metal deck units which are listed and conform to Underwriters Laboratories "Fire Resistance Directory", with each deck unit bearing the UL label and marking for specific fire-resistant system detailed. Provide units and construction which are found in UL "Roofing Materials & Systems Directory" and conform to UL Wind Uplift Class 90 construction and with each deck unit bearing the UL label and marking for specific wind-rated system detailed.

D. Factory Mutual Listing: Provide metal roof deck units which have been evaluated by Factory Mutual Research Corporation and are listed in "Factory Mutual Research Approval Guide 2000- Building Materials" for "Class 1"fire rated construction and 1-90 Windstorm Classification .

1.6 SUBMITTALS

A. Product Certification: Submit manufacturer's specifications and installation instructions for each type of deck specified. Also submit a certificate of product compliance with SDI Standards as specified.

B. Shop Drawings: Submit detailed shop drawings showing type of deck, complete layout, attachment details, closures, edge strips, supplementary framing, and all other accessories. The shop drawings shall be sealed by the same registered professional engineer who seals the calculations.

C. Calculations: The metal deck manufacturer shall submit design calculations sealed by a registered professional engineer in the state where the project is located verifying compliance with the specifications for all load and span conditions shown on the drawings. Calculations that show the deck attachment procedure and pattern meets the specified design criteria shall also be submitted.

D. Insurance Certification: Assist Architect and Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire, windstorm, and extended coverage insurance.

E. Welding Certificates: Submit Copies of certificates for welding procedures and personnel.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. See General Notes on the drawings for the location, depth of deck, design thickness, and type of deck required.

2.2 GRADES OF STEEL

Steel deck shall be manufactured from steel conforming to ASTM A611 Grades C, D, or E for painted deck or A653, Structural Steel Grade for galvanized deck or Engineer approved equal, having a minimum yield strength of 33,000 PSI.

2.3 FINISH

A. Galvanizing: Steel deck shall be galvanized with a protective zinc coating conforming to ASTM A653 G90.

B. Painting: Shop prime deck with gray or white baked-on, lead- and chromate-free rust inhibitive primer complying with performance requirements of FS TT-P-664. See Architect's drawings and painting specifications for metal deck finish paint requirements.

C. Galvanizing Repair Paint: High zinc-dust content paint for repair of damaged galvanized surfaces complying with Department of Defense Specifications DOD-P-21035.

2.4 ROOF DECK ACCESSORIES

Provide minimum 20 gauge ridge and valley plates, minimum 20 gauge cant strips, minimum 14 gauge sump pans, minimum 20 gauge inside or outside closure channels angles or plates, minimum 20 gauge butt strips at change of deck directions, minimum 20 gauge filler sheets, and rubber closures as required to provide a finished surface for the application of insulation and roofing.

2.5 MECHANICAL FASTENERS

A. Powder-Actuated or Pneumatically Driven Pins: Provide corrosion-resistant, powder-actuated or pneumatically driven fasteners manufactured from steel conforming to AISI 1060 or 1061 steel, austempered to a core hardness of 52 to 58 Rockwell C. Fasteners shall have a knurled shank and shall be zinc-plated in accordance with ASTM B633, Sc. I, Type III.

Subject to compliance with requirements, provide products of one of the following manufacturers:

Hilti, Inc., Tulsa, OK
ITWBuildex, Itasca, IL

Pneutek, Inc., Hudson, NH

B. Self-Drilling Screw Fasteners: Provide corrosion-resistant, hexagonal head, steel self drilling screws, austempered to a core hardness of Rockwell C 50.

Subject to compliance with requirements, provide products of one of the following manufacturers:

ITWBuildex, Itasca, IL

2.6 SIDE-LAP FASTENERS:

Provide Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

2.7 FABRICATION

A. General: Fabricate deck panels, without top-flange stiffening grooves, to comply with “SDI Specifications and Commentary for Steel Roof Deck”, in SDI Publication No. 29, and the following.

B. Metal Deck Spans: Metal deck spans shall not exceed the maximum center to center spans as recommended by SDI. Where possible, all metal deck shall extend over three or more supports. Single span deck is prohibited.

C. Metal Deck Spans: Metal deck spans shall not exceed the maximum center to center spans as required by the Factory Mutual Research Corporation Approval Guide 2000 – Building Materials or as recommended by SDI, whichever is less. Where possible, metal decks shall extend over three or more supports. Single span deck is prohibited.

D. Underwriters Laboratories Wind Uplift Classification: Provide metal deck panels meeting the requirements of Construction No. (i) 58 (ii) 157 (iii) 192 (iv) 234 (v) 241 (vi) 266 as listed in the 2000 UL Roofing Materials & Systems Directory under Roof Deck Constructions (TGKX) and rated as a Class (i) 30 (ii) 60 (iii) 90 assembly.

2.8 ROOF OPENINGS

Provide a 20 gage galvanized flat plate to reinforce openings in roof deck that are greater than 6” and less than 10” in any one direction.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install deck units as accessories in accordance with manufacturers recommendations and approved shop drawings, and as specified herein:

1. Place deck units on supporting framework and adjust to final position with accurately aligned side laps and ends bearing 2" minimum on supporting members before being permanently fastened. Do not stretch or contract side lap interlocks. Place the end joint over a chord angle for deck bearing on steel bar joists.
2. Place deck units in straight alignment for entire length of run of cells and with close alignment between cells at ends of abutting units.
3. Place deck units flat and square, secured to adjacent framing without warp or excessive deflection.
4. Do not place deck units on concrete supporting structure until concrete has cured and is dry.
5. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.
6. Do not use roof deck units for storage or working platforms until permanently secured.

B. Attachment of Roof Deck:

1. The method of attachment, attachment pattern, and side lap fastener type and spacing, shall be designed to resist the net uplift load and the diaphragm shear as shown on the drawings but not less than the minimum requirements noted below.
2. Method of Attachment: The deck shall be fastened to the structural support members using one of the following methods.

    a. Welding: Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work. Weld metal shall penetrate all layers of deck material at end laps and side joints and shall have good fusion to the supporting member. Welding washers shall be used only when welding steel deck less than 0.028" thickness. The diameter of the puddle weld on the supporting member shall be, at a minimum, the diameter stated in the specification but no less than 1/2 inch.
    b. Powder-Actuated or Pneumatically Driven Pins: An operator licensed by the pin manufacturer shall install all pins. Comply with the manufacturer's requirements to install the pins through all layers of the deck material and the manufacturer’s required embedment into the supporting member.
    c. Self-Drilling Fasteners: Comply with the manufacturer's requirements to install the screws through all layers of the deck material and the manufacturer's required embedment into the supporting member.

3. Side Lap Fastening: Unless required otherwise by provisions of this specification, side laps of adjacent units shall be fastened by welding (on 20 gauge or heavier deck only) or #10 (min.) TEK screws at 12” O.C.. Button Punching is not allowable as a side-lap fastener.
4. End Bearing: Provide a minimum end bearing of 2" over supports.

5. End Joints: End joints of sheets shall be lapped 2” minimum over supports. Decks that slope 1/4 inch or more in 12 inches in the long direction shall be erected beginning at the low side to insure that end laps are shingle fashion.
6. Definition of Perimeter and Corner: Unless shown otherwise on the drawings, the definition of corner and perimeter areas shall be as noted below.

    a. Definition of Roof Height: Roof height shall be defined as eave height for roofs that slope less than 10% and mean roof height for roofs with a greater slope.
    b. Buildings with roof heights of 60 feet or less

        i. Perimeter: The width of the perimeter strip shall be the smaller of one-tenth the least building dimension and four-tenths the roof height but not less than 4 feet. The strip either side of a ridgeline shall be considered as a perimeter strip for the purposes of deck fastening for roofs that slope between 10° and 45°.
        ii. Corner: On an exterior (not re-entrant) corner, a strip the width of a perimeter strip defined above and extending for a length equal to the dimension of one perimeter strip each direction from the exterior corner.

7. Minimum Attachment Requirements: Unless a more stringent attachment requirement is specified elsewhere in this specification or on the drawings, roof deck units with ribs spaced at 6” or less on center shall be attached to each structural support member at each rib where the sides lap and at a maximum of 12 inches on center in the typical condition in the field of the roof and at a maximum of 12 inches on center at eave overhangs, perimeter strips and corners. Roof deck units with ribs spaced at greater than 6” shall be attached at each rib throughout. One of the following fastening methods shall be used as a minimum requirement:

    a. 5/8” diameter puddle welds
    b. Powder-Actuated or Compressed-air Actuated pins, by Hilti, Inc.
    c. BX 12 or BX 14 pins, by ITWBuildex, Inc.
    d. K***** or SDK***** pins by Pneutek, Inc.
    e. # 12 ICHTraxx self-drilling fasteners, by ITWBuildex, Inc.

8. Minimum Attachment Requirements: Unless a more stringent attachment requirement is specified elsewhere in this specification or on the drawings, roof deck units shall be attached to each structural support member at each rib where the sides lap and at a maximum of 12 inches on center in the typical condition in the field of the roof. Along the perimeter and at corners of the roof, the fastening pattern shall be reduced to a maximum of 6 inches on center. In decks with ribs greater than 6 inches on center this requirement will be met by placing two fasteners per rib. One of the following fastening methods shall be used.

    a. 5/8” diameter puddle welds
    b. Powder-Actuated or Compressed-air Actuated pins, by Hilti, Inc.

c. BX 12 or BX 14 pins, by ITWBuildex, Inc.
d. K***** or SDK***** pins by Pneutek, Inc.
e. # 12 ICHTraxx self-drilling fasteners, by ITWBuildex, Inc.

9. Underwriters Laboratories Wind Uplift Classification Requirements: Unless a more stringent attachment requirement is specified elsewhere in this specification or on the drawings, roof deck units shall be attached to the supporting structure as required by the Construction Number specified elsewhere in this section.
10. Attachment to Girders: At locations where the deck flutes are parallel to the span of the steel framing and the top of the framing is at the bottom of the deck elevation, the deck shall be attached to the girder using one of the specified fastening methods at 18 inches on center. See the drawings for attachment details when the deck flute does not engage the top of the steel framing.

C. Cutting and Fitting: Cut and neatly fit deck units and accessories around other work projecting through or adjacent to the decking.

D. Reinforcement at Openings: Roof openings less than 6" square or diameter require no reinforcement. Openings 6" to 10" inclusive shall be reinforced with a 20 gauge galvanized plate welded to the deck at each corner and 6" maximum centers with a 5/8" diameter puddle weld or sheet metal screws. For openings greater than 10" in diameter or width, refer to the drawings and structural steel specifications for additional framing to support the deck around the opening.

E. Hanger Slots or Clips: Provide UL approved punched hanger slots between cells or flutes of lower element where roof deck units are to receive hangers for support of ceiling construction, air ducts, diffusers, or lighting fixtures.

1. Hanger clips designed to clip over male side lap joints of roof deck units may be used instead of hanger slots.
2. Locate slots or clips at not more than 14" o.c. in both directions, not over 9" from walls at ends, and not more than 12" from walls at sides, unless otherwise shown.
3. Provide manufacturer's standard hanger attachment devices.
4. Loads hanging from metal deck slabs shall not exceed 100 pounds unless specifically detailed otherwise on the drawings.

F. Roof Sump Pans and Sump Plates: Install over openings provided in roof decking and weld flanges to top of deck. Space welds not more than 12 inches apart with at least 1 weld in each corner.

G. Joint Covers: Provide metal joint covers at changes in direction of deck units, except where taped joints are specified.

H. Miscellaneous Roof Deck Accessories: Install ridge and valley plates, finish strips, cover plates, and reinforcing channels according to deck manufacturer’s written instructions. Weld to substrate to provide a complete deck installation.

I. Flexible Closure Strips: Install flexible rubber closure strips that seal the flutes of the deck when the deck cantilevers over an exterior beam and the flutes are exposed to weather and over interior partitions where there is no ceiling present and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.2 TOUCH-UP PAINTING

After deck installation, wire brush, clean and paint scarred areas, welds and rust spots on top and bottom surfaces of decking units and supporting steel members.

Touch-up galvanized surfaces with galvanizing repair paint applied in accordance with manufacturer's instructions.

Touch-up painted surfaces with same type of shop paint used on adjacent surfaces.

In areas where shop-painted surfaces are to be exposed, apply touch-up paint to blend into adjacent surfaces.

3.3 INSPECTION

A. Welded decking in place is subject to inspection and testing by designated Testing Laboratory. Expense of removing and replacing portions of decking for testing purposes will be borne by Owner if welds are found to be satisfactory. Remove work found to be defective and replace with new acceptable work. Cost of such removal and replacement shall be borne by the Contractor.

B. The nail head stand-off distance from the top of the deck for Powder-Actuated or Compressed-Air fasteners shall be in accordance with the manufacturer's requirements and shall be verified with an inspection gauge supplied by the manufacturer. The cost of re-fastening deck that is found to be inadequately fastened shall be borne by the Contractor.

END OF SECTION 05310

SECTION 05314 - STEEL COMPOSITE DECK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 STANDARDS

The following Standards are listed in this specification:

ASTM A611	Standard Specification for Structural Steel (SS), Sheet, Carbon, Cold-Rolled
ASTM A653	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

1.3 SCOPE OF WORK

A. Supplier: The metal deck supplier shall furnish all metal deck materials and accessories indicated on the Architectural, Structural, and Mechanical Drawings required to produce a complete job including but not necessarily limited to deck units, cover plates, pour stops, hanger slots or clips, metal deck edge closures, cell closures, and all related accessories.

B. Erector: The Subcontractor responsible for erecting the metal deck shall provide all labor and equipment as required to place all metal deck components and accessories as described above.

1.4 QUALIFICATIONS

The metal deck supplier shall be a manufacturer with a minimum of two years successful experience and with a minimum of two successful jobs of a comparable size and scope to this project.

1.5 QUALITY ASSURANCE

The Contractor is responsible for quality control, including workmanship and materials furnished by his subcontractors and suppliers.

A. Codes and Standards: Comply with provisions of the following codes and standards except as otherwise indicated or specified:

1. "Design Manual for Composite Decks, Form Decks, and Roof Decks", as published by the Steel Deck Institute (SDI).

2. "Specification for the Design of Cold Formed Steel Structural Members", as published by the American Iron and Steel Institute (AISI).
3. "Structural Welding Code – Sheet Steel", D1.3, as published by the American Welding Society (AWS).

B. Qualification of Field Welding: Qualify welding processes and welding operators in accordance with AWS procedures.

C. Underwriters Label: Provide metal deck units which are listed and conform to Underwriters Laboratories "Fire Resistance Directory", with each deck unit bearing the UL label and marking for specific system detailed.

D. Cellular Decks: Provide cellular floor deck units complying with UL 209 and listed in UL "Electrical Construction Equipment Directory" with each cellular metal floor deck unit bearing UL labels and marking. Provide units which will permit use of standard header ducts and outlets for electrical distribution systems.

1.6 SUBMITTALS

A. Product Certification: Submit manufacturer's specifications and installation instructions for each type of deck specified. Also submit a certificate of product compliance with SDI Standards as specified.

B. Shop Drawings: Submit detailed shop drawings showing type of deck, complete layout, attachment details, closures, edge strips, pans, deck openings, special jointing, supplementary framing, and all other accessories.

C. Calculations: The metal deck manufacturer shall submit design calculations sealed by a registered professional engineer in the state where the project is located verifying compliance with the specifications for all load and span conditions shown on the drawings.

D. Welding Certificates: Submit Copies of certificates for welding procedures and personnel.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

See General Notes on the drawings for location of metal deck types and for depth of deck, minimum deck thickness, concrete type, total slab thickness, slab reinforcing, and design superimposed loads. The average rib width to depth of deck ratio shall be greater than or equal to 2.0. The deck thickness specified shall be considered the minimum thickness. The deck manufacturer shall be responsible for selecting the required deck thickness to carry the design superimposed load indicated for all the

spans shown on the drawings and for meeting all performance criteria as specified by the SDI. Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with “SDI Specifications and Commentary for Composite Steel Floor Deck”.

Acceptable manufacturers include the following:
BHP Steel Building Products USA, Inc.
Canam Steel Corp.
Consolidated Systems, Inc.
Epic Metals Corp.
United Steel Deck, Inc.
Valley Joist, Inc.
Vulcraft/Div. Nucor Corp.
Wheeling Corrugating Co.

Other manufacturers may be used only with Architect/Engineer approval.

2.2 GRADE OF STEEL

Composite metal deck shall be cold formed from steel sheets conforming to ASTM A611 Grade C or D or ASTM A653, Structural Steel Grade, with a minimum yield strength of 33 ksi. The delivered thickness of the uncoated steel shall not be less than 95% of design thickness. Sheet metal accessories shall conform to the same material specification as the deck product.

2.3 FINISH

A. Galvanized: Composite metal deck shall be galvanized with a protective zinc coating conforming to ASTM A653 G60.

B. Painting: Shop prime deck with gray or white baked-on, lead- and chromate-free rust inhibitive primer complying with performance requirements of FS TT-P-664. See Architect's drawings and painting specifications for metal deck finish paint requirements.

C. Galvanizing Repair Paint: High zinc-dust content paint for repair of damaged galvanized surfaces complying with Department of Defense Specifications DOD-P-21035.

2.4 RELATED PRODUCTS

A. Flexible Closure Strips: Provide manufacturers standard vulcanized closed cell, synthetic rubber.

B. Acoustic Sound Barrier Closures: Provide manufacturers standard mineral fiber closures.

2.5 FABRICATOR

A. Metal Deck Spans: Metal deck spans shall not exceed the maximum clear spans as required by SDI criteria. Where possible, all metal deck shall extend over three or more spans. Simple span deck will not be permitted unless it is shored at midspan. All metal deck shall be designed as unshored construction unless indicated otherwise on the drawings. Any additional concrete topping specified over the composite slab shall be placed after the slab has reached 75% of its design strength.

B. Cell Closure at Ends of Metal Deck Flutes: Fabricate metal closure strips of not less than 0.0358" minimum (20 gage) cold formed sheet steel. Form to provide tight fitting cell closures at open ends of cells or flutes to prevent wet concrete from leaking through open cells.

C. Pour Stop Closures at Slab Edges: Provide sheet metal pour stop closures at all slab edges, columns, walls, and openings unless steel angles or bent plates are specified in details on the drawings. The closures shall be fabricated from light gage steel not less than the thickness shown in the table below. Provide a return lip on the vertical leg in accordance with the SDI Design Manual. The overhang dimension is measured from the edge of the flange to the edge of the slab.

Overhang =	0”-2”	2”-4”	4”-6”	6”-8”	8”-10”
Slab Thickness					
5.25	18	16	14	12	10
6.25	16	14	12	12	10
6.5	16	14	12	12	10
8.0	12	12	10	10	NA

2.6 COMPOSITE SLAB REINFORCEMENT

See Section 3200, “Concrete Reinforcement”, for reinforcement in composite slabs.

2.7 OPENINGS IN METAL DECK

For unframed openings, provide blockout in slab for opening with deck uncut. Cut deck at opening after concrete has reached 75% of its design strength. See Section 3200, “Concrete Reinforcement”, for reinforcing in the slab around all unframed openings in metal deck that are greater than 10" in width in either direction.

2.8 CHLORIDE ADMIXTURES

The use of admixtures in concrete containing chloride salts shall not be permitted for metal deck concrete.

2.9 EXTRA CONCRETE REQUIRED BY DECK DEFLECTION

The General Contractor shall include in his bid additional concrete required for metal deck slabs to account for deck deflection.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install deck units as accessories in accordance with manufacturers recommendations and approved shop drawings, and as specified herein:
   1. Place deck units on supporting framework and adjust to final position with ends accurately aligned and bearing 1 1/2" minimum on supporting members before being permanently fastened. Do not stretch or contract side lap interlocks.
   2. Place deck units in straight alignment for entire length of run of cells and with close alignment between cells at ends of abutting units.
   3. Place deck units flat and square, secured to adjacent framing without warp or excessive deflection.
   4. Do not place deck units on concrete supporting structure until concrete has cured and is dry.
   5. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.
   6. Do not use floor deck units for storage or working platforms until permanently secured.

B. Attachment of Composite Deck:

   1. Typical Welding of Deck: Metal deck units shall be welded to the structural support members with 5/8" puddle welds at each end of sheet and each intermediate support at each low flute, unless more frequent attachment is specified on the drawings. Where two deck units abut each other, each unit shall be so welded.
   2. Side Laps: Unless noted otherwise on the drawings, side laps of adjacent units shall be fastened by welding (1-1/2 inch long), sheet metal screws (No. 10 or larger) or button punching at maximum intervals not exceeding the lesser of ½ of the span or 36".
   3. Welding to Girder: Metal deck units shall be welded to girders (steel framing that is parallel to span of deck) with 5/8" ø puddle welds at 12" o.c. If the metal deck is not continuous across the girder, the deck on each side of the girder shall each be welded to the girder with 5/8" ø puddle welds at 12" o.c.
   4. Welding Washers: Welding washers shall be used when welding steel deck units less than 0.028" thickness.
   5. Welding of Composite Deck used on Roof: In addition to the minimum attachment specified above, typical areas of the roof deck shall be welded to resist the net uplift pressures as specified in the General Notes on the drawings
   6. Minimum Bearing: Provide a minimum deck bearing of 1 1/2" over all supports with butted end joints.

C. Welding Requirements: Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.

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.

F. Hanger Slab or Clips: Provide UL approved punched hanger slots between cells or flutes of lower element where floor deck units are to receive hangers for support of ceiling construction, air ducts, diffusers, or lighting fixtures.

1. Hanger clips designed to clip over male side lap joints of floor deck units may be used instead of hanger slots.
2. Locate slots or clips at not more than 14" o.c. in both directions, not over 9" from walls at ends, and not more than 12" from walls at sides, unless otherwise shown.
3. Provide manufacturer's standard hanger attachment devices.
4. Loads hanging from metal deck slabs shall not exceed 100 pounds unless specifically detailed otherwise on the drawings.

G. Joint Covers and Cell Closures: Weld steel sheet joint covers at abutting ends, except where taped joints are specified. Weld steel sheet column closures, cell closures and Z-closures to deck with 1" long weld at 12" maximum centers to provide tight-fitting closures at open ends of ribs, unless shown otherwise on the drawings.

H. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated. Provide minimum 2" bearing over steel support.

3.2 TOUCH-UP PAINTING

After deck installation, wire brush, clean and paint scarred areas, welds and rust spots on top and bottom surfaces of decking units and supporting steel members.

Touch-up galvanized surfaces with galvanizing repair paint applied in accordance with manufacturer's instructions.

Touch-up painted surfaces with same type of shop paint used on adjacent surfaces.
In areas where shop-painted surfaces are to be exposed, apply touch-up paint to blend into adjacent surfaces.

3.3 INSPECTION

Welded decking in place is subject to inspection and testing by the Owner's Testing Laboratory. Expense of removing and replacing portions of decking for testing purposes will be borne by Owner if welds are found to be satisfactory. Remove work found to be defective and replace with new acceptable work. Cost of such removal and replacement shall be borne by the Contractor.

END OF SECTION 05314

SECTION 05500 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:

1. Steel ladders.
2. Steel shelf angles.
3. Support angles for elevator door sills and machine beams where required.
4. Steel framing and supports for mechanical and electrical equipment.
5. Steel framing and supports for applications where framing and supports are not specified in other Sections.
6. Miscellaneous metal trim.
7. Pipe bollards.
8. Sump pit grate.
9. Cast metal nosings.
10. Bike racks.

1.2 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data:

1. Grout.
2. Cast nosings.

C. Samples for Verification: For nosings.

D. Shop Drawings: Detail 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.

1. Provide templates for anchors and bolts specified for installation under other Sections.

E. Welding Certificates: Copies of certificates for welding procedures and personnel.

F. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and Owners, and other information specified.

G. Products - Recycled Content: Provide certification from manufacturer on product's recycled content.

1.3 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.2, "Structural Welding Code--Aluminum."
3. AWS D1.3, "Structural Welding Code--Sheet Steel."
4. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.4 PROJECT CONDITIONS

A. Field Measurements: Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.5 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

1.6 METALS, GENERAL

A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

1.7 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.

C. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

D. 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/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

E. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

1.8 ALUMINUM

A. Aluminum Extrusions: ASTM B 221, alloy 6063-T6.

B. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, alloy 6061-T6.

1.9 PAINT

A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in 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 steel, complying with SSPC-Paint 20.

1.10 FASTENERS

A. General: Provide Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for 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. Anchor Bolts: ASTM F 1554, Grade 36.

D. Plain Washers: Round, carbon steel, ASME B18.22.1.

1.11 GROUT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

1.12 CONCRETE FILL

A. Concrete Materials and Properties: Comply with requirements in Section 03300 - Cast-in-Place Concrete: Normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi.

1.13 FABRICATION, GENERAL

A. 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.

B. Shear and punch metals cleanly and accurately. Remove burrs.

C. 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.

D. 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 no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

E. 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.

F. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

G. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

H. Allow for thermal movement resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening up of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 degrees F, ambient; 180 degrees F, material surfaces.

I. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

J. Remove sharp or rough areas on exposed traffic surfaces.

K. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

1.14 STEEL LADDERS

A. General: Fabricate ladders for locations shown, with dimensions, spacings, details, and anchorages as indicated.

1. Comply with ANSI A14.3, unless otherwise indicated.
2. For elevator pit ladders, comply with ASME A17.1.

B. Siderails: Continuous steel flat bars, with eased edges.

C. Bar Rungs: Steel bars as indicated.

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 not more than 60 inches o.c. with welded or bolted steel brackets. Size brackets to support design loads specified in ANSI A14.3.

F. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.

G. Galvanize ladders, including brackets and fasteners.

1.15 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates after fabrication.

1.16 LOOSE STEEL LINTELS

A. Fabricate loose structural-steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.

B. Weld adjoining members together to form a single unit where indicated.

C. Size loose lintels to provide bearing length at each side of openings equal to one-twelfth of clear span, but not less than 8 inches, unless otherwise indicated.

D. Galvanize loose steel lintels located in exterior walls.

1.17 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.

B. Galvanize shelf angles to be installed in exterior walls.

C. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

1.18 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports indicated and as necessary to complete the Work.

B. Fabricate units from structural-steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Fabricate units from slotted channel framing where indicated.

2. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors 1-1/4 inches wide by 1/4 inch thick by 8 inches long at 24 inches o.c., unless otherwise indicated.
3. Furnish inserts if units must be installed after concrete is placed.

C. Fabricate supports for operable partitions as follows:

1. Beams: Continuous steel shapes of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

D. Galvanize miscellaneous framing and supports where indicated.

1.19 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 where possible.

B. Provide cutouts, fittings, and anchorages as needed 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 on center, unless otherwise indicated.

C. Galvanize all miscellaneous steel trim.

1.20 PIPE BOLLARDS

A. Fabricate pipe bollards from Schedule 40 steel pipe.

1.21 SUMP PIT GRATE

A. Fabricate sump pit grate from swage locked aluminum bars and rods.

1. Product and Manufacturer: Series GAL-2, Swage Locked Aluminum Grating; McNichols Co.
2. Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

1.22 CAST NOSINGS

A. General: Fabricate units of metal indicated below in sizes and configurations indicated and in lengths necessary to accurately fit openings or conditions. Provide units with an integral abrasive finish consisting of aluminum oxide, silicon carbide, or a combination of both.

1. Metal: Cast aluminum.

B. Configurations: Provide units in the following configurations, unless otherwise indicated:

1. Nosings: Crosshatched units, profile as indicated, for casting into concrete steps.

C. Anchors: Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

D. Protections: Apply bituminous paint to concealed bottoms, sides, and edges of units set into concrete.

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

1. American Safety Tread Co., Inc.
2. Balco/Metalines, Inc.
3. Wooster Products Inc.

1.23 BIKE RACKS

A. Bike Racks: University standard.

1. Size: As indicated.
2. Finish: Painted.

1.24 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

1.25 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

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/NACE No. 3, "Commercial Blast Cleaning."

C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

1.26 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing 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.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications 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 surfaces of exterior units that have been hot-dip galvanized after fabrication and are 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 no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

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.

1.27 SETTING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use nonshrink grout, either metallic or nonmetallic, 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.

1.28 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings, if any.

B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

1.29 INSTALLING PIPE BOLLARDS

A. Set bollards in place and fill solidly with concrete. Mount top surface and finish smooth.

1.30 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05500

SECTION 05511 - METAL STAIRS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Steel stairs with concrete-filled treads.
2. Handrails and railings attached to metal stairs.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal stairs capable of withstanding the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each component of metal stairs.

1. Treads and Platforms of Metal Stairs: Capable of withstanding a uniform load of 100 lbf/sq. ft. or a concentrated load of 300 lbf on an area of 4 sq. in., whichever produces the greater stress.
2. Stair Framing: Capable of withstanding stresses resulting from loads specified above in addition to stresses resulting from railing system loads.
3. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch, whichever is less.

B. Structural Performance of Handrails and Railings: Comply with the requirements of the Standard Building Code. Provide handrails and railings capable of withstanding the following structural loads without exceeding allowable design working stresses of materials for handrails, railings, anchors, and connections:

1. Top Rail of Guards: Capable of withstanding the following loads applied as indicated:

a. Concentrated load of 200 lbf applied at any point and in any direction at the top of the guardrail.
b. Uniform load of 50 lbf/ft. applied horizontally and concurrently with uniform load of 100 lbf/ft. applied vertically downward.
c. Concentrated and uniform loads above need not be assumed to act concurrently.

2. Handrails Not Serving As Top Rails: Capable of withstanding the following loads applied as indicated:

    a. Concentrated load of 200 lbf applied at any point and in any direction.
    b. Uniform load of 50 lbf/ft. applied in any direction.

3. Concentrated and uniform loads above need not be assumed to act concurrently.

C. Infill Area of Guards: Capable of withstanding a horizontal concentrated load of 200 lbf applied to 1 sq. ft. at any point in system, including panels, intermediate rails, balusters, or other elements composing infill area.

1. Load above need not be assumed to act concurrently with loads on top rails in determining stress on guard.

1.3 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: For metal stairs and the following:

1. Paint products.
2. Grout.

C. Shop Drawings: Show fabrication and installation details for metal stairs. Include plans, elevations, sections, and details of metal stairs and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.

1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Welding Certificates: Copies of certificates for welding procedures and personnel.

E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and Owners, and other information specified.

F. Products - Recycled Content: Provide certification from manufacturer on product’s recycled content.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:

1. ADA Requirements: Comply with the Florida Accessibility Code for Building Construction, October 1997 Edition.

B. Installer Qualifications: Arrange for metal stairs specified in this Section to be fabricated and installed by the same firm.

C. 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 metal stairs (including handrails and railing systems) that are similar to those indicated for this Project in material, design, and extent.

D. Fabricator Qualifications: A firm experienced in producing metal stairs similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

E. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

1.5 COORDINATION

A. Coordinate installation of anchorages for metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

1.6 MANUFACTURERS

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

1. Preassembled Stairs:

a. Alfab, Inc.
b. American Stair Corp., Inc.
c. Sharon Companies, Ltd. (The).

1.7 FERROUS METALS

A. Metal Surfaces, General: Provide metal free from pitting, seam marks, roller marks, and other imperfections where exposed to view on finished units. Do not use steel sheet with variations in flatness exceeding those permitted by referenced standards for stretcher-leveled sheet.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.

D. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

E. Uncoated, Cold-Rolled Steel Sheet: Commercial quality, complying with ASTM A 366/A 366M; or structural quality, complying with ASTM A 611, Grade A, unless another grade is required by design loads.

F. Uncoated, Hot-Rolled Steel Sheet: Commercial quality, complying with ASTM A 569/A 569M; or structural quality, complying with ASTM A 570/A 570M, Grade 30, unless another grade is required by design loads.

G. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 coating, either commercial quality or structural quality, Grade 33, unless another grade is required for design loads.

H. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

1.8 FASTENERS

A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 25 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for 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: ASME B18.6.3.

D. Lag Bolts: ASME B18.2.1.

E. Plain Washers: Round, carbon steel, ASME B18.22.1.

F. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four 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: Alloy Group 1 or 2 stainless-steel bolts complying with ASTM F 593 and nuts complying with ASTM F 594.

1.9 PAINT

A. Shop Primers: Provide primers that comply with Division 9 Section "Painting."

B. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in 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.

C. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

D. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers or cold-applied asphalt emulsion complying with ASTM D 1187.

1.10 GROUT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

1.11 CONCRETE FILL AND REINFORCING MATERIALS

A. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, ready-mixed concrete with a minimum 28-day compressive strength of 3000 psi, unless higher strengths are indicated.

B. Nonslip-Aggregate Finish: Factory-packaged abrasive aggregate made from fused, aluminum-oxide grits or crushed emery; rustproof and nonglazing; unaffected by freezing, moisture, or cleaning materials.

C. Welded Wire Fabric: ASTM A 185, 6 by 6 inches--W1.4 by W1.4, unless otherwise indicated.

1.12 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, struts, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

1. Join components by welding, unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces.
3. Fabricate treads and platforms of exterior stairs so finished walking surfaces slope to drain.

B. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.

1. Commercial class, unless otherwise indicated.

C. Shop Assembly: Preassemble stairs in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

D. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Shear and punch metals cleanly and accurately. Remove sharp or rough areas on exposed surfaces.

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. Weld connections 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. Weld exposed corners and seams continuously, unless otherwise indicated.
5. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

H. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

1.13 STEEL-FRAMED STAIRS

A. Stair Framing: Fabricate stringers of structural-steel channels, plates, or a combination of both, as indicated. Provide closures for exposed ends of stringers. Construct platforms of structural-steel channel headers and miscellaneous framing members as indicated. Bolt or weld headers to stringers; bolt or weld framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.

1. Where stairs are enclosed by gypsum board shaft-wall assemblies, provide hanger rods to support landings from floor construction above. Locate hanger rods within stud space of shaft-wall construction.
2. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

B. Metal Risers, Subtread Pans, and Subplatforms: Form to configurations shown from steel sheet of thickness necessary to support indicated loads, but not less than 0.0677 inch.

1. Steel Sheet: Uncoated cold-rolled steel sheet, unless otherwise indicated.
2. Steel Sheet: Uncoated hot-rolled steel sheet, unless otherwise indicated.
3. Directly weld metal pans to stringers; locate welds on side of subtreads to be concealed by concrete fill. Do not weld risers to stringers.
4. Attach risers and subtreads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting, or bolting.
5. Shape metal pans to include nosing integral with riser.
6. Provide stair assemblies with metal-pan subtreads filled with reinforced concrete during fabrication.

7. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.

    a. Smooth Soffit Construction: Construct subplatforms with smooth soffits.

C. Formed-Metal Risers, Treads, and Platforms: Form to configurations shown from steel sheet of thickness necessary to support indicated loads, but not less than 0.0966 inch.

1. Steel Sheet: Uncoated hot-rolled steel sheet, unless otherwise indicated.
2. Directly weld risers and treads to stringers; locate welds on underside of stairs.
3. Provide platforms of configuration indicated or, if not indicated, the same as treads. Weld platforms to platform framing.
4. Finish tread and platform surfaces with manufacturer's standard epoxy-bonded abrasive finish. Provide material with coefficient of friction of 0.6 or higher when tested according to ASTM C 1028.

1.14 STEEL TUBE HANDRAILS AND RAILINGS

A. General: Fabricate handrails and railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.

B. Interconnect members by butt-welding or welding with internal connectors, at fabricator's option, unless otherwise indicated.

1. At tee and cross intersections, cope ends of intersecting members to fit contour of tube to which end is joined, and weld all around.

C. Form changes in direction of handrails and rails as follows:

1. As detailed.

D. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

E. Close exposed ends of handrail and railing members with prefabricated end fittings.

F. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns, unless clearance between end of rail and wall is 1/4 inch or less.

G. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting railings and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.

1. Connect railing posts to stair framing by direct welding, unless otherwise indicated.

H. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thickness and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

I. For nongalvanized handrails and railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.

1.15 STAIR HANDRAILS AND RAILINGS

A. General: Comply with applicable requirements in Division 5 Section "Pipe and Tube Railings" for handrails and railings, and as follows:

1.16 FINISHES

A. Comply with NAAMM'S "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal stairs after assembly.

C. 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 products:
   1. Interiors (SSPC Zone 1A): SSPC SP 3, "Power Tool Cleaning."

D. Apply shop primer to prepared surfaces of metal stair components, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

   1. Do not apply primer to galvanized surfaces.
   2. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

1.17 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free from rack.

C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete, unless otherwise indicated.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

E. 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 surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

F. 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 no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

G. Install precast treads with adhesive supplied by manufacturer.

1.18 INSTALLING METAL STAIRS WITH GROUTED BASE PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of base plates.

B. Set steel stair base plates on wedges, shims, or leveling nuts. After stairs have been positioned and aligned, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use nonmetallic, nonshrink grout, unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

1.19 INSTALLING STEEL TUBE RAILINGS AND HANDRAILS

A. Adjust handrails and railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and railing ends to building construction as follows:

1. Anchor posts to steel by welding directly to steel supporting members.
2. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with postinstalled anchors and bolts.

1.20 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

END OF SECTION 05511

SECTION 05521 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Steel pipe and tube handrails and railings.
2. Guardrails.
3. Gates.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance of Handrails and Railings and Guardrails:

1. Capable of withstanding the following structural loads without exceeding the allowable design working stress of materials involved:

a. Top Rail of Guards: Concentrated load of 200 lbf applied at any point and in any direction, and a uniform load of 50 lbf/ft. applied horizontally and concurrently with uniform load of 100 lbf/ft. applied vertically downward. Concentrated and uniform loads need not be assumed to act concurrently.
b. Handrails Not Serving as Top Rails: Concentrated load of 200 lbf applied at any point and in any direction, and a uniform load of 50 lbf/ft. applied in any direction. Concentrated and uniform loads need not be assumed to act concurrently.

B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.3 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: For the following:

1. Manufacturer's product data for prefabricated handrails and railings and accessories.

C. Shop Drawings: Show fabrication and installation of handrails and railings. Include plans, elevations, sections, component details, and attachments to other Work.

1. For installed handrails and railings indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Products - Recycled Content: Provide certification from manufacturer on products recycled content.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:

1. ADA Requirements: Comply with the Florida Accessibility Code for Building Construction, October 1997 Edition.

B. Source Limitations: Obtain each type of handrail and railing through one source from a single manufacturer.

1.5 STORAGE

A. Store handrails and railings in a dry, well-ventilated, weathertight place.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify handrail and railing dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.7 COORDINATION

A. Coordinate installation of anchorages for handrails and railings. Furnish setting drawings, templates, and directions for installing anchorages. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

1.8 METALS

A. General: Provide metal free from pitting, seam marks, roller marks, stains, discolorations, and other imperfections where exposed to view on finished units.

B. Steel: Provide steel in the form indicated, complying with the following requirements:

1. Steel Pipe: ASTM A 53; finish, type, and weight class as follows:

a. Type F, or Type S, Grade A, standard weight (Schedule 40), unless another grade and weight are required by structural loads.

2. Steel Tubing: Cold-formed steel tubing, ASTM A 500, Grade A, unless another grade is required by structural loads.
3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

1.9 WELDING MATERIALS, FASTENERS, AND ANCHORS

A. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Fasteners for Anchoring Handrails and Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring handrails and railings to other types of construction indicated and capable of withstanding design loads.

1. For steel handrails, railings, and fittings, use plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.

C. Postinstalled Anchors: Anchors fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1.10 PAINT

A. Shop Primers: Provide primers to comply with applicable requirements in Division 9 Section "Painting."

1.11 FABRICATION

A. General: Fabricate handrails and railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

1. Assemble handrails and railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

2. Form changes in direction of railing members as follows:

   a. As detailed.

3. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.

4. Welded Connections: Fabricate handrails and railings for connecting members by welding. Cope components at perpendicular and skew connections to provide close fit, or use fittings designed for this purpose. Weld connections continuously to comply with the following:

   a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   b. Obtain fusion without undercut or overlap.
   c. Remove flux immediately.
   d. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

B. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect handrail and railing members to other work, unless otherwise indicated.

1. Provide inserts and other anchorage devices for connecting handrails and railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railings. Coordinate anchorage devices with supporting structure.

C. Gate Hardware:

1. Hinge: Pivot type, self closing.
2. Latch: Self-latching; handicap accessible.
3. Bumpers: Rubber.
4. Hardware Finish: To match gate.

D. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.

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 the Work.

F. Cut, reinforce, drill, and tap components, as indicated, to receive finish hardware, screws, and similar items.

G. Close exposed ends of handrail and railing members with prefabricated end fittings.

H. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns, unless clearance between end of railing and wall is 1/4 inch or less.

I. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

1.12 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1.13 STEEL FINISHES

A. 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 handrails and railings:

1. Interiors (SSPC Zone 1A): SSPC-SP 7, "Brush-off Blast Cleaning."

B. Apply shop primer to prepared surfaces of handrail and railing components, unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

1. Stripe paint edges, corners, crevices, bolts, and welds.

PART 3 - EXECUTION

1.14 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required to install handrails and railings. Set handrails and railings accurately in location, alignment, and elevation; measured from established lines and levels and free from rack.

1. Do not weld, cut, or abrade surfaces of handrail and railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Align rails so variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

C. Adjust handrails and railings before anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated, but not less than that required by structural loads.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing handrails and railings and for properly transferring loads to in-place construction.

1.15 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

1.16 ATTACHING HANDRAILS TO WALLS

A. Attach handrails to wall with wall brackets, unless otherwise indicated. Provide bracket with 1-1/2-inch clearance from inside face of handrail and finished wall surface.

B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

C. Secure wall brackets to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in anchors.
2. For hollow masonry anchorage, use toggle bolts.

1.17 CLEANING

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 Section "Painting."

1.18 PROTECTION

A. Protect finishes of handrails and railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at the time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 05521

SECTION 06100 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Framing with dimension lumber.
2. Rooftop equipment bases and support curbs.
3. Wood blocking, cants, and nailers.
4. Wood furring and grounds.

1.2 DEFINITIONS

A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise indicated.

B. Exposed Framing: Dimension lumber not concealed by other construction.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NELMA - Northeastern Lumber Manufacturers Association.
2. NLGA - National Lumber Grades Authority.
3. SPIB - Southern Pine Inspection Bureau.

1.3 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.

2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials, both before and after exposure to elevated temperatures when tested according to ASTM D 5516 and ASTM D 5664.
3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

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 Board of Review.

D. Certification: Provide certification that all architectural wood materials originate from, 'sustainable managed forests'. Forests and forest product manufacturers may be certified by Scientific Certification Systems (SCS), RainForest Alliance's, SmartWood Program or another certifying body approved by Architect.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

B. Source Limitations for Fire-Retardant-Treated Wood: Obtain each type of fire-retardant-treated wood product through one source from a single producer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

1.6 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.

1. 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.
2. Provide dressed lumber, S4S, unless otherwise indicated.
3. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

1.7 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Chemical Treatment: Acceptable chemical treatments include Kodiack, and ALKALINE Copper Quaternary Compound (AQC-TYPE D). Other Borate-based products are acceptable. CCA, ACA, ACZA, Pentachlorophenol (Penta/PCP) and Creosote based products will not be accepted.

B. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.

C. Application: Treat all rough carpentry, unless otherwise indicated.

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.

1.8 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, provide materials that comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Use treatment for which chemical manufacturer publishes physical properties of treated wood after exposure to elevated temperatures, when tested by a qualified independent testing agency according to ASTM D 5664, for lumber and ASTM D 5516, for plywood.
2. Use treatment that does not promote corrosion of metal fasteners.
3. Use Exterior type for exterior locations and where indicated.
4. Use Interior Type A High Temperature (HT), unless otherwise indicated.

B. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.

1.9 DIMENSION LUMBER

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

1.10 MISCELLANEOUS LUMBER

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

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

B. For items of dimension lumber size, provide Construction, Stud, or No. 2 grade lumber with 19 percent maximum moisture content and any of the following species:

1. Mixed southern pine; SPIB.
2. Hem-fir or Hem-fir (north); NLGA, WCLIB, or WWPA.
3. Spruce-pine-fir (south) or Spruce-pine-fir; NELMA, NLGA, WCLIB, or WWPA.
4. Eastern softwoods; NELMA.

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

1. Mixed southern pine, No. 2 grade; SPIB.
2. Hem-fir or Hem-fir (north), Construction or 2 Common grade; NLGA, WCLIB, or WWPA.
3. Spruce-pine-fir (south) or Spruce-pine-fir, Construction or 2 Common grade; NELMA, NLGA, WCLIB, or WWPA.
4. Eastern softwoods, No. 2 Common grade; NELMA.

1.11 SHEATHING

A. Plywood Wall Sheathing: Exterior, Structural I sheathing.

1. Thickness: As indicated.

1.12 PLYWOOD BACKING PANELS

A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2 inch thick.

1.13 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 hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: CABO NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

F. Lag Bolts: ASME B18.2.1..

G. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

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 assemblies 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 and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

1.14 MISCELLANEOUS MATERIALS

A. Building Paper: Asphalt-saturated organic felt complying with ASTM D 226, Type I (No. 15 asphalt felt), unperforated.

PART 2 - EXECUTION

1.15 INSTALLATION, GENERAL

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

B. Do not use materials with defects that impair quality of rough carpentry or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

C. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

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

1. CABO NER-272 for power-driven fasteners.
2. Published requirements of metal framing anchor manufacturer.
3. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in the Uniform Building Code.
4. Table 2305.2, "Fastening Schedule," in the BOCA National Building Code.
5. Table 2306.1, "Fastening Schedule," in the Standard Building Code.
6. Table 602.3(1), "Fastener Schedule for Structural Members," and Table 602.3(2), "Alternate Attachments," in the International One- and Two-Family Dwelling Code.

E. Use common wire nails, unless otherwise indicated. 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.

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

1.16 WOOD GROUND, SLEEPER, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build anchor bolts into masonry during installation of masonry work. Where possible, secure anchor bolts to formwork before concrete placement.

C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

END OF SECTION 06100

SECTION 06402 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Plastic-laminate cabinets.
2. Strawboard cabinets.
3. Wood veneer cabinets.
4. Plastic-laminate countertops.
5. Epoxy-resin countertops.
6. Wood sills.

1.2 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items, unless concealed within other construction before woodwork installation.

1.3 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: For each type of product indicated, including cabinet hardware and accessories, and finishing materials and processes.

C. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale 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 reinforcement specified in other Sections.
3. Show locations and sizes of cutouts and holes for plumbing fixtures, and other items installed in architectural woodwork.

D. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated.

1. Plastic laminates.

E. Samples for Verification: For the following:

1. Plastic-laminate-clad panel products, 8 by 10 inches, for each type, color, pattern, and surface finish, with separate samples of unfaced panel product used for core.
2. Exposed cabinet hardware and accessories, one unit for each type and finish.

F. Product Certificates: Signed by manufacturers of woodwork certifying that products furnished comply with requirements.

G. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

H. Certification: Provide certification that all architectural wood materials originate from, ‘sustainable managed forests’. Forests and forest product manufacturers may be certified by Scientific Certification Systems (SCS), RainForest Alliance’s, SmartWood Program or another certifying body approved by Architect.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed architectural woodwork similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Fabricator Qualifications: A 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.

C. Quality Standard: Comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork, construction, finishes, and other requirements.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.6 PROJECT CONDITIONS

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

B. Field Measurements: Where woodwork is 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.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed and indicate measurements on Shop Drawings.

1.7 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.

PART 2 - PRODUCTS

1.8 MATERIALS

A. General: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Products: Comply with the following:

1. Cabinet Substrate Material – Where Indicated: “Agri-board” (strawboard).

2. Veneer Plywood: Certified plywood.

a. Veneer Species and Cut: White maple quarter sliced.

3. Plywood for Underlayment for Plastic Laminate: Certified plywood.

4. Wood Sills: Solid maple.
5. Clear Tempered Float Glass for Shelves: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality q3; with exposed edges seamed before tempering, 6 mm thick, unless otherwise indicated.

C. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated into the Work include, but are not limited to, the following:

a. Formica Corporation.
b. Pioneer Plastics Corp.
c. Westinghouse Electric Corp.; Specialty Products Div.
d. Wilsonart International; Div. of Premark International, Inc.

D. Adhesive for laminated plastic to be water based, low VOC type. Urea formaldehyde based bonding agents will not be allowed. Acceptable manufacturers/products include:

1. AFM Enterprises, Almighty Adhesive.
2. Franklin International: 'Titebond' Water-based Contact Cement.

1.9 CABINET HARDWARE AND ACCESSORIES

A. Hinges: Concealed, overlay, self-closing, all metal, 175 degree opening, independent screw action. Hinge plate shall be zinc die cast, T-type, fully adjustable. Provide number of hinges per door as recommended by hinge manufacturer based on door dimensions.

1. Product and Manufacturer – Basis of Design: 1200 Series as manufactured by Grass America, Inc. or equal as manufactured by Hafele America Company.

B. Cabinet Pulls: Solid metal (aluminum) wire type, mounted with 2 screws, with bases, fastened from back.

1. Product and Manufacture: Catalog No. 4484 as manufactured by Stanley Hardware or equal as manufactured by Hettich America Corp., or Hafele America.

a. Finish: Satin, anodized.

C. Standards and Supports (Brackets) - Concealed:

1. Product and Manufacturer: No. 255 Standards and No. 256 Supports (Brackets), Knape & Vogt or equal.

D. Drawer Slides:

1. File Drawers: Full extension, side mounted, heavy-duty; 150 pound load rating.

a. Product and Manufacturer: Model 4005 as manufactured by Accuride.

2. All Other Drawers: Full extension, side mounted, heavy-duty; 110 pound load rating.

    a. Product and Manufacturer: Model 417 as manufactured by Accuride.

E. Locks: Lever type lock, with cylinder and rosette, for vertical mounting. Closure travel 90-degrees. Provide strike plates for each lock.

1. Description: Disc 5 tumbler; die cast.
2. Lever Direction: Standard, unless otherwise required to suit casework indicated.
3. Finish: Nickel-plated.
4. Keying: Provide 2 keys per lock. Key locks alike per room.

F. Grommets: Cast plastic liner with cap.

1. Product and Manufacturer: MM4 and MM4A Grommet; Doug Mockett & Company, Inc.

    a. Color: Matte black.

1.10 INSTALLATION MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.

B. 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 sleeves for drilled-in-place anchors.

1.11 FABRICATION, GENERAL

A. Interior Woodwork Grade: Provide Premium grade interior woodwork complying with the referenced quality standard.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

C. Fabricate woodwork to dimensions, profiles, and details indicated.

1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.

2. Trial fit assemblies at 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 Shop Drawings before disassembling for shipment.

D. 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. Sand edges of cutouts to remove splinters and burrs.

1. Seal edges of openings in countertops with a coat of varnish.

1.12 PLASTIC-LAMINATE CABINETS

A. Quality Standard: Comply with AWI Section 400 requirements for laminate cabinets.

B. Grade: Premium.

C. AWI Type of Cabinet Construction: As indicated.

D. Core Material: Plywood.

E. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:

1. Horizontal Surfaces Other Than Tops: HGL.
2. Vertical Surfaces: VGS.
3. Edges: VGS.

F. Materials for Semiexposed Surfaces: Provide surface materials indicated below:

1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS.
2. Drawer Sides and Backs: Melamine (thermoset decorative overlay), unless otherwise indicated.
3. Drawer Bottoms: Melamine (thermoset decorative overlay), unless otherwise indicated.

G. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. Provide Architect's selections from laminate manufacturer's full range of colors and finishes in the following categories:

a. Solid colors and patterns.

1.13 PLASTIC-LAMINATE COUNTERTOPS

A. Quality Standard: Comply with AWI Section 400 requirements for high-pressure decorative laminate countertops.

B. Grade: Premium.

C. High-Pressure Decorative Laminate Grade: HGS.

D. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. Provide Architect's selections from manufacturer's full range of colors and finishes in the following categories:

a. Solid colors and patterns.

E. Edge Treatment: Same as laminate cladding on horizontal surfaces.

F. Core Material: Plywood.

1.14 WOOD CABINETS AND WINDOW SILLS - TRANSPARENT FINISH

A. Veneer Wood Species and Cut for Exposed Plywood and Solid Wood Surfaces: Maple, quarter sliced.

1. Grain Matching: As indicated.
2. Matching of Veneer Leaves: Book match.
3. Vertical Matching of Veneer Leaves: End match.
4. Veneer Matching within Panel Face: Running match.
5. Veneer Matching within Room: Provide cabinet veneers in each room or other space from a single flitch with doors, drawer fronts, and other surfaces matched in a sequenced set with continuous match where veneers are interrupted perpendicular to the grain.
6. Comply with veneer and other matching requirements indicated for blueprint-matched paneling.

B. Semiexposed Surfaces: Provide surface materials indicated below:

1. Surfaces Other Than Drawer Bodies: Match species and cut indicated for exposed surfaces.
2. Drawer Sides and Backs: Solid-hardwood lumber, stained to match species indicated for exposed surfaces.
3. Drawer Bottoms: Melamine (thermoset decorative overlay), unless otherwise indicated.

1.15 EPOXY COUNTERTOPS

A. Location: Labs and Studios.

B. Epoxy Countertops: Factory molded of modified epoxy-resin formulation with smooth, nonspecular finish.

1. Physical Properties:

a. Flexural Strength: Not less than 10,000 psi.
b. Modulus of Elasticity: Not less than 2,000,000 psi.
c. Hardness (Rockwell M): Not less than 100.
d. Water Absorption (24 Hours): Not more than 0.02 percent.
e. Heat Distortion Point: Not less than 260 deg F.

2. Chemical Resistance: Epoxy-resin material has the following ratings when tested with indicated reagents according to NEMA LD 3, Test Procedure 3.4.5:

a. No Effect: Acetic acid (98 percent), acetone, ammonium hydroxide (28 percent), benzene, carbon tetrachloride, dimethyl formamide, ethyl acetate, ethyl alcohol, ethyl ether, methyl alcohol, nitric acid (70 percent), phenol, sulfuric acid (60 percent), and toluene.
b. Slight Effect: Chromic acid (60 percent) and sodium hydroxide (50 percent).

3. Color: Black.

4. Countertop Fabrication: Fabricate with factory cutouts for sinks and with butt joints assembled with epoxy adhesive and prefitted, concealed metal splines.

a. Countertop Configuration: Flat, 1-inch thick, with rounded edge and corners, and with drip groove and integral coved backsplash.

PART 3 - EXECUTION

1.16 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas before installation.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

1.17 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.

1. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.
2. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces and repair damaged finish at cuts.
3. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation.

B. Cabinets: Install without distortion so 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 installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
2. Maintain veneer sequence matching of cabinets with transparent finish.

C. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
2. Apply sealant to space between backsplash and wall with sealant specified in Division 7 Section "Joint Sealants."

1.18 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork 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.

END OF SECTION 06402

SECTION 07141 - COLD FLUID-APPLIED WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Fluid applied waterproofing; single-component modified polyurethane waterproofing for below grade surfaces of retaining walls.
2. Waterproof deck coating.

1.2 PERFORMANCE REQUIREMENTS

A. Provide waterproofing membrane that prevents the passage of water.

1.3 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.

C. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

D. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.

E. Product Test Reports: From a qualified independent testing agency indicating and interpreting test results of waterproofing for compliance with requirements, based on comprehensive testing of current waterproofing formulations.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain waterproofing materials through one source from a single manufacturer.

B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." 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, testing and inspection procedures, and protection and repairs.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver liquid 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 liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by waterproofing manufacturer.

C. Remove and replace liquid materials that cannot be applied within their stated shelf life.

D. Protect stored materials from direct sunlight.

1.6 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 degrees F above dew point.

1. Do not apply waterproofing in snow, rain, fog or mist, or when such weather conditions are imminent during application and curing period.

B. Maintain adequate ventilation during application and curing of waterproofing materials.

PART 2 - PRODUCTS

1.7 MANUFACTURERS

A. Fluid Applied Waterproofing:

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

a. HLM 5000; Sonneborne, Div. of ChemRex Inc.
b. Vulkem 201; Tremco
c. Tremproof 60.Tremco

B. Waterproof Deck Coating:

1. Product and Manufacturer – Basis of Design:

a. Vulkem 350/351 NF Pedestrian Deck Coating System; Tremco

1.8 WATERPROOFING MATERIALS

A. General: Provide waterproofing materials recommended by manufacturer to be compatible with one another and able to develop bond to substrate under conditions of service and application, as demonstrated by waterproofing manufacturer based on testing and field experience.

B. Fluid-Applied Waterproofing: Comply with ASTM C 836, with manufacturer's written physical requirements, and as follows:

1. Single-component modified polyurethane waterproofing.
2. VOC Content: Less than 299 grams per liter.

C. Waterproof Deck Coating:

1. Base Coat: One-part no V.O.C. low odor, polyurethane basecoat.
2. Top Coat: Two-component no V.O.C. low odor, aliphatic polyurethane top coat.
3. Surface Texture: Non-slip; use 6-8 pounds of silica sand per gallon of top coat.
4. Color: To be selected by the Architect from manufacturer’s standard color selections.

1.9 AUXILIARY WATERPROOFING MATERIALS

A. Primer: Manufacturer's standard, factory-formulated polyurethane or epoxy primer.

B. Sheet Flashing: 50-mil- 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: Multi-component polyurethane sealant, compatible with waterproofing, complying with ASTM C 920 Type M, Class 25; Grade NS for sloping and vertical applications or Grade P for deck applications; Use NT exposure; and as recommended by manufacturer for substrate and joint conditions.

1. Backer Rod: Closed-cell polyethylene foam.

E. Protection Course: Fan folded, with a core of extruded-polystyrene board insulation sandwiched between 2 sheets of plastic film, nominal thickness 1/4 inch, with compressive strength of 15 psi per ASTM D 1621 and maximum water absorption by volume of 0.15 percent per ASTM C 272.

PART 3 - EXECUTION

1.10 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.
2. Verify that substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

1.11 SURFACE PREPARATION

A. Clean and prepare substrate according to manufacturer's written 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, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

1. Abrasive blast clean concrete surfaces uniformly to expose top surface of fine aggregate according to ASTM D 4259 with a self-contained, recirculating, blast-cleaning apparatus. 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.

D. Remove fins, ridges, and other projections and fill honeycomb, aggregate pockets, and other voids.

1.12 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 written instructions.

B. Prime substrate, unless otherwise instructed 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.

1.13 JOINT AND CRACK TREATMENT

A. Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 898 and waterproofing manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.

1. Comply with ASTM C 1193 for joint-sealant installation.
2. Apply bond breaker between sealant and preparation strip.
3. Prime substrate and apply a single thickness of preparation strip extending a minimum of 3 inches along each side of joint. Apply a double thickness of waterproofing and embed a joint reinforcing strip in preparation coat.

B. Install sheet flashing and bond to deck and wall substrates where indicated or required according to waterproofing manufacturer's written instructions.

1. Extend sheet flashings onto perpendicular surfaces and other work penetrating substrate according to ASTM C 898.

1.14 FLUID APPLIED WATERPROOFING APPLICATION

A. General: Apply waterproofing according to manufacturer's written instructions and recommendations.

1. Start installing waterproofing in presence of manufacturer's technical representative.
2. Apply primer/ basecoat over prepared substrate.

B. Mixing and Application: Mix materials and apply waterproofing by spray, roller, notched squeegee, trowel, or other application method suitable to slope of substrate.

1. Apply two coats of fluid applied waterproofing to obtain a seamless membrane free of entrapped gases, with an average total dry film thickness of 60 mils and a minimum dry film thickness of 50 mils at any point.
2. Apply fluid applied waterproofing to prepared wall terminations and vertical surfaces.
3. Verify wet film thickness of fluid applied waterproofing every 100 square feet.

1.15 WATERPROOF DECK COATING APPLICATION

A. General: Apply waterproofing according to manufacturer's written instructions and recommendations.

1. Start installing waterproofing in presence of manufacturer's technical representative.
2. Apply primer/ basecoat over prepared substrate.

B. Mixing and Application: Mix materials and apply waterproofing to substrates indicated.

1. Apply waterproofing to obtain a seamless membrane.
2. Detail edges in accordance with manufacturer’s instructions and recommendations.

1.16 CURING, PROTECTING, AND CLEANING

A. Cure waterproofing according to manufacturer's written recommendations, taking care to prevent contamination and damage during application stages and curing.

1. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07141

SECTION 07170 - BENTONITE WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following applications of a complete bentonite waterproofing system:

1. Waterproofing elevator pits.
2. Waterproofing of exterior walls below grade, where indicated.

1.2 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: Include product specifications, installation instructions and recommendations of manufacturer, for each material and type of application required.

C. Samples: Submit samples of the following materials in the following sizes:

1. Waterproofing: 6-inches square.

D. Warranty: Submit a specimen of specified waterproofing warranty.

E. Test Report: Submit manufacturer's test report on water samples taken at the site along with recommendations as a result of these tests.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Be experienced in manufacturing a bentonite waterproofing system as indicated for this Project and have a record of successful in-service performance.

B. Installer Qualifications: Engage an experienced Installer who has specialized in installing bentonite waterproofing systems as required for this Project and who is licensed by or otherwise acceptable to the manufacturer of the primary materials.

C. Single-Source Responsibility: Obtain bentonite waterproofing system from one source of a single manufacturer. Obtain accessory products used in conjunction with bentonite waterproofing from sources acceptable to the bentonite waterproofing manufacturer.

D. Preinstallation Conference: Approximately 2 weeks prior to scheduled commencement of waterproofing installation, meet at Project site with Waterproofing Installer; preparer of substrate to receive waterproofing; installers of other work in and around waterproofing that must precede, follow, or penetrate waterproofing (including Mechanical and Electrical Installers as applicable); Architect; Owner; and waterproofing manufacturer's representative to review materials, procedures, schedules, and other requirements and conditions related to installing bentonite waterproofing.

E. Water Samples: Obtain water samples from the site at approximate locations where waterproofing will be installed and have the waterproofing manufacturer test for acids, alkalies, brine, or other contaminants that may inhibit the performance of untreated bentonite. Comply with manufacturer's recommendations resulting from these tests.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original unopened containers.

B. Store materials in a dry, well-ventilated space.

C. Remove and replace bentonite materials that have been prematurely exposed to moisture.

1.6 PROJECT CONDITIONS

A. Weather Conditions: Do not apply waterproofing materials to surfaces on which ice or frost is visible. Bentonite clay in panel or loose form may be placed on damp surfaces. Do not apply waterproofing materials in areas with standing water.

B. Comply with manufacturer's recommendations regarding weather conditions before and during installation, condition of the substrate to receive waterproofing, and protection of the installed waterproofing system.

1.7 WARRANTY

A. Warranty: Submit a written warranty, executed by manufacturer and applicator, agreeing to repair or replace components of bentonite waterproofing system that fail in mate

rials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:

1. Water penetrating into the building or structure.
2. Deteriorated or displaced waterproofing materials.

B. Warranty Period: 10 years from date of Substantial Completion.

C. The warranty shall not deprive Owner of other rights 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 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. CETCO, Colloid Environmental Technologies Company.

2.2 MATERIALS, GENERAL

A. Bentonite: Granular bentonite clay (sodium bentonite), minimum 85 percent montmorillonite (hydrated aluminum silicate), with a minimum of 90 percent passing a 20-mesh sieve.

1. Product: Hydrobar Tubes; water-soluble plastic tubing filled with bentonite.
2. Product: Volclay Waterstoppage; dry granular bentonite.

B. Bentonite Mastic: Trowelable consistency, bentonite compound, specifically formulated for application at joints and penetrations.

1. Product: Bentoseal Gel.

C. Wall-to-Footing Bentonite Joint Strip: Manufacturer's standard 2 inch diameter water-soluble tube containing approximately 1.5 lbs./ft. of bentonite, hermetically sealed, designed specifically for placing on wall footings at line of joint with exterior base of wall.

D. Preformed Waterstop: Flexible strip of bentonite waterproofing compound in cartridge or coil form, designed specifically for vertical and horizontal joints in concrete construction.

1. Product: Waterstop Rx.

2.2 GEOTEXTILE/BENTONITE SHEET SYSTEM

A. Standard Sheet: Minimum average of 1.0 psf of bentonite adhered to nonwoven polypropylene fabric with water-soluble backing on opposite side.

1. Product: Voltex.

2.3 INSTALLATION ACCESSORIES

A. Protection Board: Provide products recommended by waterproofing manufacturer to suit project requirements. Types available include, but are not limited to, the following:

1. 1/4-inch thick sheets of extruded polystyrene foam core laminated between two plastic face sheets.

a. Product: Amocor PB4; Amoco Foam Products Company.

B. Termination Bar: Extruded or formed aluminum bars with upper flange to receive sealant.

C. Plastic Sheets: Polyethylene sheeting conforming to ASTM D 4397, thickness as recommended by waterproofing manufacturer to suit application, but not less than 6.0 mils.

D. Fasteners: Case-hardened nails or hardened-steel powder-actuated fasteners. Provide 1/2-inch diameter or 1-inch diameter washers (dependant on manufacturer's requirements) under fastener heads.

E. Sealants: As recommended by manufacturer. Comply with requirements specified in Division 7 Section "Joint Sealants."

PART 3 - EXECUTION

3.1 PREPARATION

A. General: Comply with manufacturer’s instructions and recommendations. Verify that substrate is complete and that all work that will penetrate waterproofing is complete and rigidly installed. Verify locations of waterproofing termination.

1. Coordinate work in vicinity of waterproofing to assure proper conditions for installation of the waterproofing system and to prevent damage to the waterproofing after installation.

B. Formed Concrete Surfaces: Remove fins and projections. Fill voids, rock pockets,

form tie holes, and other defects with bentonite mastic or cementitious patching material according to manufacturer's recommendations.

C. Horizontal Concrete Surfaces: Remove debris, standing water, oily substances, mud, and similar substances that could impair the bonding ability of the concrete or the effectiveness of the waterproofing. Fill voids, cracks greater than 1/8 inch, honeycomb areas, and other defects with bentonite mastic or cementitious patching material according to manufacturer's recommendations.

3.2 INSTALLATION

A. General: Install waterproofing and accessories according to manufacturer's instructions, standard details, and recommended practices.

B. Construction Joints: Comply with manufacturer's recommendations for waterstops.

3.3 GEOTEXTILE/BENTONITE SHEET INSTALLATION

A. General: Comply with manufacturer’s instructions and recommendations.

1. Install sheets with ends and edges lapped a minimum of 6 inches on horizontal substrates and a minimum of 4 inches on vertical substrates. Stagger end joints between sheets. Fasten seams by stapling to adjacent sheet or nailing to substrate.

END OF SECTION 07170

SECTION 07210 - BUILDING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Cellulose insulation.
2. Semi-rigid insulation.
3. Blanket or batt insulation.
4. Sound attenuation blanket or batt insulation.
5. Safing insulation.

1.2 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: 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: 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. Products - Recycled Content: Provide certification from manufacturer on product's recycled content.

1.3 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.

1.4 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

1.5 MANUFACTURERS

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

1. Cellulose Insulation – Spray Applied

a. Hamilton Manufacturing, Inc.
b. P.K. Insulation Manufacturing, Inc.
c. Tascon Industries, Inc.

2. Blanket, Batt, Semi-Rigid, and Sound Attenuation (Glass-Fiber) Insulation:

a. CertainTeed Corporation.
b. Knauf Fiber Glass GmbH.
c. Owens-Corning Fiberglas Corporation.
d. Schuller International, Inc.

3. Safing Insulation:

a. Fibrex Inc.
b. Partek Insulations, Inc.
c. USG Interiors, Inc.

1.6 INSULATING MATERIALS

A. General: Provide insulating materials that comply with requirements and with referenced standards.

1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thickness, widths, and lengths.

B. Cellulose Insulation – Spray Applied: ASTM C 1149; Class 1, Class A, ASTM E-84; chemically treated for flame-resistance, processing, and handling characteristics.

1. Moisture Absorption: Meets ASTM C 739 requirements.

C. Semi-Rigid Insulation Board: ASTM C 612, Type IA or ASTM C 553, Types I, II, and III; faced on one side with foil-scrim-kraft vapor retarder; with maximum flame-spread and smoke-developed indices of 25 and 50, respectively; and of the following properties:

1. Nominal density of 1.0 lb/cu. ft., thermal resistance of 3.7 degrees F x h x sq. ft./Btu x in. at 75 degrees F.

D. Batt Insulation: Thermal insulation combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665, Type III, Class A (blankets with reflective vapor-retarder membrane facing and flame spread of 25 or less); with foil-scrim-kraft, foil-scrim, or foil-scrim-polyethylene vapor-retarder membrane on 1 face.

1. Mineral-Fiber Type: Fibers manufactured from glass.

E. Sound Attenuation Blanket Insulation: 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.

1.7 SAFING INSULATION AND ACCESSORIES

A. Safing Insulation: Semi-rigid boards designed for use as fire stop at openings between edge of slab and exterior wall panels, produced by combining slag-wool fibers with thermosetting resin binders to comply with ASTM C 612, Type IA and IB; nominal density of 4 lb/cu. ft.; passing ASTM E 136 for combustion characteristics; thermal resistance of 4 degrees F x h x sq. ft./Btu x in. at 75 degrees F.

B. Calking Compound: Material approved by manufacturer of safing insulation for sealing joint between foil backing of safing insulation and edge of concrete floor slab against penetration of smoke.

C. Safing Clips: Galvanized steel safing clips approved by manufacturer of safing insulation for holding safing insulation in place.

1.8 AUXILIARY INSULATING MATERIALS

A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

1.9 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation, of thickness indicated, securely in position indicated with self-locking washer in place; and complying with the following requirements:

1. Plate: Perforated galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
2. Spindle: Copper-coated low carbon steel, fully annealed, 0.105 inches in diameter, length to suit depth of insulation indicated.

B. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle, capable of holding insulation securely in position indicated with self-locking washer in place, and complying with the following requirements:

1. Angle: Formed from 0.030-inch- thick, perforated, galvanized carbon-steel sheet with each leg 2 inches square.
2. Spindle: Copper-coated low carbon steel, fully annealed, 0.105 inches in diameter, length to suit depth of insulation indicated.

C. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick galvanized steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.

1. Where spindles will be exposed to human contact after installation, protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap.

D. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

PART 3 - EXECUTION

1.10 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.

1.11 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.

B. Close off openings in cavities receiving poured-in-place insulation to prevent escape of insulation. Provide bronze or stainless steel screens (inside) where openings must be maintained for drainage or ventilation.

1.12 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled

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.

1.13 INSTALLATION BUILDING INSULATIONS

A. Place loose-fill insulation into spaces and onto surfaces as shown, either by pouring or by machine blowing to comply with ASTM C 1015. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not compact excessively.

B. For spray-applied cellulosic loose-fill insulation, comply with the manufacturer’s installation instructions and recommendations and with the Cellulose Insulation Manufacturers Association's Special Report #3, "Standard Practice for Installing Cellulose Insulation”.

C. Apply insulation units to substrates, complying with manufacturer's written instructions. Bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

D. Set vapor-retarder-faced units with vapor retarder toward the exterior, unless otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.

1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

E. 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. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

1.14 INSTALLATION OF SAFING INSULATION

A. Install safing insulation in accordance with manufacturer’s instructions and recommendations. Leave no voids in completed installation.

1.15 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 07412 - METAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Metal-faced composite wall panels.

1.2 DEFINITION

A. Metal Wall Panel Assembly: Metal wall panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories necessary for a complete weathertight system.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide metal wall panel assemblies that comply with performance requirements specified as determined by testing manufacturers' standard assemblies similar to those indicated for this Project, by a qualified testing and inspecting agency.

B. Structural Performance: Provide metal wall panel assemblies capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Wind Loads: As indicated.

2. Deflection Limits: Engineer metal wall panel assemblies to withstand test pressures with deflection no greater than L/360 of the span and no evidence of material failure, structural distress, or permanent deformation exceeding 0.2 percent of the clear span.

a. Test Pressures: 150 percent of inward and outward wind-load design pressures.

C. Thermal Movements: Provide metal wall panel assemblies that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): Local conditions.

D. Thermal Movements for Metal-Faced Composite Wall Panels: Provide composite wall panel assemblies that allow for noiseless thermal movements resulting from the following range in ambient temperatures and that prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects:

1. Ambient Temperature Range: Minus 20 to plus 180 degrees F.

E. Thermal Performance: Provide insulated metal wall panel assemblies with thermal-resistance value (R-value) indicated when tested according to ASTM C 236 or ASTM C 518.

1.4 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal wall panel and accessory.

C. Shop Drawings: Show fabrication and installation layouts of metal wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details. Distinguish between factory- and field-assembled work.

1. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches:

a. Flashing and trim.
b. Downspouts.

2. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Coordination Drawings: Exterior elevations drawn to scale and coordinating penetrations and wall-mounted items. Show the following:

1. Wall panels and attachments.

E. Samples for Initial Selection: For metal wall panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.
2. Include manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each sealant exposed to view.

F. Samples for Verification: For exposed finish required, prepared on Samples of size indicated below.

1. Metal Wall Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal wall panel accessories.

a. Include four-way joint for composite panels.

G. Compatibility and Adhesion Test Reports: From sealant manufacturer indicating the following:

1. Materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

H. Field quality-control test reports.

I. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for the following:

1. Metal Wall Panels: Include reports for air infiltration, water penetration, and structural performance.

J. Research/Evaluation Reports: For metal-faced composite wall panels.

K. Maintenance Data: For metal wall panels to include in maintenance manuals.

L. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Installer Qualifications: Fabricator of metal-faced composite wall panels.

1. Installer's responsibilities include fabricating and installing metal wall panel assemblies and providing professional engineering services needed to assume engineering responsibility.

2. Engineering Responsibility: Preparation of data for metal wall panels, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

C. Fabricator Qualifications: Certified by metal-faced composite wall panel manufacturer to fabricate and install manufacturer's wall panel system.

D. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.

E. Source Limitations: Obtain each type of metal wall panel through one source from a single manufacturer.

F. Product Options: Drawings indicate size, profiles, and dimensional requirements of metal wall panels and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

G. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use manufacturer's standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

a. Perform tests under environmental conditions replicating those that will exist during installation.

2. Submit no fewer than nine pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.

H. Fire-Resistance Ratings: Where indicated, provide metal wall panels identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Combustion Characteristics: ASTM E 136.
2. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.

3. Metal wall panels shall be identified with appropriate markings of applicable testing and inspecting agency.

I. Surface-Burning Characteristics: Provide insulated metal wall panels having insulation-core materials with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Flame-Spread Index: 25 or less, unless otherwise indicated.
2. Smoke-Developed Index: 450 or less, unless otherwise indicated.

J. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.

1. Build mockup of typical corner wall panel as shown on Drawings; approximately 48 inches square by full thickness, including insulation, supports, attachments, and accessories.

   a. Include four-way joint for metal-faced composite wall panels.

2. Approval of mockups is for other material and construction qualities specifically approved by Architect in writing.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

K. Preliminary Siding Conference: Before starting wall construction, conduct conference at Project site. Comply with requirements for preinstallation conferences in Division 1 Section "Project Management and Coordination." Review methods and procedures related to wall construction and metal wall panels including, but not limited to, the following:

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, metal wall panel Installer, metal wall panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal wall panels including installers of doors, windows, and louvers.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal wall panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.

6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal wall panel assembly during and after installation.
8. Review wall panel observation and repair procedures after metal wall panel installation.

L. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to metal wall panel assemblies including, but not limited to, the following:

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, metal wall panel Installer, metal wall panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal wall panels including installers of doors, windows, and louvers.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal wall panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
6. Review governing regulations and requirements for insurance, certificates, and testing and inspecting if applicable.
7. Review temporary protection requirements for metal wall panel assembly during and after installation.
8. Review wall panel observation and repair procedures after metal wall panel installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, metal wall panels, and other manufactured items so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling.

B. Unload, store, and erect metal wall panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal wall panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal wall panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Store metal-faced composite wall panels vertically, covered with suitable weathertight and ventilated covering. Store metal-faced composite wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal-faced composite wall panels in contact with other materials that might cause staining, denting, or other surface damage. Do not allow storage space to exceed 120 deg F.

E. Protect strippable protective covering on metal wall panels from exposure to sunlight and high humidity, except to extent necessary for period of metal wall panel installation.

1.7 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal wall panels to be performed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal wall panel fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, either establish framing and opening dimensions and proceed with fabricating metal wall panels without field measurements, or allow for field trimming of panels. Coordinate wall construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

1.8 COORDINATION

A. Coordinate metal wall panel assemblies with rain drainage work, flashing, trim, and construction of other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal wall panel assemblies that fail in materials or workmanship within specified warranty period.

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

a. Structural failures, including rupturing, cracking, or puncturing.
b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

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

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

1.10 METAL-FACED COMPOSITE WALL PANELS

A. General: Provide factory-formed and -assembled metal-faced composite wall panels fabricated from two metal facings bonded, using no glues or adhesives, to solid extruded thermoplastic core; formed into profile for installation method indicated. Include attachment system components and accessories required for weathertight system.

1. Product and Manufacturer – Basis of Design:

a. Alusuisse Composites, Inc.; Alucobond.

2. System Configuration: Rainscreen System.

B. Aluminum-Faced Composite Wall Panels: Formed with 0.020-inch- thick, coil-coated aluminum sheet facings.

1. Panel Thickness: 4mm
2. Surface: Smooth flat finish.
3. Core: Manufacturer’s standard non-fire-rated core.

4. Exterior Finish: Fluoropolymer.

a. Color: As selected by Architect from manufacturer's full range.

C. Attachment System Components: Formed from extruded aluminum.

1. Include manufacturer's standard perimeter extrusions with integral weather stripping, panel stiffeners, panel clips, and anchor channels.

D. Flashing and Trim: Same materials, finish, and color as facings of adjacent composite panels, unless otherwise indicated.

1.11 FINISH

A. Aluminum Sheet: Coil-coated sheet, ASTM B 209, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.

1. Exposed Finishes: Apply the following coating, as specified or indicated on Drawings.

a. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1) Fluoropolymer Three-Coat System: Manufacturer's standard three-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight, with a minimum total dry film thickness of 1.5 mil; complying with AAMA 2605.

2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

1.12 MISCELLANEOUS METAL FRAMING

A. Steel Sheet Components, General: Complying with ASTM C 645 requirements for metal and with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.

B. Subgirts: C- or Z-shaped sections fabricated from 0.0598-inch bare steel thickness, shop-painted, cold-formed, metallic-coated steel sheet.

C. Zee Clips: 0.079-inch bare steel thickness, cold-formed, galvanized steel sheet.

D. Base or Sill Angles and Channels: 0.079-inch bare steel thickness, cold-formed, galvanized steel sheet.

E. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base Metal Thickness: 0.0312 inch.
2. Depth: As indicated.

F. Cold-Rolled Furring Channels: 0.0538-inch bare steel thickness, with minimum 1/2-inch- wide flange.

1. Depth: As indicated.

2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare steel thickness of 0.0312 inch.
3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch-diameter wire, or double strand of 0.0475-inch- diameter wire.

G. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum bare metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.

H. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

1.13 MISCELLANEOUS MATERIALS

A. Sealant: One-Part Silicone Sealant: For Metal Wall Panels (metal faced composite wall panels); one-part silicone sealant, having a joint movement capability of plus-or-minus 100% elongation, minus 50% compression, and Shore A durometer hardness of 15.

1. Product and Manufacturer: "No. 755"; Dow Corning Corp. or equal product as manufactured by General Electric Co.
2. Warranty: Manufacturer's standard 20 year warranty.

B. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal wall panels by means of plastic caps or factory-applied coating.

1. Fasteners: Self-drilling or self-tapping 410 stainless steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of metal wall panels.
2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
3. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

1.14 ACCESSORIES

A. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels, unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal wall panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible

closure strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

B. Flashing and Trim: Formed from 0.0179-inch- thick, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal wall panels.

1.15 FABRICATION

A. General: Fabricate and finish metal wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

1. Form panel lines, breaks, and angles to be sharp and true, with surfaces free from warp and buckle.
2. Fabricate wall panels with panel stiffeners as required to maintain fabrication tolerances and to withstand design loads.

B. Fabricate metal wall panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Where indicated, fabricate metal wall panel joints with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will minimize noise from movements within panel assembly.

E. Metal-Faced Composite Wall Panels: Factory form panels in a continuous process with no glues or adhesives. Trim and square edges of sheets with no displacement of face sheets or protrusion of core material.

1. Fabricate panels with panel stiffeners, as required to comply with deflection limits, attached to back of panels with structural silicone sealant or bond tape.

2. Fabricate panels with sharply cut edges, with no displacement of face sheets or protrusion of core material.

3. Dimensional Tolerances:

a. Length: Plus 0.375 inch.
b. Width: Plus 0.188 inch.
c. Thickness: Plus or minus 0.008 inch.

d. Panel Bow: 0.8 percent maximum of panel length or width.
e. Squareness: 0.2 inch maximum.

F. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.

6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal wall panel manufacturer.

a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

1.16 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: 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.

PART 3 - EXECUTION

1.17 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of work.

1. Examine primary and secondary wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
2. Examine solid wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
3. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.

B. Examine roughing-in for components and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of metal wall panels before metal wall panel installation.

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

1.18 PREPARATION

A. Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.

B. Install flashings and other sheet metal to comply with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim."

C. Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous wall panel support members and anchorage according to ASTM C 754 and metal wall panel manufacturer's written recommendations.

1.19 METAL-FACED COMPOSITE WALL PANEL INSTALLATION

A. General: Install attachment system required to support wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels in accordance with manufacturer’s instructions and recommendations.

1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.

2. Do not begin installation until weather barrier and flashings that will be concealed by composite panels are installed.

B. Rainscreen-Principle Installation: Provide manufacturer's standard pressure-equalized, rainscreen-principle system with vertical channel that provides support and complete secondary drainage system, draining at base of wall. Notch vertical channel to receive support pins. Install vertical channels supported by channel brackets or adjuster angles and at locations, spacings, and with fasteners recommended by manufacturer. Attach wall panels by engaging horizontal support pins into notches in vertical channels and into flanges of wall panels. Leave horizontal and vertical joints with open reveal.

1. Install wall panels to allow individual panels to "free float" and be installed and removed without disturbing adjacent panels.
2. Do not apply sealants to joints, unless otherwise indicated on Drawings.

1.20 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

1.21 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal wall panel units within installed tolerance of 1/4 inch in 20 feet, nonaccumulative, on level, plumb, and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

1.22 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect completed metal wall panel installation, including accessories. Report results in writing.

B. Remove and replace applications of metal wall panels where inspections indicate that they do not comply with specified requirements.

1.23 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal wall panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal wall panel installation, clean finished surfaces as recommended by metal wall panel manufacturer. Maintain in a clean condition during construction.

B. After metal wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07412

SECTION 07540 - THERMOPLASTIC MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. TPO membrane roofing system installed over lightweight concrete roof insulation system.

1.2 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

B. Design Uplift Pressure: The uplift pressure, calculated according to procedures in SPRI's "Wind Load Design Guide for Fully Adhered and Mechanically Fastened Roofing Systems," before multiplication by a safety factor.

C. Factored Design Uplift Pressure: The uplift pressure, calculated according to procedures in SPRI's "Wind Load Design Guide for Fully Adhered and Mechanically Fastened Roofing Systems," after multiplication by a safety factor.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, 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 membrane manufacturer based on testing and field experience.

C. Roofing System Design: Provide a membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE 7.

1. Corner Uplift Pressure:
2. Perimeter Uplift Pressure:
3. Field-of-Roof Uplift Pressure:

D. FMG Listing: Provide roofing membrane, base flashings, and component materials that comply with requirements in FMG 4450 and FMG 4470 as part of a membrane roofing system and that are listed in FMG's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FMG markings.

1. Fire/Windstorm Classification: Class 1A, FM-120.

1.4 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: For products indicated.

C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other Work.

1. Base flashings and membrane terminations.

D. Samples for Verification: For the following products:

1. 12-by-12-inch square of sheet roofing, of color specified, including T-shaped side and end lap seam.

E. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.

F. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of meeting performance requirements.

G. Qualification Data: For Installer and manufacturer.

H. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of roofing system.

I. Research/Evaluation Reports: For components of membrane roofing system.

J. Maintenance Data: For roofing system to include in maintenance manuals.

K. Warranties: Special warranties specified in this Section.

L. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.

B. Manufacturer Qualifications: A qualified manufacturer that has UL listing for membrane roofing system identical to that used for this Project.

C. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

D. Source Limitations: Obtain components for membrane roofing system from roofing membrane manufacturer.

E. Fire-Test-Response Characteristics: Provide membrane roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.

1. Exterior Fire-Test Exposure: Class A ASTM E 108, for application and roof slopes indicated.
2. Fire-Resistance Ratings: ASTM E 119, for fire-resistance-rated roof assemblies of which roofing system is a part.

F. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site. Comply with requirements for preinstallation conferences in Division 1 Section "Project Management and Coordination." Review methods and procedures related to roof deck construction and roofing system including, but not limited to, the following:

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. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.

6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

G. Preinstallation Conference: Conduct conference at Project site. Comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to roofing system including, but not limited to, the following:

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. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.6 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. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.7 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.

1. Special warranty includes roofing membrane, base flashings, roofing membrane accessories, fasteners, walkway products, and other components of membrane roofing system.
2. Warranty Period: 15 years from date of Substantial Completion.

B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form, signed by Installer, covering Work of this Section, including all components of membrane roofing system such as roofing membrane, base flashing, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:

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

PART 2 - PRODUCTS

1.9 THERMOPLASTIC POLYOLEFIN (TPO) ROOFING MEMBRANE

A. Fabric-Reinforced Thermoplastic Polyolefin Sheet: Uniform, flexible sheet formed from a thermoplastic polyolefin, internally fabric or scrim reinforced, and as follows:

1. Product and Manufacturer – Basis of Design: Sure-Weld System; Carlisle SynTec Incorporated.
2. Overall Thickness: 60 mils, nominal, minimum. 45 mil thick membrane is not acceptable.
3. Exposed Face Color: White.

B. Fire Retardant Additive: Magnesium hydroxide. Membranes using bromine compounds as fire retardants are not acceptable.

1.10 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.

1. Liquid-type auxiliary materials shall meet VOC limits of authorities having jurisdiction.

B. Sheet Flashing: Manufacturer's standard unreinforced thermoplastic polyolefin sheet flashing, 55 mils thick, minimum, of same color as sheet membrane.

C. Bonding Adhesive: Manufacturer's standard bonding adhesive for membrane, and solvent-based bonding adhesive for base flashings.

D. Metal Termination Bars: Manufacturer's standard predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

E. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, termination reglets, fasteners, cover strips, and other accessories.

1.11 WALKWAYS

A. Rubber Roof Pavers: Interlocking, lightweight rubber units, 24 by 24 by 2-1/4 inches, 6 lb/sq. ft.; with grooved back for 4-way drainage, beveled and doweled; and as follows:

1. Product and Manufacturer – Basis of Design:

a. Carlisle SynTec Incorporated; Interlocking Rubber Paver.

2. Color: To be selected by the Architect from manufacturer’s standard color selections.

PART 3 - EXECUTION

1.12 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations.
3. Verify that minimum drying period of lightweight concrete insulation recommended by roofing system manufacturer has passed.

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

1.13 PREPARATION

A. Clean substrates of dust, debris, moisture, 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 roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

1.14 ROOFING MEMBRANE INSTALLATION

A. Mechanically attach roofing membrane over area to receive roofing according to membrane roofing system manufacturer's written instructions.

B. Start installation of roofing membrane in presence of membrane roofing system manufacturer's technical personnel.

C. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roofing membrane that does not meet requirements.

1.15 FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Flash penetrations and field-formed inside and outside corners with sheet flashing.

C. Clean seam areas and overlap and firmly roll sheet flashings into the adhesive. Weld side and end laps to ensure a watertight seam installation.

1.16 WALKWAY INSTALLATION

A. Rubber Roof-Paver Walkways: Install rubber roof-paver walkways according to manufacturer's written instructions, loosely laid, in locations indicated.

1.17 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 date and time of inspection.

B. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

1.18 PROTECTING AND CLEANING

A. Protect membrane roofing system 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 membrane roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07540

SECTION 07620 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes sheet metal flashing and trim in the following categories:

1. Metal flashing.

1.2 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing.

1.3 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: Include manufacturer's material and finish data, installation instructions, and general recommendations for each specified flashing material and fabricated product.

C. Shop Drawings: Of each item specified showing layout, profiles, methods of joining, and anchorage details.

D. Samples: Of sheet metal flashing, trim, and accessory items, in the specified finish. Where finish involves normal color and texture variations, include Sample sets composed of 2 or more units showing the full range of variations expected.

1. 8-inch- square Samples of specified sheet materials to be exposed as finished surfaces.

E. 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.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experience Installer who has completed sheet metal flashing and trim work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

1.5 PROJECT CONDITIONS

A. Coordinate Work of this Section with interfacing and adjoining Work for proper sequencing of each installation. Ensure best possible weather resistance, durability of Work, and protection of materials and finishes.

PART 2 - PRODUCTS

1.6 METALS

A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated and with not less than the strength and durability of alloy and temper designated below:

1. Factory-Painted Aluminum Sheet: ASTM B 209, 3003-H14, with a minimum thickness of 0.040 inch, unless otherwise indicated.
2. Extruded Aluminum: ASTM B 221, alloy 6063-T52, with a minimum thickness of 0.080 inch for primary legs of extrusions that are anodized, unless otherwise indicated.

B. Stainless-Steel Sheet: ASTM A 167, Type 304, soft annealed, with No. 2D finish, except where harder temper is required for forming or performance; minimum 0.0187 inch thick, unless otherwise indicated.

1.7 CONCEALED THROUGH-WALL SHEET METAL FLASHING

A. Material: Fabricate from the following metal:

1. Stainless Steel: 0.0156 inch thick.

1.8 REGLETS

A. General: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces and compatible with flashing indicated.

B. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.

1.9 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Solder for Stainless Steel: ASTM B 32, Grade Sn60, used with an acid flux of type recommended by stainless-steel sheet manufacturer; use a noncorrosive rosin flux over tinned surfaces.

B. Fasteners: Same metal as sheet metal flashing or other noncorrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened.

C. Elastomeric Sealant: Generic type recommended by sheet metal manufacturer and fabricator of components being sealed and complying with requirements for joint sealants as specified in Division 7 Section "Joint Sealants."

D. Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather-resistant seaming and adhesive application of flashing sheet metal.

E. Paper Slip Sheet: 5-lb/square red rosin, sized building paper conforming to FS UU-B-790, Type I, Style 1b.

F. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work, matching or compatible with material being installed; noncorrosive; size and thickness required for performance.

1.10 FABRICATION, GENERAL

A. Sheet Metal Fabrication Standard: Fabricate sheet metal flashing and trim to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of the item indicated.

B. Comply with details shown to fabricate sheet metal flashing and trim that fit substrates and result in waterproof and weather-resistant performance once installed. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Form exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems.

D. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder.

E. Seams: Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

F. Expansion Provisions: Space movement joints at maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

G. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.

H. Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact with asphalt mastic or other permanent separation as recommended by manufacturer.

I. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.

J. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.

1. Size: As recommended by SMACNA manual or sheet metal manufacturer for application but never less than thickness of metal being secured.

1.11 SHEET METAL FABRICATIONS

A. General: Fabricate sheet metal items in thickness or weight needed to comply with performance requirements but not less than that listed below for each application and metal.

B. Scuppers: Fabricate from the following material:

1. Aluminum: 0.0320 inch thick.

C. Copings: Fabricate from the following material:

1. Aluminum: 0.050 inch thick.

D. Base Flashing: Fabricate from the following material:

1. Aluminum: 0.040 inch thick.

E. Counterflashing: Fabricate from the following material:

1. Aluminum: 0.0320 inch thick.

F. Equipment Support Flashing: Fabricate from the following material:

1. Stainless Steel: 0.0187 inch thick.

1.12 ALUMINUM EXTRUSION FABRICATIONS

A. Aluminum Extrusion Units: Fabricate extruded-aluminum running units with formed or extruded-aluminum joint covers for installation behind main members where possible. Fabricate mitered and welded corner units.

1.13 ALUMINUM FINISHES

A. General: Comply with Aluminum Association's (AA) "Designation System for Aluminum Finishes" for finish designations and application recommendations.

B. High-Performance Organic Coating Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's instructions.

1. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 605.2.

a. Color and Gloss: As selected by Architect from manufacturer's full range of choices for color and gloss.

PART 3 - EXECUTION

1.14 EXAMINATION

A. Examine substrates and conditions under which sheet metal flashing and trim are to be installed and verify that Work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.

1.15 INSTALLATION

A. General: Unless otherwise indicated, install sheet metal flashing and trim to comply with performance requirements, manufacturer's installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Anchor units of Work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install Work with laps, joints, and seams that will be permanently watertight and weatherproof.

B. Install exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Expansion Provisions: Provide for thermal expansion of exposed sheet metal Work. Space movement joints at maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

D. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered to a width of 1-1/2 inches, except where pretinned surface would show in finished Work.

1. Do not solder the following metals:

a. Aluminum.

E. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards. Fill joint with sealant and form metal to completely conceal sealant.

1. Use joint adhesive for nonmoving joints specified not to be soldered.

F. Separations: Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.

1. Underlayment: Where installing stainless steel or aluminum directly on cementitious or wood substrates, install a slip sheet of red-rosin paper and a course of polyethylene underlayment.

G. Counterflashings: Coordinate installation of counterflashings with installation of assemblies to be protected by counterflashing. Install counterflashings in reglets or receivers. Secure in a waterproof manner by means of snap-in installation and sealant, lead wedges and sealant, interlocking folded seam, or blind rivets and sealant. Lap counterflashing joints a minimum of 2 inches and bed with sealant.

H. Equipment Support Flashing: Coordinate equipment support flashing installation with roofing and equipment installation. Weld or seal flashing to equipment support member.

1.16 CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

B. Provide final protection and maintain conditions that ensure sheet metal flashing and trim Work during construction is without damage or deterioration other than natural weathering at the time of Substantial Completion.

END OF SECTION 07620

SECTION 07720 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Roof curbs.
2. Equipment supports.
3. Roof hatches.
4. Safety railing system.

1.2 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: For each type of product indicated. Include construction details, materials, dimensions of individual components and profiles, and finishes.

C. Shop Drawings: Show fabrication and installation details. Indicate dimensions, weights, loadings, required clearances, method of field assembly, and components. Include plans, elevations, sections, details, and attachments to other Work.

D. Coordination Drawings: Roof plans drawn to scale and coordinating penetrations and roof-mounted items. Show the following:

1. Size and location of roof accessories specified in this Section.
2. Method of attaching roof accessories to roof or building structure.
3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.

E. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for roof accessories with factory-applied color finishes.

F. Samples for Verification: For each type of exposed finish required, prepared on Samples in manufacturer's standard sizes, and of same thickness and material indicated for the Work. If finishes involve normal color or shade variations, include sample sets showing the full range of variations expected.

1.3 QUALITY ASSURANCE

A. Standards: Comply with the following:

1. SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.
2. NRCA's "Roofing and Waterproofing Manual" details for installing units.

PART 2 - PRODUCTS

1.4 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. Roof Hatch and Safety Railing System

a. TriStar Skylights, Savannah Trims, Inc., (888) 640-0850

2. Safety Railing System

a. KneeHatch Railing System, Savannah Trims, Inc., (888) 640-0850

3. Roof Hatches:

a. Bilco Company.
b. Custom Curb, Inc.
c. J. L. Industries, Inc.
d. TriStar Skylights

4. Roof Curbs and Equipment Supports:

a. Curbs Plus, Inc.
b. Custom Curb, Inc.
c. Pate Co. (The).
d. Roof Products & Systems Corp.
e. ThyCurb, Inc.

1.5 MATERIALS, GENERAL

A. Aluminum Sheet: ASTM B 209 for alclad alloy 3005H25 or alloy and temper required to suit forming operations, with mill finish, unless otherwise indicated.

B. Extruded Aluminum: ASTM B 221 alloy 6063-T52 or alloy and temper required to suit structural and finish requirements, with mill finish, unless otherwise indicated.

C. Insulation: Manufacturer's standard rigid or semi-rigid glass-fiber board of thickness indicated.

D. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, complying with AWPA C2; not less than 1-1/2 inches thick.

E. Security Grilles: 3/4-inch- diameter, hardened steel bars spaced 6 inches o.c. in one direction and 12 inches on center in the other. Weld bar intersections and ends of bars to structural frame or primary curb walls. Clean and paint with rust-inhibitive metal primer.

F. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by manufacturer. Match finish of exposed fasteners with finish of material being fastened.

1. Where removing exterior exposed fasteners affords access to building, provide nonremovable fastener heads.

G. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, or PVC; or flat design of foam rubber, sponge neoprene, or cork.

H. Elastomeric Sealant: Generic type recommended by unit manufacturer that is compatible with joint surfaces; ASTM C 920, Type S, Grade NS, Class 25, and Uses NT, G, A, and, as applicable to joint substrates indicated, O.

1.6 COMBINATION ROOF HATCH AND SAFETY RAILING SYSTEM

A. Model and Manufacturer: TriStar Skylights Model RRAH, Railing Ready access hatch. Fabricate units to withstand 40-lbf/sq. ft. external and 20-lbf/sq. ft. internal loading pressure. Frame with minimum 12-inch-high, integral-curb, double-wall construction with 1-inch insulation, formed cants and cap flashing (roofing counterflashing), with welded or sealed mechanical corner joints. Provide double-wall cover (lid) construction with 1- inch- thick insulation core. Provide gasketing and equip with corrosion-resistant or hot-dip galvanized hardware including pintle hinges, hold-open devices, interior padlock hasps, and both interior and exterior latch handles. Curb shall be factory prepared to receive the safety railing system.

1. Type: Single-leaf personnel access.
2. Size: As indicated.

3. Material: Aluminum, sheets and extrusions.

a. Finish: Clear anodic.

4. Safety Railing System: KeeHatch Railing System.

a. Hardware: Provide all hardware for a complete installation.
b. Finish: Manufacturer’s standard.

B. Sloping Roofs: Where slope or roof deck exceeds 1/4 inch per foot, fabricate hatch curbs with height tapered to match slope to level tops of units.

1.7 ROOF HATCH WITH SAFETY RAILING SYSTEM ATTACHED

A. General: Fabricate units to withstand 40-lbf/sq. ft. external and 20-lbf/sq. ft. internal loading pressure. Frame with minimum 12-inch-high, integral-curb, double-wall construction with 1-1/2-inch insulation, formed cants and cap flashing (roofing counterflashing), with welded or sealed mechanical corner joints. Provide double-wall cover (lid) construction with 1- inch- thick insulation core. Provide gasketing and equip with corrosion-resistant or hot-dip galvanized hardware including pintle hinges, hold-open devices, interior padlock hasps, and both interior and exterior latch handles. Curb shall be factory prepared to receive the safety railing system.

1. Type: Single-leaf personnel access.
2. Size: 30 by 36 inches.

3. Material: Aluminum, sheets and extrusions.

    a. Finish: Clear anodic.

4. Safety Railing System: KeeHatch Railing System.

    a. Hardware: Provide all hardware for a complete installation.
    b. Finish: Manufacturer’s standard.

B. Sloping Roofs: Where slope or roof deck exceeds 1/4 inch per foot, fabricate hatch curbs with height tapered to match slope to level tops of units.

1.8 ROOF CURBS

A. General: Provide roof curbs capable of supporting superimposed live and dead loads, including equipment loads and other construction to be supported on roof curbs. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

B. Fabrication: Unless otherwise indicated or required for strength, fabricate units from minimum 0.063-inch- thick, sheet aluminum with welded corner joints.

1. Provide preservative-treated wood nailers at tops of curbs and formed flange at perimeter bottom for mounting to roof.
2. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
3. Provide manufacturer's standard rigid or semi-rigid insulation where indicated.
4. Provide formed cants and base profile coordinated with roof insulation thickness.
5. Fabricate units to minimum height of 8 inches, unless otherwise indicated.

6. Sloping Roofs: Where slope of roof deck exceeds 1/4 inch per foot, fabricate curb units with water diverter or cricket and with height tapered to match slope to level tops of units.

1.9 EQUIPMENT SUPPORTS

A. General: Provide equipment supports capable of supporting superimposed live and dead loads, including equipment loads and other construction to be supported. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

B. Fabrication: Unless otherwise indicated or required for strength, fabricate units from minimum 0.063-inch- thick, sheet aluminum with welded corner joints.

1. Provide preservative-treated wood nailers at tops of curbs and formed flange at perimeter bottom for mounting to roof.
2. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
3. Fabricate units to minimum height of 8 inches, unless otherwise indicated.
4. Sloping Roofs: Where slope of roof deck exceeds 1/4 inch per foot, fabricate support units with height tapered to match slope to level tops of units.

1.10 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

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.

1.11 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. 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

1.12 INSTALLATION

A. General: Comply with manufacturer's written instructions. Coordinate installation of roof accessories with installation of roof deck, roof insulation, flashing, roofing membranes, penetrations, equipment, and other construction involving roof accessories to ensure that each element of the Work performs properly and that combined elements are waterproof and weathertight. Anchor roof accessories securely to supporting structural substrates so they are capable of withstanding lateral and thermal stresses, and inward and outward loading pressures.

B. Install roof accessory items according to construction details of NRCA's "Roofing and Waterproofing Manual," unless otherwise indicated,

C. Separation: Separate metal from incompatible metal or corrosive substrates, including wood, by coating concealed surfaces, at locations of contact, with bituminous coating or providing other permanent separation.

D. Flange Seals: Unless otherwise indicated, set flanges of accessory units in a thick bed of roofing cement to form a seal.

E. Operational Units: Test-operate units with operable components. Clean and lubricate joints and hardware. Adjust for proper operation.

1.13 CLEANING AND PROTECTION

A. Clean exposed surfaces according to manufacturer's written instructions. Touch up damaged metal coatings.

END OF SECTION 07720

SECTION 07841 - THROUGH-PENETRATION FIRESTOP SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes through-penetration firestop systems for penetrations through the following fire-resistance-rated assemblies, including both empty openings and openings containing penetrating items:

1. Walls and partitions.
2. Smoke barriers.

1.2 PERFORMANCE REQUIREMENTS

A. General: For the following constructions, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly penetrated.

1. Fire-resistance-rated load-bearing walls, including partitions, with fire-protection-rated openings.
2. Fire-resistance-rated non-load-bearing walls, including partitions, with fire-protection-rated openings.

B. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.

C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that after curing do not deteriorate when exposed to these conditions both during and after construction.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
2. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

D. For through-penetration firestop systems exposed to view, provide products with flame-spread ratings of less than 25 and smoke-developed ratings of less than 450, as determined per ASTM E 84.

1.3 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: For each type of through-penetration firestop system product indicated.

C. Shop Drawings: For each through-penetration firestop system, show each kind of construction condition penetrated, relationships to adjoining construction, and kind of penetrating item. Include firestop design designation of testing and inspecting agency acceptable to authorities having jurisdiction that evidences compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
2. Where Project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer.

D. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

E. Product Certificates: Signed by manufacturers of through-penetration firestop system products certifying that products furnished comply with requirements.

F. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed through-penetration firestop systems similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Installer Qualifications: An experienced installer who is qualified by having the necessary experience, staff, and training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its through-penetration firestop system products to Contractor or to an installer engaged by Contractor does not in itself confer qualification on buyer.

C. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, from a single manufacturer.

D. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in "Performance Requirements" Article:

1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.

2. Through-penetration firestop systems are identical to those tested per ASTM E 814. Provide rated systems complying with the following requirements:.

a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.

b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the following:

1) UL in "Fire Resistance Directory."

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multicomponent materials.

B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

C. Notify Owner's inspecting agency at least seven days in advance of through-penetration firestop system installations; confirm dates and times on days preceding each series of installations.

D. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector, if required by authorities having jurisdiction, have examined each installation.

PART 2 - PRODUCTS

1.8 MANUFACTURERS

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

1. Hilti Construction Chemicals, Inc.
2. Nelson Firestop Products.
3. 3M Fire Protection Products.
4. Tremco

1.9 FIRESTOPPING, GENERAL

A. Compatibility: Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by the qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:

1. Permanent forming/damming/backing materials, including the following:

   a. Slag-/rock-wool-fiber insulation.
   b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
   c. Fire-rated form board.
   d. Fillers for sealants.

2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

1.10 FILL MATERIALS

A. General: Provide through-penetration firestop systems containing the types of fill materials indicated by reference to the types of materials described in this Article. Fill materials are those referred to in directories of the referenced testing and inspecting agencies as fill, void, or cavity materials.

B. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.

E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

G. Mortars: Prepackaged, dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

H. Pillows/Bags: Reusable, heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. Silicone Sealants: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in horizontal surfaces and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.
2. Grade for Horizontal Surfaces: Pourable (self-leveling) formulation for openings in other horizontal surfaces.
3. Grade for Vertical Surfaces: Nonsag formulation for openings in vertical and other surfaces.

1.11 MIXING

A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

1.12 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance.

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

1.13 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with written recommendations of firestop system manufacturer and the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.

2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

1.14 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Install through-penetration firestop systems to comply with "Performance Requirements" Article and firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for firestop systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

1.15 FIELD QUALITY CONTROL

A. Inspecting Agency: Engage a qualified independent inspecting agency to inspect through-penetration firestop systems and to prepare test reports.

1. Inspecting agency will state in each report whether inspected through-penetration firestop systems comply with or deviate from requirements.

B. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued.

C. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

1.16 IDENTIFICATION

A. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:

1. The words: "Warning--Through-Penetration Firestop System--Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Through-penetration firestop system designation of applicable testing and inspecting agency.
4. Date of installation.
5. Through-penetration firestop system manufacturer's name.
6. Installer's name.

1.17 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce through-penetration firestop systems complying with specified requirements.

END OF SECTION 07841

SECTION 07842 - FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes fire-resistive joint systems for the following:

1. Floor-to-floor joints.
2. Floor-to-wall joints.
3. Head-of-wall joints.
4. Wall-to-wall joints.
5. Joints between perimeter edge of fire-resistance-rated floor assemblies and back of non-fire-resistance-rated, exterior, glazed aluminum curtain walls.

1.2 PERFORMANCE REQUIREMENTS

A. General: For joints in the following constructions, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly in which fire-resistive joint systems are installed:

1. Fire-resistance-rated load-bearing walls, including partitions, with fire-protection-rated openings.
2. Fire-resistance-rated non-load-bearing walls, including partitions, with fire-protection-rated openings.
3. Fire-resistance-rated floor assemblies.
4. Exterior curtain-wall assemblies and fire-resistance-rated floor assemblies.

B. Fire Resistance of Joint Systems: Assembly ratings and movement capabilities indicated, but with assembly ratings not less than that equaling or exceeding fire-resistance rating of constructions in which joints are located, as determined by UL 2079.

1. Load-bearing capabilities as determined by evaluation during the time test.

C. Fire Resistance of Perimeter Fire-Containment Systems: Integrity and insulation ratings indicated as determined by UBC Standard 26-9 and UL 2079.

1.3 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

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

C. Shop Drawings: For each fire-resistive joint system, show each kind of construction condition in which joints are installed and relationships to adjoining construction. Include fire-resistive joint system design designation of testing and inspecting agency acceptable to authorities having jurisdiction that demonstrates compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each fire-resistive joint system configuration for construction and penetrating items.

D. Product Certificates: For each type of fire-resistive joint system, signed by product manufacturer.

E. Qualification Data: For Installer.

F. Compatibility and Adhesion Test Reports: From fire-resistive joint system manufacturer indicating the following:

1. Materials forming joint substrates have been tested for compatibility and adhesion with fill materials.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

G. Evaluation Reports: Evidence of fire-resistive joint systems' compliance with ICBO ES AC30, from the ICBO Evaluation Service.

H. Research/Evaluation Reports: For each type of fire-resistive joint system.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fire-resistive joint systems for each kind of joint and construction condition indicated through one source from a single manufacturer.

B. Preconstruction Compatibility and Adhesion Testing: Submit to fire-resistive joint system manufacturers, for testing indicated below, samples of materials that will contact or affect fill materials.

1. Use manufacturer's standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of fill materials to joint substrates.

a. Perform tests under environmental conditions replicating those that will exist during installation.

2. Submit no fewer than nine pieces of each type of material, including joint substrates, forming materials, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain fire-resistive joint system manufacturer's written instructions for corrective measures, including the use of specially formulated primers.

C. Fire-Test-Response Characteristics: Provide fire-resistive joint systems that comply with the following requirements and those specified in "Performance Requirements" Article:

1. Fire-resistance tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for fire-resistive joint systems acceptable to authorities having jurisdiction.

2. Fire-resistive joint systems are identical to those tested per UL 2079. Provide rated systems complying with the following requirements:

a. Fire-resistive joint system products bear classification marking of qualified testing and inspecting agency.

b. Fire-resistive joint systems correspond to those indicated by referencing system designations listed by the following:

1) UL in its "Fire Resistance Directory."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver fire-resistive joint system products to Project site in original, unopened containers or packages with qualified testing and inspecting agency's classification marking applicable to Project and with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials for fire-resistive joint systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate fire-resistive joint systems per manufacturer's written instructions by natural means or, if this is inadequate, forced-air circulation.

1.7 COORDINATION

A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

B. Coordinate sizing of joints to accommodate fire-resistive joint systems.

C. Notify Owner's inspecting agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on days preceding each series of installations.

D. Do not cover up fire-resistive joint system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector, if required by authorities having jurisdiction, have examined each installation.

PART 2 - PRODUCTS

1.8 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.

1. Fire-Resistive Joint Systems:

a. A/D Fire Protection Systems Inc.
b. DAP Inc.
c. Firestop Systems Inc.
d. Hilti, Inc.
e. ISOLATEK International.
f. Nelson Firestop Products.
g. 3M Fire Protection Products.
h. Tremco, Inc.

2. Perimeter Fire-Containment Systems:

a. Specified Technologies Inc.
b. United States Gypsum Company.

1.9 FIRE-RESISTIVE JOINT SYSTEMS, GENERAL

A. Compatibility: Provide fire-resistive joint systems that are compatible with joint substrates, under conditions of service and application, as demonstrated by fire-resistive joint system manufacturer based on testing and field experience.

B. Accessories: Provide components of fire-resistive joint systems, including forming materials that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing and inspecting agency for systems indicated.

1.10 FIRE-RESISTIVE JOINT SYSTEMS

A. Where UL-classified fire-resistive joint systems are indicated, they refer to alphanumeric designations listed in UL's "Fire Resistance Directory" under product Category XHBN.

1.11 PERIMETER FIRE-CONTAINMENT SYSTEMS

A. Where UL-classified perimeter fire-containment systems are indicated, they refer to alphanumeric designations listed in UL's "Fire Resistance Directory" under product Category XHDG.

PART 3 - EXECUTION

1.12 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance.

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

1.13 PREPARATION

A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from fire-resistive joint system materials. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates.

1.14 INSTALLATION

A. General: Install fire-resistive joint systems to comply with Part 1 "Performance Requirements" Article and fire-resistive joint system manufacturer's written installation instructions for products and applications indicated.

B. Install forming/packing/backing materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings and forming/packing/backing materials as required to achieve fire-resistance ratings indicated.
2. Apply fill materials so they contact and adhere to substrates formed by joints.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

1.15 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified independent inspecting agency to inspect fire-resistive joint systems and to prepare inspection reports.

1. Inspecting agency will state in each report whether inspected fire-resistive joint systems comply with or deviate from requirements.

B. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and inspecting agency has approved installed fire-resistive joint systems.

C. If deficiencies are found, repair or replace fire-resistive joint systems so they comply with requirements.

1.16 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to joints as Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

END OF SECTION 07842

SECTION 07920 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes sealants for the following applications, including those specified by reference to this Section:

1. Exterior joints in the following vertical surfaces and nontraffic horizontal surfaces:

a. Control and expansion joints in cast-in-place concrete.
b. Control and expansion joints in unit masonry.
c. Joints between different materials listed above.
d. Perimeter joints between materials listed above and frames of doors and windows.
e. 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.
b. Tile control and expansion joints.
c. Joints between different materials listed above.
d. 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. Tile control and expansion joints.
d. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
e. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
f. Joints between plumbing fixtures and adjoining walls, floors, and counters.
g. 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. Control and expansion joints in tile flooring.
c. Other joints as indicated.

1.2 PERFORMANCE REQUIREMENTS

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

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

1.3 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

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

C. 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.

D. Product Certificates: Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.

E. Preconstruction Field Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing specified in "Quality Assurance" Article.

F. Field Test Report Log: For each elastomeric sealant application. Include information specified in "Field Quality Control" Article.

G. Compatibility and Adhesion Test Reports: From sealant manufacturer indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

H. Product Test Reports: From a qualified testing agency indicating sealants comply with requirements, based on comprehensive testing of current product formulations.

I. Warranties: Special warranties specified in this Section.

1.4 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.

1.5 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 multicomponent 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.

1.6 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 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.

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.

1.7 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Manufacturer's Warranty: Written warranty, signed by elastomeric sealant manufacturer agreeing to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: As specified beginning from date of Substantial Completion.

PART 2 - PRODUCTS

1.8 PRODUCTS AND MANUFACTURERS

A. Products: Subject to compliance with requirements, provide the following products indicated for each type in the sealant.

1. One-Part Silicone Sealant: For Metal Wall Panels (metal faced composite wall panels); one-part silicone sealant, having a joint movement capability of plus-or-minus 100% elongation, minus 50% compression, and Shore A durometer hardness of 15.

a. Product and Manufacturer: "No. 755"; Dow Corning Corp. or equal product as manufactured by General Electric Co.
b. Warranty: Manufacturer's standard 20 year warranty.

2. One-Part Silicone Sealant: For poured-in-place concrete-to-masonry; one-part silicone sealant, having a joint movement capability of plus-or-minus 100% elongation, minus 50% compression, and Shore A durometer hardness of 15.

a. Product and Manufacturer: "No. 790"; Dow Corning Corp. or equal product as manufactured by General Electric Co.
b. Warranty: Manufacturer's standard 20 year warranty.

3. One-Part Silicone Sealant: For masonry-to-aluminum, steel-to-aluminum, concrete-to-aluminum, steel-to-steel, and other metal-to-metal joints (including KYNAR coatings); one-part silicone sealant having a joint movement capability of plus-or-minus 50% elongation, and Shore A durometer hardness of 30.

a. Products and Manufacturers: Provide one of the following.

1) "Dow Corning 795"; Dow Corning Corp.
2) "Silpruf SCS 2000"; General Electric Co.

b. Warranty: Manufacturer's extended 5 year warranty.

4. Two-Part, Pourable Urethane Sealant: For horizontal joints, exterior and interior; provide joint sealant with a joint movement capability of plus-or-minus 25%.

a. Products and Manufacturers: Provide one of the following.

1) "Vulkem 245"; Mameco International, Inc.
2) "NR200 Urexpan"; Pecora Corp.
3) "Sikaflex 2c SL"; Sika Corp.

4) "THC-900"; Tremco, Inc.

b. Warranty: Manufacturer's extended 5 year warranty.

5. Two-Part Urethane Non-Sag Sealant: For general interior use; provide joint sealant with a joint movement capability of plus-or-minus 50%.

a. Products and Manufacturers: Provide one of the following.

1) "Vulkem 922"; Mameco International, Inc.
2) "Dynatrol II"; Pecora Corp.
3) "Sikaflex 2c NS"; Sika Corp.
4) "NP II"; Sonneborne Building Products Division, ChemRex, Inc.

b. Warranty: Manufacturer's extended 5 year warranty.

6. One-Part Silicone - Sanitary Sealant: For Interior use at plumbing fixtures in toilets and janitor closets, and horizontal and vertical joints of dissimilar materials in toilets and other wet areas.

a. Products and Manufacturers: Provide one of the following.

1) "786"; Dow Corning Corp.
2) "SCS 1700"; General Electric Co.
3) "898"; Pecora Corp.
4) "600"; Tremco, Inc.

b. Warranty: Manufacturer's extended 3 year warranty.

7. One-Part Latex Sealant: For interior use for horizontal and vertical joints around door frames, and joints between dissimilar materials.

a. Products and Manufacturers: Provide one of the following.

1) "AC-20"; Pecora Corp.
2) "Sonolac"; Sonneborn Building Products Div., ChemRex, Inc.
3) "Tremco Acrylic Latex 834"; Tremco, Inc.

b. Warranty: Manufacturer's standard warranty.

1.9 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.

1.10 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Backer Rod (Joint Fillers, Compressible Filler): Preformed, compressible, resilient, non-staining, reticulated, closed-cell polymeric foam, nonoutgassing, with a density of 2.5 pcf and tensile strength of 35 psi per ASTM D 1623, and with water absorption less than 0.02 g/cc per ASTM C 1083.

1. Available Products: Subject to compliance with requirements, materials that may be incorporated into the Work include, but are not limited to the following:

a. Product and Manufacturer: Sof Rod; Applied Extrusion Technologies, Inc.

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.

1.11 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: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

1.12 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.

1.13 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, unless otherwise recommended in writing by joint sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience.

1. 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.

1.14 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.

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

B. Backing Materials: 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. Bond-Breaker Tape: Install bond-breaker tape behind sealants where sealant backings are not used between sealants and back of joints.

D. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess 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.

1.15 FIELD QUALITY CONTROL – WHERE REQUIRED BY THE ARCHITECT

A. Field-Adhesion Testing: Perform field-test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed elastomeric sealant joints as follows:

a. Perform 10 tests for the first 1000 feet of joint length for each type of elastomeric sealant and joint substrate.
b. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation.

2. Test Method: Test joint sealants by hand-pull method described below:

a. Make knife cuts from one side of joint to the other, followed by two cuts approximately 2 inches long at sides of joint and meeting cross cut at one end. Place a mark 1 inch from cross-cut end of 2-inch piece.
b. Use fingers to grasp 2-inch piece of sealant between cross-cut end and 1-inch mark; pull firmly at a 90-degree angle or more in direction of side cuts while holding a ruler along side of sealant. Pull sealant out of joint to the distance recommended by sealant manufacturer for testing adhesive capability, but not less than that equaling specified maximum movement capability in extension; hold this position for 10 seconds.
c. For joints with dissimilar substrates, check adhesion to each substrate separately. Do this by extending cut along one side, checking adhesion to opposite side, and then repeating this procedure for opposite side.

3. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field adhesion test log.

4. Inspect tested joints and report on the following:

a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare these results to

determine if adhesion passes sealant manufacturer's field- adhesion hand-pull test criteria.

b. Whether sealants filled joint cavities and are free from voids.

c. Whether sealant dimensions and configurations comply with specified requirements.

5. Record test results in a field adhesion test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.

6. Repair sealants pulled from test area by applying new sealants following same procedures used to originally seal joints. Ensure that original sealant surfaces are clean and new sealant contacts original sealant.

B. Evaluation of Field-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements, will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

1.16 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.

1.17 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.

END OF SECTION 07920

SECTION 08110 - STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Steel doors.
2. Steel door frames.
3. Sidelight frames
4. Fire-rated door and frame assemblies.
5. Window frames.

1.2 DEFINITIONS

A. Steel Sheet Thicknesses: Thickness dimensions, including those referenced in ANSI A250.8, are minimums as defined in referenced ASTM standards for both uncoated steel sheet and the uncoated base metal of metallic-coated steel sheets.

1.3 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: For each type of door and frame indicated, include door designation, type, level and model, material description, core description, construction details, label compliance, sound and fire-resistance ratings, and finishes.

C. Shop Drawings: Show the following:

1. Elevations of each door design.
2. Details of doors including vertical and horizontal edge details.
3. Frame details for each frame type including dimensioned profiles.
4. Details and locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, accessories, joints, and connections.
7. Coordination of glazing frames and stops with glass and glazing requirements.

D. Frame Schedule: Use same reference designations indicated on Drawings in preparing schedule for doors and frames.

E. Oversize Construction Certificates: For door assemblies required to be fire-protection rated and exceeding size limitations of labeled assemblies.

F. Products - Recycled Content: Provide certification from manufacturer on product's recycled content.

1.4 QUALITY ASSURANCE

A. Steel Door and Frame Standard: Comply with ANSI A 250.8, unless more stringent requirements are indicated.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.

1. Test Pressure: Test at atmospheric pressure.
2. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a testing agency acceptable to authorities having jurisdiction that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
3. Temperature-Rise Rating: Where indicated, provide doors that have a temperature-rise rating of 450 degrees F maximum in 30 minutes of fire exposure.

C. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.

B. Inspect doors and frames on delivery for damage, and notify shipper and supplier if damage is found. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect. Remove and replace damaged items that cannot be repaired as directed.

C. Store doors and frames at building site under cover. Place units on minimum 4-inch-high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If door packaging becomes wet, remove cartons immediately. Provide minimum 1/4-inch spaces between stacked doors to permit air circulation.

PART 2 - PRODUCTS

1.6 MANUFACTURERS

A. Manufacturers: Provide products by one of the following:

1. Steel Doors and Frames:

a. Ceco Door Products; a United Dominion Company.
b. Curries Company.
c. Republic Builders Products.
d. Steelcraft; a division of Ingersoll-Rand.

1.7 MATERIALS

A. Hot-Rolled Steel Sheets: ASTM A 569/A 569M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

B. Cold-Rolled Steel Sheets: ASTM A 366/A 366M, Commercial Steel (CS), or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness.

C. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591/A 591M, Commercial Steel (CS), Class B coating; mill phosphatized; suitable for unexposed applications; stretcher-leveled standard of flatness where used for face sheets.

1.8 DOORS

A. General: Provide doors of sizes, thickness, and designs indicated.

B. Interior Doors: Provide doors complying with requirements indicated below by referencing ANSI 250.8 for level and model and ANSI A250.4 for physical-endurance level:

1. Interior Doors Including Stairwell Doors: Level 2 and Physical Performance Level B (Heavy Duty), Model 2 (Seamless).

C. Exterior Doors: Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:

1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless).

D. Door Louvers: Provide louvers for interior doors, where indicated, that comply with SDI 111C, with blades or baffles formed of 0.020-inch- thick, cold-rolled steel sheet set into 0.032-inch- thick steel frame.

1. Sightproof Louvers: Stationary louvers constructed with inverted V-shaped or Y-shaped blades.

1.9 FRAMES

A. General: Provide steel frames for doors, transoms, sidelights, borrowed lights, and other openings that comply with ANSI A250.8 and with details indicated for type and profile. Conceal fastenings, unless otherwise indicated.

B. Frames of 0.053-inch- thick steel sheet for:

1. Door openings wider than 48 inches.
2. Level 2 steel doors.
3. Wood doors, unless otherwise indicated.

C. Frames of 0.067-inch- thick steel sheet for:

1. Level 3 steel doors.

D. Door Silencers: Except on weather-stripped frames, fabricate stops to receive three silencers on strike jambs of single-door frames and two silencers on heads of double-door frames.

E. Supports and Anchors: Fabricated from not less than 0.042-inch- thick, electrolytic zinc-coated or metallic-coated steel sheet.

1. Wall Anchors in Masonry Construction: 0.177-inch- diameter, steel wire complying with ASTM A 510 may be used in place of steel sheet.

F. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where zinc-coated items are to be built into exterior walls, comply with ASTM A 153/A 153M, Class C or D as applicable.

1.10 FABRICATION

A. General: Fabricate steel door and frame units to comply with ANSI A250.8 and to be rigid, neat in appearance, and free from defects including warp and 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.

B. Exterior Door Construction: For exterior locations and elsewhere as indicated, fabricate doors, panels, and frames from metallic-coated steel sheet. Close top and bottom edges of doors flush as an integral part of door construction or by addition of 0.053-inch- thick, metallic-coated steel channels with channel webs placed even with top and bottom edges.

C. Interior Door Faces: Fabricate exposed faces of doors and panels, including stiles and rails of nonflush units, from the following material:

1. Cold-rolled steel sheet.

D. Core Construction:

1. Interior Doors: Resin-impregnated kraft/paper honeycomb or rigid mineral-fiber board as required for fire ratings.
2. Exterior Doors: Polystyrene.

E. Clearances for Non-Fire-Rated Doors: Not more than 1/8 inch at jambs and heads, except not more than 1/4 inch between pairs of doors. Not more than 3/4 inch at bottom.

F. Clearances for Fire-Rated Doors: As required by NFPA 80.

G. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

H. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.

I. 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 of 0.41 Btu/sq. ft. x h x degrees F or better.

J. 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 in ANSI A250.6 and ANSI A115 Series specifications for door and frame preparation for hardware.

1. For concealed overhead door closers, provide space, cutouts, reinforcement, and provisions for fastening in top rail of doors or head of frames, as applicable.
2. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.

K. Door and Window Frame Construction: Fabricate frames to shape shown.

1. Fabricate frames with mitered or coped and continuously welded corners and seamless face joints.
2. Provide welded frames with temporary spreader bars for doors.

L. Reinforcement: Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.

M. Glazing Stops: Manufacturer's standard, formed from 0.032-inch- thick steel sheet.

1. Provide nonremovable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.
2. Provide screw-applied, removable, glazing stops on inside of glass, louvers, and other panels in doors.

N. Astragals: As required by NFPA 80 to provide fire ratings indicated.

1.11 FINISHES

A. Prime Finish: Manufacturer's standard, factory-applied coat of rust-inhibiting primer complying with ANSI A250.10 for acceptance criteria.

PART 3 - EXECUTION

1.12 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 in SDI 105. 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. In masonry construction, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry T-shaped anchors.
2. In metal-stud partitions, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Attach wall anchors to studs with screws.
3. Install fire-rated frames according to NFPA 80.

C. Door Installation: Comply with ANSI A250.8. Fit hollow-metal doors accurately in frames, within clearances specified in ANSI A250.8. Shim as necessary to comply with SDI 122 and ANSI/DHI A115.1G.

1. Fire-Rated Doors: Install within clearances specified in NFPA 80.
2. Smoke-Control Doors: Install to comply with NFPA 105.

1.13 ADJUSTING AND CLEANING

A. Prime-Coat Touchup: Immediately after installation, sand smooth any rusted or damaged areas of prime coat and apply touch up of compatible air-drying primer.

B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION 08110

SECTION 08211 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 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. Louvers for flush wood doors.

1.2 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: For each type of door. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.

C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.
5. Indicate fire ratings for fire doors.

D. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.

E. Products - Recycled Content: Provide certification from manufacturer on product's recycled content.

F. Certification: Provide certification that all architectural wood materials originate from, ‘sustainable managed forests’. Forests and forest product manufacturers may be certified by Scientific Certification Systems (SCS), RainForest Alliance’s, SmartWood Program or another certifying body approved by Architect.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.

B. Quality Standard: Comply with AWI’s "Architectural Woodwork Quality Standards Illustrated."

1. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.

C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

1. Oversize, Fire-Rated Wood Doors: For door assemblies exceeding sizes of tested assemblies, provide oversize fire door label or certificate of inspection, from a testing and inspecting agency acceptable to authorities having jurisdiction, stating that doors comply with requirements of design, materials, and construction.
2. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating of 450 degrees F maximum in 30 minutes of fire exposure.

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

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.5 PROJECT CONDITIONS

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

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section, or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.

2. Warranty shall be in effect during the following period of time from date of Substantial Completion:

a. Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

1.7 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. Flush Wood Doors:

a. Algoma Hardwoods Inc.
b. Eggers Industries; Architectural Door Division.
c. VT Industries Inc.
d. Marshfield Door Systems (formerly Weyerhaeuser Company)

2. Metal Louvers for Doors:

a. Air Louvers, Inc.
b. Anemostat Door Products.

1.8 DOOR CONSTRUCTION, GENERAL

A. Doors for Opaque Finish:

1. Grade: Custom.
2. Faces for Interior Doors: Any closed-grain Certified hardwood of mill option.

1.9 SOLID-CORE DOORS

A. Particleboard Cores: Comply with the following requirements:

1. Particleboard: ANSI A208.1, Grade LD-2.
2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.

B. Interior Doors:

1. Core: Particleboard.
2. Construction: Five plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.

C. Fire-Rated Doors:

1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as needed to provide fire rating indicated.
2. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated as needed to eliminate through-bolting hardware.
3. Edge Construction: At hinge stiles, provide manufacturer's standard laminated-edge construction with improved screw-holding capability and split resistance and with outer stile matching face veneer.

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

    a. Finish astragals with baked enamel same color as doors.

5. Pairs: Provide fire-rated pairs with fire-retardant stiles matching face veneer that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals.

D. Labels: Provide factory-applied labels. Label all doors “asbestos free” using ¾-inch wide by 3-inch long brass tags with an embossed message reading “non-asbestos”, mechanically attached to the hinge edge of the door and mounted 2-inches below the fire label.

1.10 LOUVERS AND LIGHT FRAMES

A. Wood Louvers: Door manufacturer's standard solid-wood louvers, unless otherwise indicated.

B. Metal Louvers:

1. Blade Type: Vision-proof, inverted V.
2. Metal and Finish: Extruded aluminum with black Class II, color anodic finish complying with AA-C22A32/A34.

C. Metal Frames for Light Openings in Fire Doors: Manufacturer's standard frame formed of 0.0478-inch- thick, cold-rolled steel sheet; factory primed and approved for use in doors of fire rating indicated.

1.11 FABRICATION

A. Fabricate 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. Comply with requirements in NFPA 80 for fire-rated doors.

C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Premachine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

D. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Louvers: Factory install louvers in prepared openings.

1.12 FACTORY FINISHING

A. General: Comply with AWI’s "Architectural Woodwork Quality Standards Illustrated” for factory finishing.

B. Opaque Finish:

1. Finish: Refer to Section 09912, Painting.
2. Color: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

1.13 EXAMINATION

A. Examine doors and 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 level heads and plumb jambs.
2. Reject doors with defects.

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

1.14 INSTALLATION

A. Hardware: For installation, see Division 8 Section "Door Hardware."

B. Manufacturer's Written Instructions: Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for 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.

a. Comply with NFPA 80 for fire-rated doors.

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 at lock edge; trim stiles and rails only to extent permitted by labeling agency.

1.15 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08211

SECTION 08311 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following types of access doors:

1. Wall access doors.
2. Fire-rated wall access doors.
3. Ceiling access doors.
4. Fire-rated ceiling access doors.

1.2 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

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. Products - Recycled Content: Provide certification from manufacturer on product's recycled content.

1.3 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain access doors for entire Project from one source and by a single manufacturer.

B. Fire-Rated Door Assemblies: Units that comply with NFPA 80, are identical to door and frame assemblies tested for fire-test-response characteristics per test method as

indicated below, and are labeled and listed by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Test Method for Vertical Installations: ASTM E 152.
2. Test Method for Horizontal Installations: ASTM E 119.

C. Size Variations: Obtain Architect's acceptance of manufacturer's standard size units, which may vary slightly from sizes indicated.

1.4 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

1.5 MANUFACTURERS

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

1. J.L. Industries.
2. Karp Associates, Inc.
3. Larsen's Manufacturing Co.
4. Milcor, Inc.
5. Nystrom, Inc.

1.6 MATERIALS

A. Steel Sheet: ASTM A 366 commercial-quality, cold-rolled steel sheet with baked-on, rust-inhibitive primer.

1.7 ACCESS DOORS

A. Insulated, Fire-Rated Access Doors: Self-latching units consisting of frame, trim, door, insulation, and hardware, including automatic closer, interior latch release, and complying with the following requirements:

1. Trimless Frame: Perimeter frame complying with the following requirements:

a. Metal: 0.0598-inch- thick steel sheet.
b. Frame Configuration: Flange integral with frame and overlapping face of adjoining gypsum board, with surface formed to receive joint compound.

2. Door: 0.0359-inch- thick steel sheet, welded pan type.
3. Hinges: Continuous type.
4. Latches: Bolt type, operated by either a ring turn or flush key device (keyed alike).
5. Insulation: 2-inch- thick mineral-fiber insulation.
6. Fire-Protection Rating for Walls: 1-1/2 hours with a temperature rise not exceeding 250 degrees F at the end of 30 minutes.
7. Fire-Protection Rating for Ceilings: 1 hour combustible or 3 hour non-combustible as required for constructed indicated.

B. Noninsulated, Fire-Rated Doors for Walls: Self-latching units consisting of frame, trim, door, and hardware, including automatic closer, interior latch release, and complying with the following requirements:

1. Frame: 0.0598-inch- thick steel sheet.
2. Door: 0.0598-inch- thick steel sheet.
3. Hinge: Continuous type.
4. Latches: Bolt type, operated by either a ring turn or flush key device (keyed alike).
5. Fire-Protection Rating for Walls: 1-1/2 hours.

C. Trimless, Flush Access Doors for Gypsum Board: Units consisting of frame, concealed edge trim, door, hardware, and complying with the following requirements:

1. Frame: 0.0598-inch- thick steel sheet.
2. Door: 0.0747-inch- thick steel sheet.
3. Concealed, Gypsum Board Edge Trim: 0.0299-inch zinc-coated or galvanized-steel sheet with face flange formed to receive joint compound.
4. Hinge: Concealed spring pin or continuous type.
5. Locks: Key-operated cylinder lock.

1.8 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.

1. Exposed Flange: Nominal 1 to 1-1/2 inches wide around perimeter of frame.
2. For gypsum board assemblies or gypsum veneer plaster, furnish frames with edge trim for gypsum board or gypsum base.
3. For installation in masonry construction, furnish frames with adjustable metal masonry anchors.

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.
2. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

PART 3 - EXECUTION

1.9 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.

1.10 INSTALLATION

A. General: Comply with manufacturer's instructions for installing access doors.

1. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finished surfaces.
2. Install concealed-frame access doors flush with adjacent finish surfaces.
3. Paint exposed surface of access doors and frames to match adjacent surface finish.

1.11 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 08311

SECTION 08410 - ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Exterior entrance systems.
2. Interior entrance systems.
3. Interior storefront systems.

1.2 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. Loads: Provide entrance and storefront systems, including anchorage, capable of withstanding exterior and interior structural loads and 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.

E. Air Infiltration – Exterior Entrances: Provide entrance and storefront systems with permanent resistance to air leakage through fixed glazing and frame areas of not more than 0.50 cfm/linear. ft. of perimeter crack when tested according to ASTM E 283 at a static-air-pressure difference of 6.24 lbf/sq. ft.

F. Thermal Movements: Provide exterior entrance 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 degrees F, ambient; 180 degrees F, material surfaces.

G. Structural-Support Movement: Provide entrance and storefront systems that accommodate structural movements including, but not limited to, sway and deflection.

H. Dimensional Tolerances: Provide entrance and storefront systems that accommodate dimensional tolerances of building frame and other adjacent construction.

1.3 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: For each product specified. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes.

C. 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.

D. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for units with factory-applied color finishes.

E. 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.

F. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

G. 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.

H. Field Test Reports: Indicate and interpret test results for compliance with storefront systems' performance requirements.

I. Product Test Reports: Based on evaluation of tests performed by manufacturer and witnessed by a qualified independent testing agency, indicate compliance of entrance and storefront systems with requirements based on comprehensive testing of current systems.

J. Products - Recycled Content: Provide certification from manufacturer on product's recycled content.

1.4 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. Testing Agency Qualifications: Demonstrate to Architect's satisfaction, based on Architect's evaluation of criteria conforming to ASTM E 699, that the independent testing agency has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.

C. Source Limitations: Obtain each type of entrance and storefront system through one source from a single manufacturer.

D. Preconstruction Sealant Testing: Perform sealant manufacturers' standard tests for compatibility and adhesion of sealants with each material that will come in contact with sealants and each condition required by system.

1. Test a minimum of 8 samples of each metal, glazing, and other material.
2. Prepare samples using techniques and primers required for installed systems.
3. Perform tests under environmental conditions that duplicate those under which systems will be installed.
4. For materials that fail tests, determine corrective measures required to prepare each material to ensure compatibility with and adhesion of sealants, including, but not limited to, specially formulated primers. After performing these corrective measures on the minimum number of samples required for each material, retest materials.

E. Welding Standards: Comply with applicable provisions of AWS D1.2, "Structural Welding Code--Aluminum."

1.5 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.

1.6 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 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

1.7 SYSTEMS

A. Model and Manufacturer – Basis of Design:

1. Exterior Entrances: 560 Insulclad Thermal Entrance; Kawneer Company, Inc.
2. Interior Entrances: Entara Entrances; Kawneer Company, Inc.
3. Interior Storefront: Trifab 450 VG; Kawneer Company, Inc.

B. Other 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. EFCO Corporation.
2. Tubelite Architectural Systems.
3. YKK AP America Inc.

1.8 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. 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: Refer to Division 8 Section "Glazing."

D. 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.

E. 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: As selected by Architect from manufacturer's full range of colors.
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.

F. 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: Black.
2. Use neutral-cure silicone sealant with insulating-glass units.

G. Sealants and joint fillers for joints at perimeter of entrance and storefront systems as specified in Division 7 Section "Joint Sealants."

H. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos, formulated for 30-mil thickness per coat.

1.9 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: High-performance plastic connectors separate framing members exposed to the exterior from members exposed to the interior.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with 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. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

E. Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials. Form exposed flashing from sheet aluminum finished to match framing and of sufficient thickness to maintain a flat appearance without visible deflection.

F. Framing System Gaskets and Sealants: Manufacturer's standard recommended by manufacturer for joint type.

1.10 GLAZING SYSTEMS

A. Glazing: As specified in Division 8 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard compression types, replaceable, molded or extruded, that maintain uniform pressure and watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric types.

D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

E. Glazing Sealants: For structural-sealant-glazed systems, as recommended by manufacturer for joint type and as follows:

1. Structural Sealant: ASTM C 1184, neutral-curing silicone formulation compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant, and approved by structural-sealant manufacturer for use in aluminum-framed systems indicated.

a. Color: As selected by Architect from manufacturer's full range of colors.

2. Weatherseal Sealant: ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; neutral-curing silicone formulation compatible with structural sealant and other system components with which it comes in contact; and recommended by structural- and weatherseal-sealant and aluminum-framed system manufacturers for this use.

a. Color: Matching structural sealant.

1.11 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. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.

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.

1.12 DOOR HARDWARE

A. General: Provide heavy-duty units in sizes and types recommended by entrance system and hardware manufacturers for entrances and uses indicated.

B. Continuous-Gear Hinges: Manufacturer's standard with stainless-steel bearings between knuckles; fabricated to full height of door and frame.

C. Closers: As specified in Division 8 Section "Door Hardware."

D. Cylinders: As specified in Division 8 Section "Door Hardware."

E. 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.

F. Weather Stripping: Manufacturer's standard replaceable components.

1.13 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 screw-spline frame construction.

B. Forming: Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.

C. Framing: Physical and thermal isolation of glazing from framing members.

D. Prepare components to receive concealed fasteners and anchor and connection devices.

E. Fabricate components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.

F. 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.

G. Glazing Channels: Provide minimum clearances for thickness and type of glass indicated according to FGMA's "Glazing Manual."

H. 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.

I. 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.

J. 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. Interior Doors: Provide ANSI/BHMA A156.16 silencers at stops to prevent metal to metal contact. Provide 3 silencers on strike jamb of single-door frames and 2 silencers on head of double-door frames.

1.14 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. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

D. High-Performance Organic Finish (2-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA and with coating and resin manufacturers' written instructions.

1. Color: Custom as selected by the Architect.

PART 3 - EXECUTION

1.15 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.

1.16 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.

1.17 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing agency to perform field quality-control testing indicated.

B. 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.

C. Water Spray Test: After completing the installation of test areas indicated, test storefront system for water penetration according to AAMA 501.2 requirements.

D. Repair or remove and replace Work that does not meet requirements or that is damaged by testing; replace to conform to specified requirements.

1.18 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.

1.19 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 08630 - METAL-FRAMED SKYLIGHTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Aluminum-framed skylights with retaining caps.

1.2 PERFORMANCE REQUIREMENTS

A. General: Provide metal-framed skylights capable of withstanding loads and thermal and structural movements indicated without failure. Failure includes the following:

1. Deflection exceeding specified limits.
2. Thermal stresses transferred to the building structure.
3. Framing members transferring stresses, including those caused by thermal and structural movement, to glazing.
4. Noise or vibration created by thermal and structural movement and wind.
5. Loosening or weakening of fasteners, attachments, and other components.
6. Sealant failure.

B. Deflection Limits: As follows:

1. Deflection of the entire length of framing members in direction normal to glazing plane is limited to 1/180 of clear span or 3/4 inch, whichever is smaller, unless otherwise indicated.
2. Deflection of the entire length of framing members for spans exceeding 20 feet is limited to 1/240 of clear span.
3. Deflection of framing members in a direction parallel to glazing plane, when carrying full dead load, is limited to an amount not exceeding that which reduces glazing bite below 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch.

C. Lateral Support: Compression flanges of flexural members are laterally braced by cross members with minimum depths equal to 50 percent of flexural member depth and by anchors to the building structure. Glazing material does not provide lateral support.

D. Structural Loads: Provide metal-framed skylights, including anchorage, capable of withstanding the effects of the following design loads when supporting full dead loads:

1. Wind Loads: As indicated.

2. Roof Loads: As follows:

   a. Concentrated Load: 250 lbf applied to framing members at location that produces the most severe stress or deflection.
   b. Live Load: As indicated.
   c. Rain Load: As indicated.

E. Structural Performance: Provide metal-framed skylights, including anchorage, capable of withstanding test pressure indicated without material and deflection failures and permanent deformation of structural members exceeding 0.2 percent of span when tested according to ASTM E 330.

1. Test Pressure: 150 percent of positive and negative wind-load design pressures.
2. Test Duration: As required by design wind velocity; fastest 1 mile of wind for relevant exposure category.

F. Thermal Movement: Provide metal-framed skylights that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, sealant failure, and other detrimental effects.

1. Temperature Change (Range): Local conditions.

G. Air Infiltration: Provide metal-framed skylights with maximum air leakage of 0.06 cfm/sq. ft. of surface when tested according to ASTM E 283 at a minimum static-air-pressure differential of 6.24 lbf/sq. ft.

H. Water Penetration: Provide metal-framed skylights that do not evidence water penetration when tested according to ASTM E 331 at a minimum differential static pressure of 20 percent of positive design wind load, but not less than 6.24 lbf/sq. ft.

1.3 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: Include construction details, material descriptions, dimensions and profiles of components, and finishes for metal-framed skylights.

C. Shop Drawings: For metal-framed skylights. Include plans, elevations, sections, details, and attachments to other Work.

1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Samples for Initial Selection: Manufacturer's color charts consisting of sections of units showing the full range of colors available for factory-finished aluminum.

E. Samples for Verification: For each exposed aluminum finish required, prepared on 12-inch- long sections of extrusions or formed shapes in same thickness and material indicated for the Work. If finishes involve normal color variations, include sample sets consisting of two or more units showing the full range of variations expected.

F. Preconstruction Test Reports: Indicate and interpret test results for compliance with requirements.

G. Product Test Reports: From a qualified testing agency indicating skylights comply with requirements, based on comprehensive testing of current products.

H. 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 sealant manufacturer's interpretation of test results for sealant performance and recommendations for primers and substrate preparation needed for adhesion.

I. Field Test Reports: Indicate and interpret test results for compliance with requirements.

J. Products - Recycled Content: Provide certification from manufacturer on product’s recycled content.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer to assume engineering responsibility who has specialized in installing metal-framed skylights similar to those indicated for this Project and who is acceptable to manufacturer.

1. Engineering Responsibility: Preparation of data for metal-framed skylights, including Shop Drawings, based on engineering analysis of manufacturer's standard skylights similar to those indicated for this Project.

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 skylights that are similar to those indicated for this Project in material, design, and extent.

C. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

D. Preconstruction Testing: As follows:

1. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated.
2. Preconstruction Testing Service: Engage a qualified independent testing agency to perform preconstruction testing indicated.
3. Test metal-framed skylights for compliance with performance requirements according to specified test methods. Conduct tests using specimen representative of proposed materials and construction including perimeter components, corners, splice joints, sealants, and anchors according to AAMA 501 recommendations adapted to skylights.
4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.

E. Preconstruction Sealant Compatibility and Adhesion Testing: Submit to sealant manufacturer, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use manufacturer's standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

    a. Perform tests under environmental conditions replicating those that will exist during installation.

2. Submit not fewer than nine pieces of each type of material, including joint substrates, shims, joint sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.

F. Welding: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code--Aluminum."

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1.

1.5 PROJECT CONDITIONS

A. Field Measurements: Where metal-framed skylights 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.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating skylights without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.6 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of metal-framed skylights that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

1. Structural failures.
2. Sealant failures.
3. Failure of systems to meet performance requirements.
4. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
5. Water leakage; defined as uncontrolled water appearing on normally exposed interior surfaces of skylights from sources other than condensation. Water controlled by flashing and gutters and drained back to the exterior and that cannot damage adjacent materials or finishes is not water leakage.
6. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

1.7 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. Fisher Skylights, Inc.
2. Super Sky Products, Inc.

1.8 FRAMING MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for use and finish indicated, and as follows:

1. Extrusions: ASTM B 221.
2. Sheet and Plate: ASTM B 209.
3. Bars, Rods, and Wire: ASTM B 211.

B. Brackets and Reinforcements: Provide manufacturer's standard high-strength aluminum brackets and reinforcements. Provide nonstaining, nonferrous shims to install and align skylights.

C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing; compatible with adjacent materials.

D. Exposed Flashing and Closures: Aluminum sheet.

1. Minimum Thickness: 0.040 inch.

E. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories; compatible with adjacent materials.

1. Movement Joints: Provide slip-joint linings, spacers, and sleeves of material and type recommended by manufacturer.
2. Aluminum-Retaining-Cap Fasteners: ASTM A 193/A 193M, Series 300 stainless-steel screws; type as recommended by manufacturer.
3. Connections to Supporting Structure: ASTM A 307, zinc-coated steel fasteners.
4. Anchor Bolts: ASTM A 307, Grade A, zinc-coated steel anchor bolts.
5. Concrete or Masonry Inserts: Zinc-coated cast-iron, malleable-iron, or steel inserts; hot-dip galvanized according to ASTM A 123.

F. Framing-System Gaskets and Joint Fillers: Manufacturer's standard permanent gaskets and joint fillers for sliding, compression, and nonmoving joints.

G. Framing-System Sealants: Compatible with components with which sealants come in contact and recommended by skylight and sealant manufacturers for this use.

1.9 GLAZING MATERIALS

A. Insulating Glass: As specified in Division 8 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard pressure-glazing gaskets of elastomer type and hardness selected by skylight and gasket manufacturers to comply with requirements. Provide gasket assemblies that have corners sealed with sealant recommended by gasket manufacturer.

C. Spacers, Edge Blocks, and Setting Blocks: Manufacturer's standard permanent nonmigrating type of elastomer type and hardness selected to comply with requirements.

1. For structural silicone glazing, provide bond-breaking spacer gaskets and bonding setting blocks compatible with silicone sealants.

D. Structural Silicone Sealant: ASTM C 1184, compatible with components with which sealant comes in contact, formulated and tested for use as a structural sealant, and neutral curing.

1. Color: Black.
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 skylight systems' design.

E. Weatherseal Sealant: Neutral-curing silicone sealant recommended by skylight and sealant manufacturers for this use.

1. Sealant is capable of withstanding 50 percent movement in both extension and compression (total of 100 percent movement) when tested for adhesion and cohesion under maximum cyclic movement according to ASTM C 719.
2. Sealant complies with ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and, as applicable to substrates including other sealants with which it comes in contact, O.
3. Color: Black.

1.10 FABRICATION

A. Framing Components: As follows:

1. Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion.
2. Fabricate components to drain water passing joints and to drain condensation and moisture occurring or migrating within skylight system to the exterior.
3. Fabricate components to accommodate expansion, contraction, and field adjustment, and to provide for minimum clearance and shimming at skylight perimeter.
4. Fabricate components to ensure that glazing is thermally and physically isolated from framing members.
5. Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.
6. Fit and assemble components to greatest extent practicable before finishing.
7. Fit and secure joints with screw and spline, internal reinforcement, or welding.
8. Reinforce members as required to retain fastener threads.
9. Where fasteners are exposed to view from interior, countersink bolt or screw heads and finish to match framing.
10. Weld components before finishing and in concealed locations to greatest extent practicable to minimize distortion.
11. Before shipping, shop assemble, mark, and disassemble components that cannot be permanently shop assembled.

B. Provide continuous aluminum curb with weatherproof expansion joints and locked and sealed or fully welded corners. Locate weep holes in the curb at each rafter connection to drain condensation.

C. Prepare framing to receive anchor and connection devices and fasteners.

D. Metal Protection: As follows:

1. 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.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
3. Where aluminum will contact pressure-treated wood, separate dissimilar materials by methods recommended by manufacturer.

E. Factory Glazing: As follows:

1. Insulating Glass: Comply with requirements in Division 8 Section "Glazing."
2. Structural Silicone Sealant Glazing: Prepare surfaces that will contact sealant and install sealant according to sealant manufacturer's written instructions. Preparation includes, but is not limited to, cleaning and priming. Mechanically fasten glazing in place until sealant cures. Clean excess sealant from surfaces before sealant cures. Do not transport units until sealant has cured.

1.11 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

C. Class I, Clear Anodic Finish: AA-M10C22A41 (Mechanical Finish: 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

1.12 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting skylight performance.

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

1.13 PREPARATION

A. Furnish anchor bolts and inserts for setting in concrete formwork or masonry indicated to support skylights.

B. Metal Protection: As follows:

1. 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.
2. Where aluminum will contact pressure-treated wood, separate dissimilar materials by methods recommended by manufacturer.

1.14 INSTALLATION

A. General: Comply with manufacturer's written instructions for protecting, handling, and installing skylight components.

1. Fit frame joints to produce hairline joints free of burrs and distortion.
2. Rigidly secure nonmovement joints.
3. Accommodate thermal and mechanical movements.
4. Install framing components to drain water passing joints and to drain condensation and moisture occurring or migrating within skylight system to the exterior.
5. Coordinate installation of insulation and flashings at skylight perimeters to maintain continuity of thermal and water barriers.
6. Set continuous curbs and flashings in a full sealant bed, unless otherwise indicated. Comply with requirements in Division 7 Section "Joint Sealants."

B. Erection Tolerances: Install skylight components true in plane, accurately aligned, and without warp or rack. Adjust framing to comply with the following tolerances:

1. Variation from Plane: Limit variation from plane or location shown to 1/8 inch in 10 feet; 1/4 inch over total length.
2. Alignment: Where surfaces abut in line and at corners and where surfaces are separated by less than 3 inches, limit offset from true alignment to less than 1/32 inch; otherwise, limit offset from true alignment to 1/8 inch.

C. Field Glazing: As follows:

1. Insulating Glass: Comply with requirements in Division 8 Section "Glazing."
2. Structural Silicone Sealant Glazing: Prepare surfaces that will contact sealant and install sealant according to sealant manufacturer's written instructions. Preparation includes, but is not limited to, cleaning and priming. Mechanically fasten glazing in place until sealant cures. Clean excess sealant from surfaces before sealant cures.

D. 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.

1.15 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field quality-control tests and to prepare test reports.

B. Sealant Adhesion Tests: Test installed sealant in a minimum of two areas and as follows:

1. Test structural silicone sealant according to field adhesion test method described in AAMA CW 13, "Structural Sealant Glazing Systems (A Design Guide)."
2. Test weatherseal sealant as recommended in writing by sealant manufacturer.

C. Water-Spray Test: Test skylights for compliance with requirements according to procedures in AAMA 501.2.

D. Air Infiltration: Test skylights according to AAMA 503, which requires testing according to ASTM E 783.

1. Static-Air-Pressure Differential: 1.57 lbf/sq. ft. minimum.
2. Air Leakage: 0.06 cfm/sq. ft. of surface maximum.

E. Water Penetration: Test skylights for compliance with requirements according to AAMA 503, which requires testing according to ASTM E 1105.

1. Uniform Static-Air-Pressure Difference: 20 percent of positive design wind load, but not less than 6.24 lbf/sq. ft..

F. Repair or replace Work that does not meet requirements or that is damaged by testing; repair or replace to comply with specifications.

1.16 CLEANING

A. Clean skylights inside and outside, immediately after installation and after sealants have cured, according to manufacturer's written recommendations.

1. Remove temporary protective coverings and strippable coatings from prefinished metal surfaces. Remove labels and markings from all components.

B. Remove excess sealant according to sealant manufacturer's written recommendations.

END OF SECTION 08630

SECTION 08711 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Commercial door hardware as scheduled.
2. Furnish all items of hardware necessary to complete the work indicated. In the event hardware has not been indicated for an opening, provide hardware for any and all parts of the building where normally required in order to properly complete the work. The type and quality of additional hardware items required shall be comparable in every respect to items indicated for similar openings.

1.2 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Sequence: Attention to lead times required for delivery of certain hardware items is required.

1. Extensions of time will not be contemplated because of failure in ordering hardware in a timely manner.
2. Allow adequate lead-time required for the University to produce a keying schedule. Coordinate the process with the PPD Facilities Department allowing sufficient time for timely completion by PPD.

C. Product Data: Include manufacturer’s technical product data for each item of door hardware, installation details, material descriptions, maintenance of operating parts, dimensions of individual components and profiles, and finishes.

D. Shop Drawings: Details of electrified door hardware, indicating the following:

1. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring. Include the following:

a. System schematic.
b. Point-to-point wiring diagram.
c. Riser diagram.
d. Elevation of each door.

2. Detail interface between electrified door hardware and the building control system.

E. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Organize door hardware sets in same order as in the Door Hardware Schedule at the end of Part 3. Include the following information:

a. Type, style, function, size, and finish of each hardware item.
b. Name and manufacturer of each item.
c. Fasteners required.
d. Locaiton of hardware set cross-referenced to indications on the Drawings both on floor plans and in the door and frame schedule.
e. Explanation of all abbreviations, symbols, codes, etc. contained in the schedule.
f. Mounting locations.
g. Door and frame sizes and materials.
h. Keying information.

i. Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.

1) Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit.

F. Templates: Furnish hardware templates to each fabricator of doors, frames, and other work to be factory-prepared for the installation of hardware.

G. Keying Schedule: Prepared by or under the supervision of supplier, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to door designations.

H. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, indicating current products comply with requirements.

I. Certification: Provide a certificate executed by a representative of the manufacturer of the door closers that all closers have been inspected and adjusted, are operating as designed, and have been installed in accordance with manufacturer’s instructions. Include certificate with Operations and Maintenance Manuals.

J. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 1.

K. Warranties: Special warranties specified in this Section.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.

B. Supplier: A builder's hardware supplier who has been furnishing hardware for a period of not less than 2 years, and who is, or has in employment, an experienced hardware consultant.

C. Regulatory Requirements: Comply with provisions of the following:

1. All signage shall meet the requirements of the Florida Accessibility Code.

2. Where required to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," and ANSI A117.1, FED-STD-795, "Uniform Federal Accessibility Standards," as follows:

a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.

b. Door Closers: Comply with the following maximum opening-force requirements indicated:

1) Interior Hinged Doors: 5 lbf applied perpendicular to door.
2) Sliding or Folding Doors: 5 lbf applied parallel to door at latch.
3) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

c. Thresholds: Not more than 1/2 inch in height. Bevel raised thresholds with a slope of not more than 1:2.

3. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

D. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

1. Test at door assemblies' atmospheric pressure.

2. Provide hardware for fire-rated openings in compliance with A.I.A. (NBFU) Pamphlet No. 80, NFPA Standards NO. 101, UBC 702 (1997) and UL10C. This requirement takes precedence over other requirements for such hardware. Provide only hardware that has been tested and listed by UL for the types and sizes of doors required, and complies with the requirements of the door and door frame labels.
3. Where panic exit devices are required on fire-rated doors, provide supplementary marking on door UL label indicating Fire Door to be equipped with fire exit hardware and provide UL label on exit device indicating “Fire Exit Hardware”.

E. Keying Conference: The supplier shall meet with the PPD Facilities Department to finalize keying requirements and obtain final instructions in writing.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to electrified door hardware including, but not limited to, the following:

1.4 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

1.5 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. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of operators and door hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

C. Warranty Period for Manual Closers: 10 years from date of Substantial Completion.

1.6 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

1.7 SCHEDULED DOOR HARDWARE

A. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Schedule at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.

1.8 PRODUCTS AND MANUFACTURERS

A. General: The following is a listing of products, specified manufacturers, and other acceptable manufacturers.

PRODUCTS	**SPECIFIED MANUFACTURER**	**OTHER ACCEPTABLE MANUFACTURERS**
Hinges	Stanley	Hager, McKinney
Exit Device	Von Duprin	Sargent
Closer	LCN	No Substitution
Cylinders	Russwin	Sargent
Power Transfer	Von Duprin	Locknetics
Power Supply	Von Duprin	Locknetics
Auto Closer	LCN	Sargent
Actuators	LCN	Locknetics
Locksets	Russwin	Sargent
Latchsets	Russwin	Sargent
Kick Plates	Rockwood	Ives, Glynn-Johnson
Flushbolts	Rockwood	Ives, Glynn-Johnson
O.H. Stops	Glynn-Johnson	ABH

Pull Plates/Push Plates	Rockwood	Ives, Glynn-Johnson
Stops		
Silencers		
Threshold	Pemko	

1.9 KEYING

A. General: At the start of the Project, provide the PPD Facilities Department with the following:

1. A Work Order that identifies the University's Project Manager, the building number and floor, and the customer's name and phone number.
2. A set of contract documents with a hardware schedule that includes the University-assigned room and door numbers, the manufacturer of the locks, the manufacturer's lock number, the hand of the locks, the type of trim, and the lock finish.

B. Keys: Deliver all keys to the UF PPD Key Shop. Include project name and BR number with shipment.

C. Keying:

1. Do not stamp cut number on keys.

2. Factory stamp each key and blanks with the following notation:

a. Notation: PROPERTY OF UF – DO NOT DUPLICATE

3. All locks shall be construction masterkeyed.
4. All keying shall be done at the factory. All keys shall be tagged per door number at the factory.
5. Furnish 4 keys per lock (K.D.). Bitting shall be by UF PPD Lock Shop.
6. Furnish 10 each masterkeys per lockset.
7. Furnish a total of 100 key blanks.

D. Construction Cylinders and Keys: Provide all construction cylinders and keys required during construction.

1. All construction keys shall be checked out from the UF PPD Key Shop and returned upon substantial completion. Failure to return all keys may result in the re-keying the entire project at no additional cost to the Owner.

1.10 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws

according to commercially recognized industry standards for application intended. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.

1.11 FINISHES

A. BHMA Designations and U.S. Finishes: Comply with base material and finish requirements indicated.

1. Finish designations used are industry-recognized standard commercial finishes, unless otherwise indicated.
2. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

1.12 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

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

1.13 PREPARATION

A. Steel Doors and Frames: Comply with DHI A115 series.

1. Surface-Applied Door Hardware: Drill and tap doors and frames according to SDI 107.

B. Wood Doors: Comply with DHI A115-W series.

1.14 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

1.15 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1.16 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

1.17 DOOR HARDWARE SCHEDULE

A. General: The following schedule shall not be considered entirely exclusive. Provide additional hardware, as required, for compliance with the Code, or authority having jurisdiction.

1. Hardware Group No.1: Provide the following:

Quantity	Description	Model Number	Finish
2 Each	Exit Device	CD3547L	US26D
2 Each	Door Closer	2031	AL
4 Each	Cylinders	1000 Series	US26D

Remainder of Hardware by Aluminum Storefront supplier

2. Hardware Group No.2: Provide the following:

Quantity	Description	Model Number	Finish
1 Each	Exit Device	CD35L	US26D
1 Each	Door Closer	2031	AL
2 Each	Cylinders	1000 Series	US26D

Remainder of Hardware by Aluminum Storefront supplier

3. Hardware Group No.3: Provide the following:

Quantity	Description	Model Number	Finish
1 Each	Exit Device	EL35L	US26D
1 Each	Cylinder	1000 Series	US26D
1 Each	Power Transfer	EPT 1024	US32D
1 Each	Power Supply	PS873-2	Gray
1 Each	Auto Closer	4622	AL
1 Each	Actuator	956	US32D
1 Each	Actuator	957 Exterior	US32D
1 Each	Wiring Diagram	---	---
1ea	Threshold	896V - LAR	AL

Remainder of hardware by aluminum storefront supplier. Exterior Actuator may vary with security requirements; possible key switch activation - To be reviewed.

4. Hardware Group No.4: Provide the following:

Quantity	Description	Model Number	Finish
3 Each	Hinges	BB1279 4.5 x 4.5	US26D
1 Each	Lockset	ML2057 x NSM	US26D
1 Each	Stop	409	US32D
3 Each	Silencers	608	Gray

5. Hardware Group No.5: Provide the following:

Quantity	Description	Model Number	Finish
3 Each	Hinges	BB1279 4.5 x 4.5	US26D
1 Each	Lockset	ML2055 x NSM	US26D
1 Each	Stop	409	US32D
3 Each	Silencers	608	Gray

6. Hardware Group No.6: Provide the following:

Quantity	Description	Model Number	Finish
6 Each	Hinges	BB1279 4.5 x 4.5 NRP	US26D
1 Each	Lockset	ML2257 x NSM	US26D
1 Pair	Flushbolts	555	US26D
2 Each	Kickplate	8 x 34	US32D
1 Each	Stop	440	US32D
2 Each	Silencers	608	Gray

7. Hardware Group No.7: Provide the following:

Quantity	Description	Model Number	Finish
3 Each	Hinges	BB1168 4.5 x 4.5	US26D
1 Each	Lockset	ML2055 x NSM	US26D
1 Each	Closer	4041 x SNB	AL
1 Each	Stop	409	US32D
3 Each	Silencers	608	Gray

8. Hardware Group No.8: Provide the following:

Quantity	Description	Model Number	Finish
3 Each	Hinges	BB1279 4.5 x 4.5	US26D
1 Each	Lockset	ML2030 x NSM	US26D
1 Each	Closer	4041 x SNB	AL
1 Each	Stop	409	US32D
3 Each	Silencers	608	Gray

9. Hardware Group No.9: Provide the following:

Quantity	Description	Model Number	Finish
3 Each	Hinges	BB1279 4.5 x 4.5	US26D
1 Each	Latchset	ML2010 x NSM	US26D
1 Each	Closer	4041 x SNB	AL
1 Each	Stop	409	US32D
3 Each	Silencers	608	Gray

10. Hardware Group No.10: Provide the following:

Quantity	Description	Model Number	Finish
6 Each	Hinges	BB1279 4.5 x 4.5	US26D
2 Each	Exit Device	CD9927L	US26D
2 Each	Closer	4041 x SNB	AL
4 Each	Cylinders	1000 Series	US26D
1 Each	Stop	409	US32D
3 Each	Silencers	608	Gray

11. Hardware Group No.11: Provide the following:

Quantity	Description	Model Number	Finish
6 Each	Hinges	BB1279 4.5 x 4.5	US26D
2 Each	Exit Device	9927L-F	US26D
2 Each	Closer	4041 x SNB	AL
2 Each	Cylinders	1000 Series	US26D
2 Each	Stop	440	US32D
2 Each	Silencers	608	Gray

12. Hardware Group No.12: Provide the following:

Quantity	Description	Model Number	Finish
6 Each	Hinges	BB1279 4.5 x 4.5 NRP	US26D
1 Each	Lockset	ML2257 x NSM	US26D
1 Pair	Flushbolts	555	US26D
2 Each	Kickplate	8 x 34	US32D
2 Each	O.H. Stop	GJ904S	US32D
2 Each	Silencers	608	Gray

13. Hardware Group No.13: Provide the following:

Quantity	Description	Model Number	Finish
3 Each	Hinges	BB1279 4.5 x 4.5 NRP	US26D
1 Each	Exit Device	99L-F	US26D
1 Each	Closer	4041 x SNB	AL
1 Each	Cylinders	1000 Series	US26D
1 Each	Kickplate	8 x 34	US32D
1 Each	Stop	440	US32D
1 Each	Silencers	608	Gray

14. Hardware Group No.14: Provide the following:

Quantity	Description	Model Number	Finish
3 Each	Hinges	BB1279 4.5 x 4.5	US26D
1 Each	Pull Plate	125 x 70C	US32D
1 Each	Push Plate	70C	US32D
1 Each	Closer	4041 x SNB	AL
1 Each	Kickplate	8 x 34	US32D
1 Each	Stop	440	US32D
1 Each	Silencers	608	Gray

15. Hardware Group No.15: Provide the following:

Quantity	Description	Model Number	Finish
3 Each	Hinges	BB1279 4.5 x 4.5	US26D
1 Each	Lockset	ML2055 x NSM	US26D
1 Each	Closer	4041 x SNB	AL
1 Each	Stop	409	US32D
3 Each	Silencers	608	Gray

16. Hardware Group No.16: Provide the following:

Quantity	Description	Model Number	Finish
2 Each	Exit Device	EL3457L	US26D
2 Each	Cylinder	1000 Series	US26D
2 Each	Power Transfer	EPT 1024	US32D
1 Each	Power Supply	PS873-2	Gray
2 Each	Auto Closer	4622	AL
1 Each	Actuator	956	US32D
1 Each	Actuator	957 Exterior	US32D
1 Each	Wiring Diagram	---	---

Remainder of hardware by aluminum storefront supplier. Exterior Actuator may vary with security requirements; possible key switch activation - To be reviewed.

17. Hardware Group No.17: Provide the following:

Quantity	Description	Model Number	Finish
3 Each	Hinges	BB1279 4.5 x 4.5	US26D
1 Each	Exit Device	99L-F BE	US26D
1 Each	Closer	4041 x SNB	AL
1 Each	Stop	409	US32D
3 Each	Silencers	608	Gray

18. Hardware Group No.18: Provide the following:

Quantity	Description	Model Number	Finish
6 Each	Hinges	BB1279 4.5 x 4.5	US26D
2 Each	Exit Device	9927L x RG27	US26D
2 Each	Closer	4041 x SNB	AL
2 Each	Cylinders	1000 Series	US26D
2 Each	Stop	440	US32D
2 Each	Silencers	608	Gray

19. Hardware Group No.19: Provide the following:

Quantity	Description	Model Number	Finish
6 Each	Hinges	BB1279 4.5 x 4.5 NRP	US26D
1 Each	Lockset	ML2055 x NSM	US26D
1 Pair	Flushbolts	557	US26D
2 Each	Closers	4041 Cush x SNB	AL
2 Each	Stop	440	US32D
2 Each	Silencers	608	Gray

20. Hardware Group No.20: Provide the following:

Quantity	Description	Model Number	Finish
3 Each	Hinges	BB1168 4.5 x 4.5	US26D
1 Each	Lockset	ML2057 x NSM	US26D
1 Each	Closer	4041 Cush x SNB	AL
3 Each	Silencers	608	Gray

END OF SECTION 08711

SECTION 08716 - POWER DOOR OPERATORS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. ADA compliant automatic door openers; power door operators for swinging doors.

1.2 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: For each door operator type required. Include manufacturer's standard details, fabrication methods, and published recommendations for each component of the door operating system required, and the following:

1. Roughing-in diagrams.
2. Certified performance reports.
3. Installation instructions.
4. Parts lists.

C. Wiring Diagrams: Detail wiring for power operator, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.

D. Maintenance Data: For power door operators to include in the maintenance manuals specified in Division 1.

E. Products - Recycled Content: Provide certification from manufacturer on product’s recycled content.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who is an authorized representative of the product manufacturer for both installation and maintenance of units required for this Project.

1. Maintenance Proximity: Not more than 2 hours' normal travel time from Installer's place of business to Project site.

B. Manufacturer Qualifications: Engage a firm experienced in manufacturing operators similar to those indicated for this Project and with a record of successful in-service performance.

C. BHMA Standard: Provide power door operators that comply with applicable requirements of BHMA A156.19, "Power Assist and Low Energy Power Operated Doors."

D. UL Standard: Provide power door operators that comply with UL 325.

E. Fire-Rated Doors and Emergency-Exit Openings: Provide door operators that comply with NFPA 80 requirements for doors as emergency exits and that do not interfere with fire ratings.

1.4 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 the power door operator system that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

1. Faulty operation of operator or controls.
2. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

C. Warranty Period: 3 years from date of Substantial Completion.

PART 2 - PRODUCTS

1.5 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering power door operators that may be incorporated into the Work include, but are not limited to, the following:

1. Electromechanical Operators for Swinging Doors:

a. Besam, Inc.
b. EFCO Corp.
c. Gyro-Tech, Inc.

d. Horton Automatics.
e. LCN Closers.
f. Stanley Access Technologies.

1.6 GENERAL DOOR OPERATOR REQUIREMENTS

A. Capacity: Provide operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated.

B. Hinge Operation: For swinging doors, refer to Division 8 Section "Door Hardware" to determine the type of hinge action to accommodate door operator action.

C. Exposed Housing: Minimum 0.062-inch- thick, extruded- or formed-aluminum cover with provisions for maintenance access. Provide with fasteners concealed when door is in closed position. Finish to match doors and frames.

D. Exposed Housing for Operators: Minimum 0.0598-inch- thick, formed steel sheet cover with provisions for maintenance access. Provide with fasteners concealed when door is in closed position. Provide in manufacturer's standard prime-coat finish for field painting.

E. Adjustment Features: Operators shall be fully adjustable. Provide adjustment for opening, closing, and checking speeds, as well as length of time door remains open.

1.7 SWINGING DOOR OPERATORS

A. Electromechanical Operators for Swinging Doors: Manufacturer's standard electromechanical unit with doors power opened and spring closed, with closing speed controlled mechanically by gear train and dynamically by braking action of electric motor, and with easy manual operation including spring closing with power off. Provide operator action as indicated and mounting as follows:

1. Operator Mounting Type: Surface-mounted overhead operator.
2. Power-Assisted and Low-Energy Operators: Provide power-assisted and low-energy operators meeting requirements of BHMA A156.19 and ADA's "Accessibility Guidelines for Buildings and Facilities (ADAAG)," Appendix B, Article 4.13.12, "Automatic Doors and Power-Assisted Doors."
3. Power-Assisted Closing: Provide power-assisted spring closing for overcoming wind and static pressures.

1.8 OPERATOR CONTROL SYSTEMS

A. Microwave-Scanner, Motion-Detecting Control System: Self-contained, motion-detecting control system consisting of a microwave-scanner sensing device to activate door operator and horizontal photoelectric beam across door opening to prevent door

from closing until door is clear of traffic. Sensing device shall be adjustable to provide detection patterns and sensitivity equivalent to those required for mats. Provide housing for sensing device with finish matching finish of doors and frames.

1. Install scanners on both interior and exterior sides of each automatic-sliding entrance door as indicated.
2. Install scanners on approach side of each automatic-sliding entrance door as indicated.

B. Control Pad: Manufacturer's standard, wall-mounted, door-control switch plate for operation by touch of elbow by occupants familiar with door operating system.

1.9 GUIDE RAILS

A. General: Provide anodized-aluminum bar-stock guide rails of same length as floor mats for freestanding floor mounting as indicated.

1. Equip rails with filler panels of expanded aluminum mesh for maximum control of traffic on and off floor-mat control panels.
2. Equip rails with filler panels of polycarbonate plastic in clear or color to match Architect's sample.
3. Equip rails with filler panels of polycarbonate plastic in clear or color as selected by Architect from manufacturer's choices.

PART 3 - EXECUTION

1.10 PREPARATION

A. Templates and Diagrams: Furnish templates, diagrams, and other data to fabricators and installers of related work as necessary for coordinating power door operator installation.

1.11 INSTALLATION

A. General: Install complete power door operator system according to manufacturer's written instructions, including controls, control wiring, and remote power units.

1. Refer to Division 16 Sections for power connection.

B. Set tracks, header assemblies, operating brackets, rails, and guides level and true to location with adequate anchorage for permanent support.

1.12 ADJUSTING

A. After repeated operation of completed installation equivalent to 3 days' use by normal traffic (100 to 300 cycles), readjust door operators and controls for optimum operating condition, safety, and weathertight closure. Lubricate hardware, operating equipment, and other moving parts.

END OF SECTION 08716

SECTION 08800 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Windows.
2. Doors.
3. Glazed entrances.
4. Interior borrowed lites.
5. Storefront framing.
6. Skylights.

1.2 DEFINITIONS

A. Manufacturer: A firm that produces primary glass or fabricated glass as defined in referenced glazing publications.

B. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

C. Deterioration of Laminated 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 laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

D. Deterioration of Insulating Glass: Failure of the hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (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; or other defects in construction.

B. Glass Design: Glass thickness indicated is minimums and is for detailing only. Confirm glass thickness by analyzing Project loads and in-service conditions. Provide glass lites for various size openings in nominal thickness indicated, but not less than thickness and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thickness: Select minimum glass thickness to comply with ASTM E 1300, according to the following requirements:

a. Specified Design Wind Loads: As indicated.

b. Probability of Breakage for Vertical Glazing: 1 lite per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.

1) Load Duration: 60 seconds or less.

c. Maximum Lateral Deflection: For the following types of glass supported on all four edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 3/4 inch, whichever is less.

1) For monolithic-glass lites heat treated to resist wind loads.
2) For insulating glass.
3) For laminated-glass lites.

d. Minimum Glass Thickness for Exterior Lites: Not less than 6 mm.
e. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.

C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): Local conditions.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units with lites 6 mm thick and a nominal 1/2-inch- wide interspace.
4. Center-of-Glass U-Values: NFRC 100 methodology using LBL-35298 WINDOW 4.1 computer program, expressed as Btu/ sq. ft. x h x deg F.

5. Center-of-Glass Solar Heat Gain Coefficient: NFRC 200 methodology using LBL-35298 WINDOW 4.1 computer program.
6. Solar Optical Properties: NFRC 300.

1.4 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: For each glass product and glazing material indicated.

C. Samples: For the following products, in the form of 12-inch- square Samples for glass and of 12-inch- long Samples for sealants. Install sealant Samples between two strips of material representative in color of the adjoining framing system.

D. Samples: For the following products, in the form of 12-inch- square Samples for glass.

1. Each color of tinted float glass.
2. Each type of laminated glass with colored interlayer.
3. Insulating glass for each designation indicated.

E. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thickness for each size opening and location.

F. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

G. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

H. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

I. Product Test Reports: From a qualified testing agency indicating the following products comply with requirements, based on comprehensive testing of current products:

1. Tinted float glass.
2. Insulating glass.

3. Glazing sealants.
4. Glazing gaskets.

J. SWRI Validation Certificate: For each elastomeric glazing sealant specified to be validated by SWRI's Sealant Validation Program.

K. Warranties: Special warranties specified in this Section.

L. Products - Recycled Content: Provide certification from manufacturer on product's recycled content.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).

B. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for Project and whose work has resulted in construction with a record of successful in-service performance.

C. Source Limitations for Clear Glass: Obtain clear float glass from one primary-glass manufacturer.

D. Source Limitations for Tinted Glass: Obtain tinted, heat-absorbing, and light-reducing float glass from one primary-glass manufacturer for each tint color indicated.

E. Source Limitations for Laminated Glass: Obtain laminated-glass units from one manufacturer using the same type of glass lites and interlayers for each type of unit indicated.

F. Source Limitations for Insulating Glass: Obtain insulating-glass units from one manufacturer using the same type of glass and other components for each type of unit indicated.

G. Source Limitations for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.

H. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.

1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

2. Glass Testing Agency Qualifications: An independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

I. Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.

1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
2. Test elastomeric glazing sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
3. Test elastomeric glazing sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

J. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing indicated below, samples of each glass type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants.

1. Use manufacturer's standard test methods to determine whether priming and other specific preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.

    a. Perform tests under normal environmental conditions replicating those that will exist during installation.

2. Submit not fewer than nine pieces of each type and finish of glass-framing members and each type, class, kind, condition, and form of glass (monolithic, laminated, and insulating units) as well as one sample of each glazing accessory (gaskets, tape sealants, setting blocks, and spacers).
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
5. Testing will not be required if elastomeric glazing sealant manufacturers submit data based on previous testing of current sealant products for adhesion to, and compatibility with, glazing materials matching those submitted.

K. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

L. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257.

M. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.

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.

N. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA'S "Glazing Manual" and "Laminated Glass Design Guide."

O. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following inspecting and testing agency:

1. Insulating Glass Certification Council.
2. Associated Laboratories, Inc.
3. National Accreditation and Management Institute.

P. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F.

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. Manufacturer's Special Warranty on Coated-Glass Products: Written warranty, made out to Owner and signed by coated-glass manufacturer agreeing to furnish replacements for those coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: 10 years from date of Substantial Completion.

C. Manufacturer's Special Warranty on Insulating Glass: Written warranty, made out to Owner and signed by insulating-glass manufacturer agreeing to furnish replacements for insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

1.9 PRODUCTS AND MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products indicated in schedules at the end of Part 3.

1.10 PRIMARY FLOAT GLASS

A. Float Glass: ASTM C 1036, Type I (transparent glass, flat), Quality q3 (glazing select); class as indicated in schedules at the end of Part 3.

1.11 HEAT-TREATED FLOAT GLASS

A. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.

B. Fabrication Process: By vertical (tong-held) or horizontal (roller-hearth) process, at manufacturer's option, except provide horizontal process where indicated as tongless or free of tong marks.

C. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent glass, flat); Quality q3 (glazing select); class, kind, and condition as indicated in schedules at the end of Part 3.

1.12 WIRED GLASS

A. Wired Glass: ASTM C 1036, Type II (patterned and wired glass, flat), Class 1 (clear), Quality q8 (glazing); 6.4 mm thick; of form and mesh pattern indicated below:

1. Polished Wired Glass: Form 1 (wired, polished both sides), and as follows:

a. Mesh m1 (diamond).

2. Patterned Wired Glass: Form 2 (patterned and wired), Mesh m1 (diamond).

1.13 INSULATING GLASS

A. Insulating-Glass Units: Preassembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in the Insulating-Glass Schedule at the end of Part 3.

1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in "Performance Requirements" Article. Provide Kind FT (fully tempered) where safety glass is indicated.

B. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated in the Insulating-Glass Schedule at the end of Part 3 are nominal and the overall thickness of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.

C. Sealing System: Dual seal, with primary and secondary sealants as follows:

1. Manufacturer's standard sealants.

D. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:

1. Aluminum with powdered metal paint finish in color selected by Architect.
2. Desiccant: Molecular sieve or silica gel, or blend of both.
3. Corner Construction: Manufacturer's standard corner construction.

1.14 ELASTOMERIC GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:

1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of

service and application, as demonstrated by sealant manufacturer based on testing and field experience.

2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: Match Architect's samples.
4. Colors of Exposed Glazing Sealants: As indicated by manufacturer's designations.
5. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range for this characteristic.

B. Elastomeric Glazing Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied, chemically curing sealant in the Glazing Sealant Schedule at the end of Part 3, including those referencing ASTM C 920 classifications for type, grade, class, and uses.

1. Additional Movement Capability: Where additional movement capability is specified in the Glazing 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 time of installation and remain in compliance with other requirements in ASTM C 920 for uses indicated.

C. Glazing Sealant for Fire-Resistive Glazing Products: Identical to product used in test assembly to obtain fire-protection rating.

1.15 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 for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types 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).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

G. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

1.16 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 written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.

B. Clean-cut or 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.

C. Grind smooth and polish exposed glass edges.

PART 3 - EXECUTION

1.17 EXAMINATION

A. Examine framing glazing, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and 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. Proceed with installation only after unsatisfactory conditions have been corrected.

1.18 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

1.19 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless 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 thickness, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where the length plus width is larger than 50 inches as follows:

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to 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.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. 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.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

1.20 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

1.21 PROTECTION AND CLEANING

A. Protect exterior glass from damage 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, alkaline deposits, or stains; 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 exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

1.22 GLASS SCHEDULE

A. Glazing: Refer to the Window Schedule.

1. Insulated glass units; performance specifications based on Viracon VE7-2M. Shading coefficient = .32, Winter U = .29, Summer U = .30, Visible Transmittance = .55

B. Skylight Glazing: Performance specifications based on Viracon VE7-2M with additional azurlite and laminated glass layers. Shading coefficient = .27, Winter U = .29, Summer U = .30, Visible Transmittance = .40

C. Interior Glass: ¼" Interior Tempered glazing.

END OF SECTION 08800

SECTION 08911 - GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes conventionally glazed aluminum curtain walls.

1.2 PERFORMANCE REQUIREMENTS

A. General: Provide glazed aluminum curtain-wall systems, including anchorage, capable of withstanding, without failure, the effects of the following:

1. Structural loads.
2. Movements of supporting structure indicated on Drawings including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
3. Dimensional tolerances of building frame and other adjacent construction.

4. Failure includes the following:

a. Deflection exceeding specified limits.
b. Thermal stresses transferred to building structure.
c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
d. Noise or vibration created by wind and thermal and structural movements.
e. Loosening or weakening of fasteners, attachments, and other components.
f. Sealant failure.

B. Structural Loads:

1. Wind Loads: As indicated.

C. Structural-Test Performance: Provide glazed aluminum curtain-wall systems, including anchorage, capable of withstanding test pressure indicated without material and deflection failures and permanent deformation of structural members exceeding 0.2 percent of span when tested according to ASTM E 330.

1. Submit reports of tests performed on manufacturer's standard assemblies.
2. Test Pressure: 150 percent of positive and negative wind-load design pressures.
3. Test Duration: As required by design wind velocity but not less than 10 seconds.

D. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span or 3/4 inch, whichever is smaller.

E. Thermal Movements: Provide glazed aluminum curtain-wall systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 degrees F, ambient; 180 degrees F, material surfaces.

2. Test Performance: No buckling, stress on glass, glazing-edge seal failure, sealant failure, excess stress on curtain-wall framing, anchors and fasteners, or reduction of performance when tested according to AAMA 501.5.

a. Test Ambient Temperature Range: Local conditions.

F. Air Infiltration: Provide glazed aluminum curtain-wall systems with maximum air leakage of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure differential of 1.57 lbf/sq. ft..

G. Water Penetration Under Static Pressure: Provide aluminum glazed curtain-wall systems that do not evidence water penetration when tested according to ASTM E 331 at a minimum differential static pressure of 20 percent of positive design wind load, but not less than 10 lbf/sq. fl.

H. Water Penetration Under Dynamic Pressure: Provide glazed aluminum curtain-wall systems that do not evidence water leakage when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of positive design wind load, but not less than 10 lbf/sq. ft.

1. Maximum Water Leakage: According to AAMA 501.1 No uncontrolled water penetrating systems or appearing on systems' normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained to exterior and cannot damage adjacent materials or finishes is not considered water leakage.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product indicated.

B. Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication and assembly of glazed aluminum curtain-wall systems.

1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

E. Welding certificates.

F. Qualification Data: For Installer.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for glazed aluminum curtain-wall systems.

H. Preconstruction Test Reports: For glazed aluminum curtain-wall systems.

I. Field quality-control test reports.

J. Warranties: Special warranties specified in this Section.

K. Products - Recycled Content: Provide certification from manufacturer on product's recycled content.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Capable of assuming engineering responsibility and performing Work of this Section and who is acceptable to manufacturer.

1. Engineering Responsibility: Preparation of data for glazed aluminum curtain-wall systems including the following:

a. Shop Drawings based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
b. Shop Drawings, preconstruction-testing program development, and comprehensive engineering analysis by a qualified professional engineer.

B. Testing Agency Qualifications: An independent agency qualified according to ASTM E 699 for testing indicated.

C. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

D. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to test glazed aluminum curtain-wall systems for compliance with specified requirements for performance and test methods. Provide test specimens and assemblies representative of proposed materials and construction.

1. Select sizes and configurations of assemblies to adequately demonstrate capability of glazed aluminum curtain-wall systems to comply with performance requirements and according to AAMA 501 recommendations.
2. Notify Architect seven days in advance of the dates and times when assemblies will be constructed.

E. Welding: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code--Aluminum."

F. Mockups: Build mockups to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical wall area as shown on Drawings.
2. Field testing shall be performed on mockups according to requirements in Part 3 "Field Quality Control" Article.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to glazed aluminum curtain-wall systems including, but not limited to, the following:

1. Review structural load limitations.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review required testing, inspecting, and certifying procedures.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for glazed aluminum curtain-wall systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating glazed aluminum curtain-wall systems without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.6 WARRANTY

A. Special Assembly Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of glazed aluminum curtain-wall systems that do not comply with requirements or that deteriorate as defined in this Section within specified warranty period.

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

a. Structural failures including, but not limited to, excessive deflection.
b. Noise or vibration caused by thermal movements.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
d. Water leakage.
e. Failure of operating components to function normally.

2. Warranty Period: Five 10 years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

1.7 MANUFACTURERS

A. Curtainwall - Model and Manufacturer - Basis-of-Design: 1600 Wall System 4, Thermal Break System; Kawneer Company, Inc.

B. Operable Windows – Model and Manufacturer - Basis-of-Design: Series 8225-T Projected; Kawneer Company, Inc.

1.8 FRAMING SYSTEMS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. 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. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 611.
3. Hot-Rolled Sheet and Strip: ASTM A 570/A 570M.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Fasteners and Accessories: All fasteners shall be concealed. Provide corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Where fasteners are subject to loosening or turn out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads.
4. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended by manufacturer.

E. Anchors: Three-way adjustable anchors that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

F. Concealed Flashing: Dead-soft, 0.018-inch- thick stainless steel, ASTM A 240/A 240M of type recommended by manufacturer.

G. Framing Sealants: As recommended by manufacturer for joint type.

1.9 GLAZING SYSTEMS

A. Glazing: As specified in Division 8 Section "Glazing."

B. Glazing Sealants: As recommended by manufacturer for joint type.

1.10 FABRICATION

A. Form aluminum shapes before finishing.

B. Fabricate components that, when assembled, have the following characteristics:

1. Sharp profiles, straight and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Internal guttering systems or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to prevent glazing-to-glazing contact and to maintain required glazing edge clearances.
6. Provisions for reglazing from exterior.

C. 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.

1.11 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

C. High-Performance Organic Finish (2-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA and with coating and resin manufacturers' written instructions.

1. Color: Custom as selected by the Architect.

PART 3 - EXECUTION

1.12 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

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

1.13 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
7. Seal joints watertight, unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. 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, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Install components plumb and true in alignment with established lines and grades.

E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

F. Install glazing as specified Division 8 Section "Glazing."

G. Install sealants as specified in Division 7 Section "Joint Sealants."

H. Install insulation materials as specified in Division 7 Section "Building Insulation."

I. Install perimeter fire-containment systems (safing insulation).

J. Erection Tolerances: Install glazed aluminum curtain-wall systems to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.

3. Alignment:

   a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
   b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
   c. Where surfaces are separated by reveal or protruding element of 1 inch wide or greater, limit offset from true alignment to 1/4 inch.

4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

1.14 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing and inspecting of representative areas to determine compliance of installed system with specified requirements.

   1. Water Penetration: Areas shall be tested according to ASTM E 1105.

C. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

END OF SECTION 08911

SECTION 09253 - GYPSUM SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes gypsum sheathing attached to steel framing members of exterior walls.

1.2 DEFINITIONS

A. Gypsum Board Construction Terminology Standard: Refer to ASTM C 11 and GA-505 for definitions of terms for gypsum sheathing board construction not defined in this Section or in other referenced standards.

1.3 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: For each product specified.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each gypsum sheathing product through one source from a single manufacturer.

B. Fire-Resistance-Rated Assemblies: Where gypsum sheathing boards are part of fire-resistance-rated assemblies, provide assemblies as follows:

1. Assemblies comply with requirements of fire-response-tested assemblies indicated by GA File Numbers in GA-600, "Fire Resistance Design Manual"; or by design designations in UL's "Fire Resistance Directory" or in certification listings of another testing and inspecting agency acceptable to authorities having jurisdiction.
2. Fire-resistance ratings were determined by fire-response testing assemblies according to ASTM E 119.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles, each bearing brand name and identification of manufacturer.

B. Store materials protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, or other causes. Neatly stack gypsum sheathing board flat on leveled supports off the ground, under cover, and fully protected from weather.

PART 2 - PRODUCTS

1.6 GYPSUM SHEATHING BOARD

A. Paper-Surfaced Gypsum Sheathing Board: ASTM C 79/C 79M, with water-resistant material incorporated into core and with water-repellent paper bonded to core's face, back, and long edges.

1. Type and Thickness: Type X, 5/8 inch thick, unless otherwise indicated.

1.7 ACCESSORY MATERIALS

A. Weather Barrier: Self-Adhering, Polymer-Modified, Bituminous Sheet Underlayment: ASTM D 1970, minimum of 40 mils thick. Provide primer when recommended by underlayment manufacturer.

1. Product and Manufacturer: Perm-A-Barrier System 4000; W.R. Grace & Co.

a. Thickness: 40 mils nominal.
b. Surface Conditioner: Perm-A-Barrier Surface Conditioner

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

a. CertainTeed Corporation.
b. Nord Bitumi US, Inc.
c. Polyguard Products, Inc.

B. Fasteners: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

1.8 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Paper-Surfaced Gypsum Sheathing Board: Elastomeric, medium-modulus, neutral-curing silicone joint sealant compatible with joint substrates formed by gypsum sheathing and other materials, recommended by sheathing manufacturer for application indicated, and complying with requirements for elastomeric sealants specified in Division 7 Section "Joint Sealants."

PART 3 - EXECUTION

1.9 INSTALLATION

A. General: Install gypsum sheathing to comply with GA-253 and manufacturer's written instructions.

1. Cut boards at penetrations, edges, and other obstructions of the work; fit tightly against abutting construction, except provide a 3/8-inch setback where non-load-bearing construction abuts structural elements.
2. Coordinate sheathing installation with flashing and joint sealant installation so these materials are installed in the sequence and manner that prevent exterior moisture from passing through completed exterior wall assembly.
3. Apply fasteners so screw heads bear tightly against face of sheathing boards but do not cut into facing.
4. Do not bridge building expansion joints with sheathing; cut and space edges to match spacing of structural support elements.

1.10 WEATHER-RESISTANT BARRIER INSTALLATION

A. Weather Barrier Application: Cover sheathing with weather barrier in accordance with manufacturer’s instructions and recommendations.

1. Prime surfaces in accordance with manufacturer’s instructions.
2. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
3. Apply barrier to cover vertical flashing with a minimum 4-inch overlap, unless otherwise indicated.

1.11 SHEATHING JOINT-AND-PENETRATION TREATMENT

A. Seal sheathing joints according to sheathing manufacturer's written recommendations.

1. Apply elastomeric sealant on joints and fasteners and trowel flat. Apply sufficient quantity of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.

END OF SECTION 09253

SECTION 09260 - GYPSUM BOARD ASSEMBLIES

PARAT 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Interior gypsum wallboard.

1.2 DEFINITIONS

A. Gypsum Board Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.3 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: For each product indicated.

C. Products - Recycled Content: Provide certification from manufacturer on product's recycled content.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance-Rated Assemblies: As indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

PART 2 - PRODUCTS

1.7 MANUFACTURERS

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

1. Steel Framing and Furring:

a. Dale Industries, Inc. - Dale/Incor.
b. Dietrich Industries, Inc.
c. Unimast, Inc.

2. Gypsum Board and Related Products:

a. G-P Gypsum Corp.
b. National Gypsum Company.
c. United States Gypsum Co.

1.8 STEEL SUSPENDED CEILING AND SOFFIT FRAMING

A. Components, General: Comply with ASTM C 754 for conditions indicated.

B. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch-diameter wire, or double strand of 0.0475-inch- diameter wire.

C. Hangers: As follows:

1. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.

D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base metal thickness of 0.0538 inch, a minimum 1/2-inch- wide flange, with ASTM A 653/A 653M, G40, hot-dip galvanized zinc coating.

E. Furring Channels (Furring Members): Commercial-steel sheet with ASTM A 653/A 653M, G40, hot-dip galvanized.

1. Cold Rolled Channels: 0.0538-inch bare steel thickness, with minimum 1/2-inch-wide flange, 3/4 inch deep.
2. Steel Studs: ASTM C 645.
3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.

F. Grid Suspension System for Interior Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Armstrong World Industries, Inc.; Furring Systems/Drywall.
b. Chicago Metallic Corporation; Drywall Furring System.
c. USG Interiors, Inc.; Drywall Suspension System.

1.9 STEEL PARTITION AND SOFFIT FRAMING

A. Components, General: As follows:

1. Comply with ASTM C 754 for conditions indicated.

B. Steel Studs and Runners: ASTM C 645.

C. Deep-Leg Deflection Track: ASTM C 645 top runner with 2-inch- deep flanges.

D. Proprietary Deflection Track – Contractor’s Option: Steel sheet top runner manufactured to prevent cracking of gypsum board applied to interior partitions resulting from deflection of structure above; in thickness indicated for studs and in width to accommodate depth of studs.

1. Product: Subject to compliance with requirements, provide one of the following:

a. Delta Star, Inc., Superior Metal Trim; Superior Flex Track System (SFT).
b. Metal-Lite, Inc.; Slotted Track.

E. Cold-Rolled Channel Bridging: 0.0538-inch bare steel thickness, with minimum 1/2-inch- wide flange.

1. Clip Angle: 1-1/2 by 1-1/2 inch, 0.068-inch- thick, galvanized steel.

F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

G. Cold-Rolled Furring Channels: 0.0538-inch bare steel thickness, with minimum 1/2-inch- wide flange.

1. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare steel thickness of 0.0312 inch.
2. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch-diameter wire, or double strand of 0.0475-inch- diameter wire.

H. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

1.10 INTERIOR GYPSUM WALLBOARD

A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

B. Gypsum Wallboard: ASTM C 36.

1. Type X:

a. Thickness: As indicated.

C. High Abuse Gypboard: ASTM C 36, manufactured to produce greater resistance to surface indentation and through-penetration than standard gypsum panels.

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

a. National Gypsum Company; Gold Bond Hi-Abuse Wallboard.
b. United States Gypsum Co.; SHEETROCK Brand Abuse-Resistant Gypsum Panels.

2. Thickness: As indicated.
3. Long Edges: Tapered.

1.11 TILE BACKING PANELS AND MOISTURE RESISTANT (MR) BOARD

A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

B. Tile Backer and Moisture Resistant (MR) Board: Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M.

1. Product: Subject to compliance with requirements, provide "Dens-Shield Tile Backer" manufactured by G-P Gypsum Corp.
2. Thickness: As indicated.

1.12 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Paper-faced galvanized steel sheet.

1.13 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.
2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

D. Joint Compound for Tile Backing Panels: As recommended by manufacturer.

1.14 ACOUSTICAL SEALANT

A. Products: Subject to compliance with requirements, provide one of the following:

1. Acoustical Sealant for Exposed and Concealed Joints:

a. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

1.15 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

D. Isolation Strip at Exterior Walls:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.

E. Thermal Insulation: As specified in Division 7 Section "Building Insulation."

PART 3 - EXECUTION

1.16 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

1.17 PREPARATION

A. Suspended Ceilings: Coordinate installation of ceiling suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers at spacing required to support ceilings and that hangers will develop their full strength.

1.18 INSTALLING STEEL FRAMING, GENERAL

A. Installation Standards: ASTM C 754, and 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 gypsum board manufacturer's written recommendations or, if none available, with United States Gypsum's "Gypsum Construction Handbook."

C. Do not bridge building control and expansion joints with steel framing or furring members. Frame both sides of joints independently.

1.19 INSTALLING STEEL SUSPENDED CEILING AND SOFFIT FRAMING

A. Suspend ceiling hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.
4. Secure hangers to structure, including intermediate framing members, by attaching to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not attach hangers to steel deck tabs.
6. Do not attach hangers to steel roof deck. Attach hangers to structural members.
7. Do not connect or suspend steel framing from ducts, pipes, or conduit.

B. Installation Tolerances: Install steel framing components for suspended ceilings so members for panel attachment are level to within 1/8 inch in 12 feetmeasured lengthwise on each member and transversely between parallel members.

C. Install suspended steel framing components in sizes and spacings indicated, but not less than that required by the referenced steel framing and installation standards.

D. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

1.20 INSTALLING STEEL PARTITION AND SOFFIT FRAMING

A. General: Install tracks (runners) at floors, ceilings, and structural walls and columns where gypsum board assemblies abut other construction.

B. Installation Tolerance: Install each steel framing and furring member so fastening surfaces vary not 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.

D. Install steel studs so flanges point in the same direction and leading edge or end of each panel can be attached to open (unsupported) edges of stud flanges first.

E. Frame door openings to comply with GA-600 and with gypsum board manufacturer's applicable written recommendations, unless otherwise indicated. Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

1. Install two 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.

F. Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

1.21 APPLYING AND FINISHING PANELS, GENERAL

A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.

B. 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.

C. Install gypsum panels with face side out. 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.

D. Locate edge and 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. Do not make joints other than control joints at corners of framed openings.

E. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

F. Attach gypsum panels to framing provided at openings and cutouts.

G. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members using resilient channels, or provide control joints to counteract wood shrinkage.

H. Form control and expansion joints with space between edges of adjoining gypsum panels.

I. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless 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.

J. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except floors. 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.

K. Floating Construction: Where feasible, including where recommended in writing by manufacturer, install gypsum panels over wood framing, with floating internal corner construction.

L. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.

1. Space screws a maximum of 12 inches on center for vertical applications.

M. Space fasteners in panels that are tile substrates a maximum of 8 inches on center

1.22 PANEL APPLICATION METHODS

A. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.

2. On partitions/walls, apply gypsum, unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

a. Stagger abutting end joints not less than one framing member in alternate courses of board.

B. Multilayer Application on Partitions/Walls: Apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

C. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.

1. Install with 1/4-inch open space where panels abut other construction or structural penetrations.
2. Fasten with corrosion-resistant screws.

D. Tile Backing Panels:

1. Glass-Mat, Water-Resistant Backing Panel: Comply with manufacturer's written installation instructions and install at locations indicated. Install with 1/4-inch gap where panels abut other construction or penetrations.

1.23 INSTALLING TRIM ACCESSORIES

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

1.24 FINISHING GYPSUM BOARD ASSEMBLIES

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

1. Prefill open joints and damaged surface areas.
2. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

B. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:

1. Concealed Locations: Level 3.
2. All Other Locations: Level 5.

C. Glass-Mat, Water-Resistant Backing Panels: Finish according to manufacturer's written instructions.

END OF SECTION 09260

SECTION 09265 - GYPSUM BOARD SHAFT-WALL ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Shaft enclosures.

1.2 DEFINITIONS

A. Gypsum Board Construction Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board construction not defined in this Section or in other referenced standards.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance:

1. Provide gypsum board shaft-wall assemblies capable of withstanding air-pressure loads indicated for maximum heights of partitions without failing and while maintaining an airtight and smoke-tight seal. Evidence of failure includes deflections exceeding limits indicated, bending stresses causing studs to break or to distort, and end-reaction shear causing track (runners) to bend or to shear and studs to become crippled.
2. Provide gypsum board shaft-wall assemblies for horizontal duct enclosures capable of spanning distances indicated within deflection limits indicated.

1.4 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: For each gypsum board shaft-wall assembly indicated.

C. Fire-Test-Response Reports: From a qualified independent testing and inspecting agency substantiating each gypsum board shaft-wall assembly's required fire-resistance rating.

1. Include data substantiating that elevator entrances and other items that penetrate each gypsum board shaft-wall assembly do not negate fire-resistance rating.

D. Research/Evaluation Reports: Evidence of compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction that substantiate required fire-resistance rating for each gypsum board shaft-wall assembly.

E. Products - Recycled Content: Provide certification from manufacturer on product's recycled content.

1.5 QUALITY ASSURANCE

A. Fire-Resistance-Rated Assemblies: Provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance-Rated Assemblies: As indicated.

B. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Management and Coordination." Review methods and procedures for installing work related to gypsum board shaft-wall assemblies including, but not limited to, the following:

1. Fasteners proposed for anchoring steel framing to building structure.
2. Items supported by shaft-wall-assembly framing.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, and 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. Stack gypsum panels flat on leveled supports off the ground to prevent sagging.

1.7 PROJECT CONDITIONS

A. Comply with requirements for environmental conditions, room temperatures, and ventilation specified in Division 9 Section, Gypsum Board Assemblies.

PART 2 - PRODUCTS

1.8 ASSEMBLY MATERIALS

A. General: Provide materials and components complying with requirements of fire-resistance-rated assemblies indicated.

1. Provide panels in maximum lengths available to eliminate or minimize end-to-end butt joints.
2. Provide auxiliary materials complying with gypsum board shaft-wall assembly manufacturer's written recommendations.

B. Steel Framing: ASTM C 645.

1. Protective Coating: ASTM A 653/A 653M, G40, hot-dip galvanized coating.

C. Gypsum Liner Panels: Manufacturer's proprietary liner panels in 1-inch thickness and with moisture-resistant paper faces.

D. Gypsum Wallboard: ASTM C 36, core type as required by fire-resistance-rated assembly indicated.

E. Accessories: Cornerbead, edge trim, and control joints of material and shapes specified in Division 9 Section Gypsum Board Assemblies that comply with gypsum board shaft-wall assembly manufacturer's written recommendations for application indicated.

F. Gypsum Wallboard Joint-Treatment Materials: ASTM C 475 and as specified in Division 9 Section Gypsum Board Assemblies.

G. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

H. Track (Runner) Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft-wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.

I. Acoustical Sealant: As recommended by gypsum board shaft-wall assembly manufacturer for application indicated.

1.9 GYPSUM BOARD SHAFT WALL

A. Basis-of-Design Product: Cavity Shaft Walls; United States Gypsum Company.

B. Studs: Manufacturer's standard profile for repetitive members and corner and end members and for fire-resistance-rated assembly indicated.

C. Track (Runner): Manufacturer's standard J-profile track with long-leg length as standard with manufacturer, in depth matching studs.

D. Room-Side Finish: Gypsum board.

E. Shaft-Side Finish: As indicated by fire-resistance-rated assembly design designation.

PART 3 - EXECUTION

1.10 EXAMINATION

A. Examine substrates to which gypsum board shaft-wall assemblies attach or abut, with Installer present, including hollow-metal frames, elevator hoistway door frames, cast-in anchors, and structural framing. Examine for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

1.11 INSTALLATION

A. General: Install gypsum board shaft-wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and the following:

1. ASTM C 754 for installing steel framing.
2. Division 9 Section "Gypsum Board Assemblies" for applying and finishing panels.

B. Do not bridge building expansion joints with shaft-wall assemblies; frame both sides of joints with furring and other support.

C. Install supplementary framing in gypsum board shaft-wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, and similar items that cannot be supported directly by shaft-wall assembly framing.

D. At penetrations in shaft wall, maintain fire-resistance rating of shaft-wall assembly by installing supplementary steel framing around perimeter of penetration and fire

protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.

E. Isolate gypsum finish panels from building structure to prevent cracking of finish panels while maintaining continuity of fire-rated construction.

F. Install control joints to maintain fire-resistance rating of assemblies.

G. Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly. Install acoustical sealant to withstand dislocation by air-pressure differential between shaft and external spaces; maintain an airtight and smoke-tight seal; and comply with manufacturer's written instructions or ASTM C 919, whichever is more stringent.

END OF SECTION 09265

SECTION 09310 - CERAMIC TILE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Tile.

1.2 DEFINITIONS

A. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.

B. Facial Dimension: Actual tile size (minor facial dimension as measured per ASTM C 499).

C. Facial Dimension: Nominal tile size as defined in ANSI A137.1.

1.3 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:

1. Level Surfaces: Minimum 0.6.
2. Step Treads: Minimum 0.6.
3. Ramp Surfaces: Minimum 0.8.

1.4 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

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

C. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

D. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required.
2. Assembled samples with grouted joints for each type and composition of tile and for each color and finish required, at least 12 inches square and mounted on rigid panel. Use grout of type and in color or colors approved for completed work.
3. Full-size units of each type of trim and accessory for each color and finish required.
4. Stone thresholds in 6-inch lengths.
5. Metal edge strips in 6-inch lengths.

E. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

F. Product Certificates: For each type of product, signed by product manufacturer.

G. Qualification Data: For Installer.

H. Material Test Reports: For each tile-setting and -grouting product.

I. Products - Recycled Content: Provide certification from manufacturer on product's recycled content.

1.5 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain all tile from one source or producer.

1. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. 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.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section through one source from a single manufacturer for each product:

1. Stone thresholds.
2. Waterproofing.
3. Joint sealants.
4. Cementitious backer units.
5. Metal edge strips.

D. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects.

1. Build mockup of each type of floor tile installation.

2. Build mockup of each type of wall tile installation.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1.

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 in ANSI A137.1 for labeling sealed tile packages.

B. Store tile and 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. Handle tile that has 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 complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. 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

1.9 TILE PRODUCTS

A. Products and Manufacturers – Basis of Design: Refer to the Finish Legend.

1. Adhesive: Chapco, “Safe-set”

B. Waterproofing: Laticrete 9235 Waterproof Membrane; LATICRETE International Inc.

1.10 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges at 1:2 slope, aligning lower edge of bevel with adjacent floor finish. Limit height of bevel to 1/2 inch or less, and finish bevel to match face of threshold.

B. Marble Thresholds: ASTM C 503 with a minimum abrasion resistance of [**10**] **12** per ASTM C 1353 or ASTM C 241 and with honed finish.

1. Description: Uniform, fine- to medium-grained white stone with gray veining.
2. Description: Match Architect's sample.

1.11 WATERPROOFING FOR THIN-SET TILE INSTALLATIONS

A. General: Manufacturer's standard product that complies with ANSI A118.10.

B. Fabric-Reinforced, Fluid-Applied Product: System consisting of liquid-latex rubber and fabric reinforcement.

1. Product and Manufacturer – Basis of Design:

a. LATICRETE International Inc.; Laticrete 9235 Waterproof Membrane.

1.12 SETTING MATERIAL

A. Adhesive:

1. Product and Manufacturer – Basis of Design:

a. Chapco, “Safe-set”

1.13 GROUT

A. Polymer-Modified Tile Grout: ANSI A118.7.

1. Polymer Admixture: Acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix.

a. Product and Manufacturer – Basis of Design: Laticrete 1776 Grout Admix Plus; Laticrete International, Inc.

2. Unsanded Grout: Factory prepared, unsanded Portland cement grout designed to be mixed with polymer admixture; for joints 1/8 inch and narrower.
3. Sanded Grout: Factory prepared, sanded cement grout designed to be mixed with polymer admixture mixture for joints 1/8 inch and wider.

B. Grout Colors: To be selected by the Architect from manufacturer’s standard color selections.

1.14 ELASTOMERIC SEALANTS

A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements in Division 7 Section "Joint Sealants."

1.15 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. 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.

1.16 MIXING GROUT

A. Mix 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

1.17 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 of 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 joint locations in consultation with Architect.

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

1.18 PREPARATION

A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.

B. Provide concrete substrates for tile floors installed with adhesives that comply with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.

1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions. Use product specifically recommended by tile-setting material manufacturer.
2. Remove protrusions, bumps, and ridges by sanding or grinding.

1.19 INSTALLATION, GENERAL

A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "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. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.

C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. 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.

E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are 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. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.

F. Lay out tile wainscots to next full tile beyond dimensions indicated.

G. 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 in Division 7 Section "Joint Sealants."

H. Grout tile to comply with requirements of the following tile installation standards:

1. For chemical-resistant epoxy grouts, comply with ANSI A108.6.

1.20 WATERPROOFING INSTALLATION

A. Install waterproofing to comply with ANSI A108.13 and waterproofing manufacturer's written instructions to produce 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.

1.21 FLOOR TILE INSTALLATION

A. General: Install tile to comply with requirements in the Floor Tile Installation Schedule, including those referencing TCA installation methods and ANSI A108 Series of tile installation standards.

B. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.

1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent nontile floor finish.

1.22 WALL TILE INSTALLATION

A. Install types of tile designated for wall installations to comply with requirements in the Wall Tile Installation Schedule, including those referencing TCA installation methods and ANSI setting-bed standards.

B. Install metal lath and scratch coat for walls to comply with ANSI A108.1A, Section 4.1.

1.23 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 epoxy grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces 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. When recommended by tile manufacturer, apply 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.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION 09310

SECTION 09511 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

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

B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete at ceilings.

1.2 DEFINITIONS

A. AC: Articulation Class.

B. CAC: Ceiling Attenuation Class.

C. LR: Light Reflectance coefficient.

D. NRC: Noise Reduction Coefficient.

1.3 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

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

C. Coordinate Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:

1. Ceiling suspension members.
2. Method of attaching hangers to building structure.
3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Panel: Set of 6-inch- square Samples of each type, color, pattern, and texture.

2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch-long Samples of each type, finish, and color.

E. Qualification Data: For testing agency.

F. Field quality-control test reports.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.

H. Research/Evaluation Reports: For each acoustical panel ceiling and components.

I. Maintenance Data: For finishes to include in maintenance manuals.

J. Products - Recycled Content: Provide certification from manufacturer on product's recycled content.

1.4 QUALITY ASSURANCE

A. Acoustical Testing Agency Qualifications: An independent testing laboratory, or an NVLAP-accredited laboratory, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.

B. Source Limitations:

1. Acoustical Ceiling Panel: Obtain each type through one source from a single manufacturer.
2. Suspension System: Obtain each type through one source from a single manufacturer.

C. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.

D. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:

1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

a. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
b. Identify materials with appropriate markings of applicable testing and inspecting agency.

2. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:

   a. Smoke-Developed Index: 450 or less.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

1.7 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed.
2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

1.9 ACOUSTICAL PANELS, GENERAL

A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectance, unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.

B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

1.10 CEILING PANELS

A. Product and Manufacturer – Basis of Design:

1. Ultima; Armstrong World Industries, Inc.

B. Color: Selected by the Architect from manufacturer's full range.

C. LR: Not less than 0.89.

D. NRC: Not less than 0.70.

E. Edge Profile: 9/16-inch beveled tegular.

F. Size: As indicated.

G. Recycled Content: Not less than 79%.

1.11 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.
3. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.135-inch- diameter wire.

E. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch-thick, galvanized steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.

F. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches on center on all cross tees.

1.12 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed Sheet-Metal Edge Moldings and Trim: Manufacturer’s standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

1. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.

2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

PART 3 - EXECUTION

1.13 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

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

1.14 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

1.15 INSTALLATION, GENERAL

A. General: Install acoustical panel ceilings to comply with ASTM C 636, in accordance with manufacturer's written instructions, and CISCA's "Ceiling Systems Handbook."

1.16 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09511

SECTION 09253 - GYPSUM SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes gypsum sheathing attached to steel framing members of exterior walls.

1.2 DEFINITIONS

A. Gypsum Board Construction Terminology Standard: Refer to ASTM C 11 and GA-505 for definitions of terms for gypsum sheathing board construction not defined in this Section or in other referenced standards.

1.3 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: For each product specified.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each gypsum sheathing product through one source from a single manufacturer.

B. Fire-Resistance-Rated Assemblies: Where gypsum sheathing boards are part of fire-resistance-rated assemblies, provide assemblies as follows:

1. Assemblies comply with requirements of fire-response-tested assemblies indicated by GA File Numbers in GA-600, "Fire Resistance Design Manual"; or by design designations in UL's "Fire Resistance Directory" or in certification listings of another testing and inspecting agency acceptable to authorities having jurisdiction.
2. Fire-resistance ratings were determined by fire-response testing assemblies according to ASTM E 119.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles, each bearing brand name and identification of manufacturer.

B. Store materials protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, or other causes. Neatly stack gypsum sheathing board flat on leveled supports off the ground, under cover, and fully protected from weather.

PART 2 - PRODUCTS

1.6 GYPSUM SHEATHING BOARD

A. Paper-Surfaced Gypsum Sheathing Board: ASTM C 79/C 79M, with water-resistant material incorporated into core and with water-repellent paper bonded to core's face, back, and long edges.

1. Type and Thickness: Type X, 5/8 inch thick, unless otherwise indicated.

1.7 ACCESSORY MATERIALS

A. Weather Barrier: Self-Adhering, Polymer-Modified, Bituminous Sheet Underlayment: ASTM D 1970, minimum of 40 mils thick. Provide primer when recommended by underlayment manufacturer.

1. Product and Manufacturer: Perm-A-Barrier System 4000; W.R. Grace & Co.

a. Thickness: 40 mils nominal.
b. Surface Conditioner: Perm-A-Barrier Surface Conditioner

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

a. CertainTeed Corporation.
b. Nord Bitumi US, Inc.
c. Polyguard Products, Inc.

B. Fasteners: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

1.8 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Paper-Surfaced Gypsum Sheathing Board: Elastomeric, medium-modulus, neutral-curing silicone joint sealant compatible with joint substrates formed by gypsum sheathing and other materials, recommended by sheathing manufacturer for application indicated, and complying with requirements for elastomeric sealants specified in Division 7 Section "Joint Sealants."

PART 3 - EXECUTION

1.9 INSTALLATION

A. General: Install gypsum sheathing to comply with GA-253 and manufacturer's written instructions.

1. Cut boards at penetrations, edges, and other obstructions of the work; fit tightly against abutting construction, except provide a 3/8-inch setback where non-load-bearing construction abuts structural elements.
2. Coordinate sheathing installation with flashing and joint sealant installation so these materials are installed in the sequence and manner that prevent exterior moisture from passing through completed exterior wall assembly.
3. Apply fasteners so screw heads bear tightly against face of sheathing boards but do not cut into facing.
4. Do not bridge building expansion joints with sheathing; cut and space edges to match spacing of structural support elements.

1.10 WEATHER-RESISTANT BARRIER INSTALLATION

A. Weather Barrier Application: Cover sheathing with weather barrier in accordance with manufacturer’s instructions and recommendations.

1. Prime surfaces in accordance with manufacturer’s instructions.
2. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
3. Apply barrier to cover vertical flashing with a minimum 4-inch overlap, unless otherwise indicated.

1.11 SHEATHING JOINT-AND-PENETRATION TREATMENT

A. Seal sheathing joints according to sheathing manufacturer's written recommendations.

1. Apply elastomeric sealant on joints and fasteners and trowel flat. Apply sufficient quantity of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.

END OF SECTION 09253

SECTION 09260 - GYPSUM BOARD ASSEMBLIES

PARAT 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Interior gypsum wallboard.

1.2 DEFINITIONS

A. Gypsum Board Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.3 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: For each product indicated.

C. Products - Recycled Content: Provide certification from manufacturer on product's recycled content.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance-Rated Assemblies: As indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

PART 2 - PRODUCTS

1.7 MANUFACTURERS

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

1. Steel Framing and Furring:

a. Dale Industries, Inc. - Dale/Incor.
b. Dietrich Industries, Inc.
c. Unimast, Inc.

2. Gypsum Board and Related Products:

a. G-P Gypsum Corp.
b. National Gypsum Company.
c. United States Gypsum Co.

1.8 STEEL SUSPENDED CEILING AND SOFFIT FRAMING

A. Components, General: Comply with ASTM C 754 for conditions indicated.

B. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch-diameter wire, or double strand of 0.0475-inch- diameter wire.

C. Hangers: As follows:

1. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.

D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base metal thickness of 0.0538 inch, a minimum 1/2-inch- wide flange, with ASTM A 653/A 653M, G40, hot-dip galvanized zinc coating.

E. Furring Channels (Furring Members): Commercial-steel sheet with ASTM A 653/A 653M, G40, hot-dip galvanized.

1. Cold Rolled Channels: 0.0538-inch bare steel thickness, with minimum 1/2-inch-wide flange, 3/4 inch deep.
2. Steel Studs: ASTM C 645.
3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.

F. Grid Suspension System for Interior Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Armstrong World Industries, Inc.; Furring Systems/Drywall.
b. Chicago Metallic Corporation; Drywall Furring System.
c. USG Interiors, Inc.; Drywall Suspension System.

1.9 STEEL PARTITION AND SOFFIT FRAMING

A. Components, General: As follows:

1. Comply with ASTM C 754 for conditions indicated.

B. Steel Studs and Runners: ASTM C 645.

C. Deep-Leg Deflection Track: ASTM C 645 top runner with 2-inch- deep flanges.

D. Proprietary Deflection Track – Contractor’s Option: Steel sheet top runner manufactured to prevent cracking of gypsum board applied to interior partitions resulting from deflection of structure above; in thickness indicated for studs and in width to accommodate depth of studs.

1. Product: Subject to compliance with requirements, provide one of the following:

a. Delta Star, Inc., Superior Metal Trim; Superior Flex Track System (SFT).
b. Metal-Lite, Inc.; Slotted Track.

E. Cold-Rolled Channel Bridging: 0.0538-inch bare steel thickness, with minimum 1/2-inch- wide flange.

1. Clip Angle: 1-1/2 by 1-1/2 inch, 0.068-inch- thick, galvanized steel.

F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

G. Cold-Rolled Furring Channels: 0.0538-inch bare steel thickness, with minimum 1/2-inch- wide flange.

1. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare steel thickness of 0.0312 inch.
2. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch-diameter wire, or double strand of 0.0475-inch- diameter wire.

H. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

1.10 INTERIOR GYPSUM WALLBOARD

A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

B. Gypsum Wallboard: ASTM C 36.

1. Type X:

a. Thickness: As indicated.

C. High Abuse Gypboard: ASTM C 36, manufactured to produce greater resistance to surface indentation and through-penetration than standard gypsum panels.

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

a. National Gypsum Company; Gold Bond Hi-Abuse Wallboard.
b. United States Gypsum Co.; SHEETROCK Brand Abuse-Resistant Gypsum Panels.

2. Thickness: As indicated.
3. Long Edges: Tapered.

1.11 TILE BACKING PANELS AND MOISTURE RESISTANT (MR) BOARD

A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

B. Tile Backer and Moisture Resistant (MR) Board: Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M.

1. Product: Subject to compliance with requirements, provide "Dens-Shield Tile Backer" manufactured by G-P Gypsum Corp.
2. Thickness: As indicated.

1.12 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Paper-faced galvanized steel sheet.

1.13 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.
2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

D. Joint Compound for Tile Backing Panels: As recommended by manufacturer.

1.14 ACOUSTICAL SEALANT

A. Products: Subject to compliance with requirements, provide one of the following:

1. Acoustical Sealant for Exposed and Concealed Joints:

a. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

1.15 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

D. Isolation Strip at Exterior Walls:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.

E. Thermal Insulation: As specified in Division 7 Section "Building Insulation."

PART 3 - EXECUTION

1.16 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

1.17 PREPARATION

A. Suspended Ceilings: Coordinate installation of ceiling suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers at spacing required to support ceilings and that hangers will develop their full strength.

1.18 INSTALLING STEEL FRAMING, GENERAL

A. Installation Standards: ASTM C 754, and 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 gypsum board manufacturer's written recommendations or, if none available, with United States Gypsum's "Gypsum Construction Handbook."

C. Do not bridge building control and expansion joints with steel framing or furring members. Frame both sides of joints independently.

1.19 INSTALLING STEEL SUSPENDED CEILING AND SOFFIT FRAMING

A. Suspend ceiling hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.
4. Secure hangers to structure, including intermediate framing members, by attaching to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not attach hangers to steel deck tabs.
6. Do not attach hangers to steel roof deck. Attach hangers to structural members.
7. Do not connect or suspend steel framing from ducts, pipes, or conduit.

B. Installation Tolerances: Install steel framing components for suspended ceilings so members for panel attachment are level to within 1/8 inch in 12 feetmeasured lengthwise on each member and transversely between parallel members.

C. Install suspended steel framing components in sizes and spacings indicated, but not less than that required by the referenced steel framing and installation standards.

D. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

1.20 INSTALLING STEEL PARTITION AND SOFFIT FRAMING

A. General: Install tracks (runners) at floors, ceilings, and structural walls and columns where gypsum board assemblies abut other construction.

B. Installation Tolerance: Install each steel framing and furring member so fastening surfaces vary not 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.

D. Install steel studs so flanges point in the same direction and leading edge or end of each panel can be attached to open (unsupported) edges of stud flanges first.

E. Frame door openings to comply with GA-600 and with gypsum board manufacturer's applicable written recommendations, unless otherwise indicated. Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

1. Install two 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.

F. Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

1.21 APPLYING AND FINISHING PANELS, GENERAL

A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.

B. 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.

C. Install gypsum panels with face side out. 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.

D. Locate edge and 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. Do not make joints other than control joints at corners of framed openings.

E. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

F. Attach gypsum panels to framing provided at openings and cutouts.

G. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members using resilient channels, or provide control joints to counteract wood shrinkage.

H. Form control and expansion joints with space between edges of adjoining gypsum panels.

I. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless 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.

J. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except floors. 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.

K. Floating Construction: Where feasible, including where recommended in writing by manufacturer, install gypsum panels over wood framing, with floating internal corner construction.

L. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.

1. Space screws a maximum of 12 inches on center for vertical applications.

M. Space fasteners in panels that are tile substrates a maximum of 8 inches on center

1.22 PANEL APPLICATION METHODS

A. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.

2. On partitions/walls, apply gypsum, unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

a. Stagger abutting end joints not less than one framing member in alternate courses of board.

B. Multilayer Application on Partitions/Walls: Apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

C. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.

1. Install with 1/4-inch open space where panels abut other construction or structural penetrations.
2. Fasten with corrosion-resistant screws.

D. Tile Backing Panels:

1. Glass-Mat, Water-Resistant Backing Panel: Comply with manufacturer's written installation instructions and install at locations indicated. Install with 1/4-inch gap where panels abut other construction or penetrations.

1.23 INSTALLING TRIM ACCESSORIES

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

1.24 FINISHING GYPSUM BOARD ASSEMBLIES

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

1. Prefill open joints and damaged surface areas.
2. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

B. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:

1. Concealed Locations: Level 3.
2. All Other Locations: Level 5.

C. Glass-Mat, Water-Resistant Backing Panels: Finish according to manufacturer's written instructions.

END OF SECTION 09260

SECTION 09265 - GYPSUM BOARD SHAFT-WALL ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Shaft enclosures.

1.2 DEFINITIONS

A. Gypsum Board Construction Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board construction not defined in this Section or in other referenced standards.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance:

1. Provide gypsum board shaft-wall assemblies capable of withstanding air-pressure loads indicated for maximum heights of partitions without failing and while maintaining an airtight and smoke-tight seal. Evidence of failure includes deflections exceeding limits indicated, bending stresses causing studs to break or to distort, and end-reaction shear causing track (runners) to bend or to shear and studs to become crippled.
2. Provide gypsum board shaft-wall assemblies for horizontal duct enclosures capable of spanning distances indicated within deflection limits indicated.

1.4 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: For each gypsum board shaft-wall assembly indicated.

C. Fire-Test-Response Reports: From a qualified independent testing and inspecting agency substantiating each gypsum board shaft-wall assembly's required fire-resistance rating.

1. Include data substantiating that elevator entrances and other items that penetrate each gypsum board shaft-wall assembly do not negate fire-resistance rating.

D. Research/Evaluation Reports: Evidence of compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction that substantiate required fire-resistance rating for each gypsum board shaft-wall assembly.

E. Products - Recycled Content: Provide certification from manufacturer on product's recycled content.

1.5 QUALITY ASSURANCE

A. Fire-Resistance-Rated Assemblies: Provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance-Rated Assemblies: As indicated.

B. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Management and Coordination." Review methods and procedures for installing work related to gypsum board shaft-wall assemblies including, but not limited to, the following:

1. Fasteners proposed for anchoring steel framing to building structure.
2. Items supported by shaft-wall-assembly framing.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, and 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. Stack gypsum panels flat on leveled supports off the ground to prevent sagging.

1.7 PROJECT CONDITIONS

A. Comply with requirements for environmental conditions, room temperatures, and ventilation specified in Division 9 Section, Gypsum Board Assemblies.

PART 2 - PRODUCTS

1.8 ASSEMBLY MATERIALS

A. General: Provide materials and components complying with requirements of fire-resistance-rated assemblies indicated.

1. Provide panels in maximum lengths available to eliminate or minimize end-to-end butt joints.
2. Provide auxiliary materials complying with gypsum board shaft-wall assembly manufacturer's written recommendations.

B. Steel Framing: ASTM C 645.

1. Protective Coating: ASTM A 653/A 653M, G40, hot-dip galvanized coating.

C. Gypsum Liner Panels: Manufacturer's proprietary liner panels in 1-inch thickness and with moisture-resistant paper faces.

D. Gypsum Wallboard: ASTM C 36, core type as required by fire-resistance-rated assembly indicated.

E. Accessories: Cornerbead, edge trim, and control joints of material and shapes specified in Division 9 Section Gypsum Board Assemblies that comply with gypsum board shaft-wall assembly manufacturer's written recommendations for application indicated.

F. Gypsum Wallboard Joint-Treatment Materials: ASTM C 475 and as specified in Division 9 Section Gypsum Board Assemblies.

G. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

H. Track (Runner) Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft-wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.

I. Acoustical Sealant: As recommended by gypsum board shaft-wall assembly manufacturer for application indicated.

1.9 GYPSUM BOARD SHAFT WALL

A. Basis-of-Design Product: Cavity Shaft Walls; United States Gypsum Company.

B. Studs: Manufacturer's standard profile for repetitive members and corner and end members and for fire-resistance-rated assembly indicated.

C. Track (Runner): Manufacturer's standard J-profile track with long-leg length as standard with manufacturer, in depth matching studs.

D. Room-Side Finish: Gypsum board.

E. Shaft-Side Finish: As indicated by fire-resistance-rated assembly design designation.

PART 3 - EXECUTION

1.10 EXAMINATION

A. Examine substrates to which gypsum board shaft-wall assemblies attach or abut, with Installer present, including hollow-metal frames, elevator hoistway door frames, cast-in anchors, and structural framing. Examine for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

1.11 INSTALLATION

A. General: Install gypsum board shaft-wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and the following:

1. ASTM C 754 for installing steel framing.
2. Division 9 Section "Gypsum Board Assemblies" for applying and finishing panels.

B. Do not bridge building expansion joints with shaft-wall assemblies; frame both sides of joints with furring and other support.

C. Install supplementary framing in gypsum board shaft-wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, and similar items that cannot be supported directly by shaft-wall assembly framing.

D. At penetrations in shaft wall, maintain fire-resistance rating of shaft-wall assembly by installing supplementary steel framing around perimeter of penetration and fire

protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.

E. Isolate gypsum finish panels from building structure to prevent cracking of finish panels while maintaining continuity of fire-rated construction.

F. Install control joints to maintain fire-resistance rating of assemblies.

G. Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly. Install acoustical sealant to withstand dislocation by air-pressure differential between shaft and external spaces; maintain an airtight and smoke-tight seal; and comply with manufacturer's written instructions or ASTM C 919, whichever is more stringent.

END OF SECTION 09265

SECTION 09310 - CERAMIC TILE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Tile.

1.2 DEFINITIONS

A. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.

B. Facial Dimension: Actual tile size (minor facial dimension as measured per ASTM C 499).

C. Facial Dimension: Nominal tile size as defined in ANSI A137.1.

1.3 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:

1. Level Surfaces: Minimum 0.6.
2. Step Treads: Minimum 0.6.
3. Ramp Surfaces: Minimum 0.8.

1.4 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

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

C. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

D. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required.
2. Assembled samples with grouted joints for each type and composition of tile and for each color and finish required, at least 12 inches square and mounted on rigid panel. Use grout of type and in color or colors approved for completed work.
3. Full-size units of each type of trim and accessory for each color and finish required.
4. Stone thresholds in 6-inch lengths.
5. Metal edge strips in 6-inch lengths.

E. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

F. Product Certificates: For each type of product, signed by product manufacturer.

G. Qualification Data: For Installer.

H. Material Test Reports: For each tile-setting and -grouting product.

I. Products - Recycled Content: Provide certification from manufacturer on product's recycled content.

1.5 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain all tile from one source or producer.

1. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. 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.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section through one source from a single manufacturer for each product:

1. Stone thresholds.
2. Waterproofing.
3. Joint sealants.
4. Cementitious backer units.
5. Metal edge strips.

D. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects.

1. Build mockup of each type of floor tile installation.

2. Build mockup of each type of wall tile installation.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1.

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 in ANSI A137.1 for labeling sealed tile packages.

B. Store tile and 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. Handle tile that has 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 complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. 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

1.9 TILE PRODUCTS

A. Products and Manufacturers – Basis of Design: Refer to the Finish Legend.

1. Adhesive: Chapco, “Safe-set”

B. Waterproofing: Laticrete 9235 Waterproof Membrane; LATICRETE International Inc.

1.10 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges at 1:2 slope, aligning lower edge of bevel with adjacent floor finish. Limit height of bevel to 1/2 inch or less, and finish bevel to match face of threshold.

B. Marble Thresholds: ASTM C 503 with a minimum abrasion resistance of [**10**] **12** per ASTM C 1353 or ASTM C 241 and with honed finish.

1. Description: Uniform, fine- to medium-grained white stone with gray veining.
2. Description: Match Architect's sample.

1.11 WATERPROOFING FOR THIN-SET TILE INSTALLATIONS

A. General: Manufacturer's standard product that complies with ANSI A118.10.

B. Fabric-Reinforced, Fluid-Applied Product: System consisting of liquid-latex rubber and fabric reinforcement.

1. Product and Manufacturer – Basis of Design:

a. LATICRETE International Inc.; Laticrete 9235 Waterproof Membrane.

1.12 SETTING MATERIAL

A. Adhesive:

1. Product and Manufacturer – Basis of Design:

a. Chapco, “Safe-set”

1.13 GROUT

A. Polymer-Modified Tile Grout: ANSI A118.7.

1. Polymer Admixture: Acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix.

a. Product and Manufacturer – Basis of Design: Laticrete 1776 Grout Admix Plus; Laticrete International, Inc.

2. Unsanded Grout: Factory prepared, unsanded Portland cement grout designed to be mixed with polymer admixture; for joints 1/8 inch and narrower.
3. Sanded Grout: Factory prepared, sanded cement grout designed to be mixed with polymer admixture mixture for joints 1/8 inch and wider.

B. Grout Colors: To be selected by the Architect from manufacturer’s standard color selections.

1.14 ELASTOMERIC SEALANTS

A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements in Division 7 Section "Joint Sealants."

1.15 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. 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.

1.16 MIXING GROUT

A. Mix 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

1.17 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 of 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 joint locations in consultation with Architect.

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

1.18 PREPARATION

A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.

B. Provide concrete substrates for tile floors installed with adhesives that comply with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.

1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions. Use product specifically recommended by tile-setting material manufacturer.
2. Remove protrusions, bumps, and ridges by sanding or grinding.

1.19 INSTALLATION, GENERAL

A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "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. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.

C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. 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.

E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are 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. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.

F. Lay out tile wainscots to next full tile beyond dimensions indicated.

G. 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 in Division 7 Section "Joint Sealants."

H. Grout tile to comply with requirements of the following tile installation standards:

1. For chemical-resistant epoxy grouts, comply with ANSI A108.6.

1.20 WATERPROOFING INSTALLATION

A. Install waterproofing to comply with ANSI A108.13 and waterproofing manufacturer's written instructions to produce 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.

1.21 FLOOR TILE INSTALLATION

A. General: Install tile to comply with requirements in the Floor Tile Installation Schedule, including those referencing TCA installation methods and ANSI A108 Series of tile installation standards.

B. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.

1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent nontile floor finish.

1.22 WALL TILE INSTALLATION

A. Install types of tile designated for wall installations to comply with requirements in the Wall Tile Installation Schedule, including those referencing TCA installation methods and ANSI setting-bed standards.

B. Install metal lath and scratch coat for walls to comply with ANSI A108.1A, Section 4.1.

1.23 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 epoxy grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces 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. When recommended by tile manufacturer, apply 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.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION 09310

SECTION 09511 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

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

B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete at ceilings.

1.2 DEFINITIONS

A. AC: Articulation Class.

B. CAC: Ceiling Attenuation Class.

C. LR: Light Reflectance coefficient.

D. NRC: Noise Reduction Coefficient.

1.3 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

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

C. Coordinate Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:

1. Ceiling suspension members.
2. Method of attaching hangers to building structure.
3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Panel: Set of 6-inch- square Samples of each type, color, pattern, and texture.

2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch-long Samples of each type, finish, and color.

E. Qualification Data: For testing agency.

F. Field quality-control test reports.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.

H. Research/Evaluation Reports: For each acoustical panel ceiling and components.

I. Maintenance Data: For finishes to include in maintenance manuals.

J. Products - Recycled Content: Provide certification from manufacturer on product's recycled content.

1.4 QUALITY ASSURANCE

A. Acoustical Testing Agency Qualifications: An independent testing laboratory, or an NVLAP-accredited laboratory, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.

B. Source Limitations:

1. Acoustical Ceiling Panel: Obtain each type through one source from a single manufacturer.
2. Suspension System: Obtain each type through one source from a single manufacturer.

C. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.

D. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:

1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

a. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
b. Identify materials with appropriate markings of applicable testing and inspecting agency.

2. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:

   a. Smoke-Developed Index: 450 or less.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

1.7 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed.
2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

1.9 ACOUSTICAL PANELS, GENERAL

A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectance, unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.

B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

1.10 CEILING PANELS

A. Product and Manufacturer – Basis of Design:

1. Ultima; Armstrong World Industries, Inc.

B. Color: Selected by the Architect from manufacturer's full range.

C. LR: Not less than 0.89.

D. NRC: Not less than 0.70.

E. Edge Profile: 9/16-inch beveled tegular.

F. Size: As indicated.

G. Recycled Content: Not less than 79%.

1.11 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.
3. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.135-inch- diameter wire.

E. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch-thick, galvanized steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.

F. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches on center on all cross tees.

1.12 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed Sheet-Metal Edge Moldings and Trim: Manufacturer’s standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

1. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.

2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

PART 3 - EXECUTION

1.13 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

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

1.14 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

1.15 INSTALLATION, GENERAL

A. General: Install acoustical panel ceilings to comply with ASTM C 636, in accordance with manufacturer's written instructions, and CISCA's "Ceiling Systems Handbook."

1.16 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09511

SECTION 09653 - RESILIENT WALL BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Wall base.

1.2 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

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

C. Samples for Initial Selection: For each type of product indicated.

D. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches long, of each resilient product color, texture, and pattern required.

E. Products - Recycled Content: Provide certification from manufacturer on product’s recycled content.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide resilient stair accessories with a critical radiant flux classification of Class I, not less than 0.45 W/sq. cm, as determined by testing identical products per ASTM E 648 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1.4 DELIVERY, STORAGE, AND HANDLING

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

1.5 PROJECT CONDITIONS

A. Maintain temperatures within range recommended by manufacturer in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After postinstallation period, maintain temperatures within range recommended by manufacturer.

C. Install resilient products after other finishing operations, including painting, have been completed.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

1.7 RESILIENT WALL BASE

A. Wall Base: ASTM F 1861.

B. Product and Manufacturer – Basis of Design: Refer to the Finish Legend.

C. Type (Material Requirement): TS (rubber, vulcanized thermoset).

D. Group (Manufacturing Method): I (solid).

E. Style: Cove (with top-set toe).

F. Minimum Thickness: 0.125 inch.

G. Height: 4 inches, unless otherwise indicated.

H. Outside Corners: Job formed or premolded.

I. Inside Corners: Job formed or premolded.

J. Surface: Smooth.

K. Colors and Patterns: Refer to the Finish Legend. If not indicated, colors shall be selected by Architect from manufacturer's full range.

1.8 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturers for applications indicated.

B. Adhesives: Water resistant types made or recommended by the flooring manufacturer for the conditions of the installation.

1. Products and Manufacturers: W.F. Taylor “Envirotec #2040’, AFM, Mapei, or Roberts ‘Earthbound 7200 Cove Base Adhesive’.

PART 3 - EXECUTION

1.9 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

1.10 PREPARATION

A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.

B. Concrete Substrates for Stair Accessories: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

3. Moisture Testing:

a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.

b. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.

E. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

1. Do not install resilient products until they are the same temperature as the space where they are to be installed.

F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

1.11 RESILIENT WALL BASE INSTALLATION

A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

D. Do not stretch wall base during installation.

E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.

F. Premolded Corners: Install premolded corners before installing straight pieces.

G. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.
2. Inside Corners: Use straight pieces of maximum lengths possible. Form 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.

1.12 CLEANING AND PROTECTION

A. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.

3. Damp-mop surfaces to remove marks and soil.

a. Do not wash surfaces until after time period recommended by manufacturer.

B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.

1. Apply protective floor polish to stair accessory surfaces that are free from soil, visible adhesive, and surface blemishes if recommended in writing by manufacturer.

a. Use commercially available product acceptable to manufacturer.
b. Coordinate selection of floor polish with Owner's maintenance service.

2. Cover stair accessory products with undyed, untreated building paper until Substantial Completion.
3. Do not move heavy and sharp objects directly over stair accessories. Place plywood or hardboard panels over surfaces and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION 09653

SECTION 09654 - LINOLEUM FLOOR COVERINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes linoleum floor tile and sheet floor coverings.

1.2 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

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

C. Shop Drawings:

1. Show locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
2. Show details of special patterns.

D. Samples for Initial Selection: For each type of linoleum floor covering indicated.

1. Include similar Samples of installation accessories involving color selection.

E. Samples for Verification: In manufacturer's standard size, but not less than 6-by-9-inch sections of each color and pattern of linoleum floor covering required.

1. Heat-Welding Bead: Include manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.

F. Heat-Welded Seam Samples: For each flooring product and welding bead color and pattern combination required; with seam running lengthwise and in center of 6-by-9-inch Sample applied to rigid backing and prepared by Installer for this Project.

G. Qualification Data: For Installer.

H. Maintenance Data: For linoleum floor coverings to include in maintenance manuals.

I. Products - Recycled Content: Provide certification from manufacturer on product’s recycled content.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project that are competent in techniques required by manufacturer for floor covering installation indicated.

1. Engage an installer who employs workers for this Project that are trained or certified by floor covering manufacturer for installation techniques required.

B. Fire-Test-Response Characteristics: Provide products identical to those tested for fire-exposure behavior per test method indicated by a testing and inspecting agency acceptable to authorities having jurisdiction.

C. Mockups: Install mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.

1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store floor coverings and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 degrees F or more than 90 degrees F.

1. Floor Tile: Store on flat surfaces.
2. Sheet Floor Covering: Store rolls upright.

1.5 PROJECT CONDITIONS

A. Maintain temperatures within range recommended by manufacturer in spaces to receive floor tile during the following time periods:

1. 72 hours before installation.
2. During installation.
3. 72 hours after installation.

B. After postinstallation period, maintain temperatures within range recommended by manufacturer.

C. Close spaces to traffic during floor covering installation.

D. Close spaces to traffic for 72 hours after floor covering installation.

E. Install floor coverings after other finishing operations, including painting, have been completed.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof of each type, color, and pattern of floor tile installed.
2. Sheet Floor Covering: Furnish not less than 10 linear feet in full roll width for every 500 linear feet or fraction thereof, in roll form and in full roll width, of each different type, color, and pattern of sheet floor covering installed.

PART 2 - PRODUCTS

1.7 LINOLEUM FLOOR COVERING

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

1. Armstrong World Industries, Inc.
2. Azrock Commercial Flooring, DOMCO
3. Forbo Industries, Inc.

B. Color and Pattern: As selected by Architect from manufacturer's full range.

C. Tile: Solidified mixture of linoleum cement binder (linseed oil and pine, fossil, or other resins or rosins, or equivalent oxidized oleoresinous binder) and ground cork, wood flour, mineral fillers, and pigments bonded to a fibrous or other suitable backing so that backing is partially embedded in mixture. Patterns and colors extend through entire wear-layer thickness.

1. Nominal Tile Size: Manufacturer's standard.

D. Sheet Floor Covering: ASTM F 2034.

1. Roll Size: In manufacturer's standard length by not less than 78 inches wide.

E. Seaming Method: Heat welded.

F. Thickness: Manufacturer’s standard for installation indicated.

G. Fire-Test-Response Characteristics:

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm per ASTM E 648.

1.8 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by floor covering manufacturer for applications indicated.

B. Adhesives: Water resistant types made or recommended by the flooring manufacturer for the conditions of the installation.

C. Heat-Welding Bead: Solid-strand product of floor covering manufacturer.

1. Color: As selected by Architect from manufacturer's full range to contrast with floor covering.

D. Integral-Flash-Cove-Base Accessories:

1. Cove Strip: 1-inch radius provided or approved by floor covering manufacturer.

E. Metal Edge Strips: Extruded aluminum with mill finish, of width shown, of height required to protect exposed edge of floor covering, and in maximum available lengths to minimize running joints.

PART 3 - EXECUTION

1.9 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor coverings.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

1.10 PREPARATION

A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of floor coverings.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

3. Moisture Testing:

   a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
   b. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

C. Remove substrate coatings and other substances that are incompatible with floor covering adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.

E. Move floor coverings and installation materials into spaces where they will be installed at least 72 hours in advance of installation.

1. Do not install floor coverings until they are same temperature as space where they are to be installed.

F. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

1.11 INSTALLATION, GENERAL

A. Scribe and cut floor coverings to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.

B. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.

C. Maintain reference markers, holes, or openings that are in place or marked for future cutting by repeating on floor coverings as marked on subfloor. Use chalk or other nonpermanent marking device.

D. Install floor coverings on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of floor coverings installed on covers. Tightly adhere floor covering edges to substrates that abut covers and to cover perimeters.

E. Adhere floor coverings to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

F. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and use welding bead to permanently fuse sections into a seamless floor covering. Prepare, weld, and finish seams to produce surfaces flush with adjoining floor covering surfaces.

1.12 TILE INSTALLATION

A. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles in pattern indicated.

B. Match tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1.13 SHEET FLOOR COVERING INSTALLATION

A. Unroll sheet floor coverings and allow them to stabilize before cutting and fitting.

B. Lay out sheet floor coverings as follows:

1. Maintain uniformity of floor covering direction.
2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in floor covering substrates.
3. Match edges of floor coverings for color shading at seams.
4. Avoid cross seams.
5. Eliminate deformations that result from hanging method used during drying process (stove bar marks).

C. Integral Flash Cove Base: Cove floor coverings dimension indicated up vertical surfaces. Support floor coverings at horizontal and vertical junction with cove strip. Butt at top against cap strip.

1.14 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing floor coverings:

1. Remove adhesive and other surface blemishes from floor covering surfaces.
2. Sweep and vacuum floor coverings thoroughly.

3. Damp-mop floor coverings to remove marks and soil.

a. Do not wash floor coverings until after time period recommended by manufacturer.

B. Protect floor coverings against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended in writing by manufacturer.

1. Apply protective floor polish to surfaces that are free of soil, visible adhesive, and surface blemishes.

    a. Seal linoleum as recommended by manufacturer but with not less than three coats of floor polish.
    b. Use commercially available product acceptable to manufacturer.
    c. Coordinate selection of floor polish with Owner's maintenance service.

2. Cover linoleum floor coverings with undyed, untreated building paper until inspection for Substantial Completion.

    a. Allow drying room film (yellow film caused by linseed oil oxidation) to disappear before Substantial Completion.

3. Do not move heavy and sharp objects directly over floor covering surfaces. Place plywood or hardboard panels over floor coverings and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION 09654

SECTION 09680 - CARPET

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Carpet.

1.2 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate required.

C. Shop Drawings: Show the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet.
2. Existing flooring materials to be removed.
3. Existing flooring materials to remain.
4. Carpet type, color, and dye lot.
5. Locations where dye lot changes occur.
6. Seam locations, types, and methods.
7. Type of subfloor.
8. Type of installation.
9. Pattern type, repeat size, location, direction, and starting point.
10. Pile direction.
11. Type, color, and location of insets and borders.
12. Type, color, and location of edge, transition, and other accessory strips.
13. Transition details to other flooring materials.

D. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet: 12-inch- square Sample.
2. Exposed Edge Stripping and Accessory: 12-inch- long Samples.

3. Carpet Seam: 6-inch Sample.
4. Mitered Carpet Border Seam: 12-inch- square Sample. Show carpet pattern alignment.

E. Product Schedule: Use same room and product designations indicated on Drawings and in schedules.

F. Maintenance Data: For carpet to include in maintenance manuals specified in Division 1. Include the following:

1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.

B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

C. Product Options: Products and manufacturers named in Part 2 establish requirements for product quality in terms of appearance, construction, and performance. Other manufacturers' products comparable in quality to named products and complying with requirements may be considered. Refer to Division 1 Section "Substitutions."

D. Mockups: Before installing carpet, install mockups for each type of carpet installation required to demonstrate aesthetic effects and qualities of materials and execution. Install mockups to comply with the following requirements, using materials indicated for the completed Work:

1. Install mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
2. Notify Architect seven days in advance of dates and times when mockups will be installed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Architect's approval of mockups before starting work.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Remove mockups when directed.
7. Approved mockups may become part of the completed Work if undamaged at time of Substantial Completion.

1.4 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with CRI 104, Section 5, "Storage and Handling."

1.5 PROJECT CONDITIONS

A. General: Comply with CRI 104, Section 6.1, "Site Conditions; Temperature and Humidity."

B. Environmental Limitations: Do not install carpet until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

C. Do not install carpet over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet before installing these items.

1.6 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Carpet Warranty: Written warranty, signed by carpet manufacturer agreeing to replace carpet that does not comply with requirements or that fails within specified warranty period. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.

1. Warranty Period: 10 years from date of Substantial Completion.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet: Full-width rolls equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd..

PART 2 - PRODUCTS

1.8 CARPET

A. Product and Manufacturer – Basis of Design: Refer to the Finish Legend.

1.9 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided by or recommended by the following:

1. Carpet manufacturer.

B. Adhesive: AFM, “3-1 Adhesive”

PART 3 - EXECUTION

1.10 EXAMINATION

A. Examine substrates, areas, and conditions for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Verify that substrates and conditions are satisfactory for carpet installation and comply with requirements specified.

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 that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by the following:

a. Carpet manufacturer.

2. Subfloor finishes comply with requirements specified in Division 3 Section "Cast-in-Place Concrete" for slabs receiving carpet.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

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

1.11 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and carpet manufacturer's written installation instructions for preparing substrates indicated to receive carpet installation.

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, without using solvents. Use mechanical methods recommended in writing by the following:

1. Carpet manufacturer.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

1.12 INSTALLATION

A. Double-Glue-Down Installation: Comply with CRI 104, Section 9, "Double Glue-Down Installation."

B. Comply with carpet manufacturer's written recommendations for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.

1. Bevel adjoining border edges at seams with hand shears.
2. Level adjoining border edges.

C. Do not bridge building expansion joints with carpet.

D. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.

E. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

G. Install pattern parallel to walls and borders.

1.13 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
2. Remove yarns that protrude from carpet surface.
3. Vacuum carpet using commercial machine with face-beater element.

B. Protect installed carpet to comply with CRI 104, Section 15, "Protection of Indoor Installations."

C. Protect carpet against 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 carpet manufacturer.

END OF SECTION 09680

SECTION 09912 - PAINTING

PART 1 - GENERAL

1.1 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. 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.

1.2 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. 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.

C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.

1. After color selection, the Architect will furnish color chips for surfaces to be coated.

D. 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 stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
2. Provide a list of materials and applications for each coat of each sample. Label each sample for location and application.

E. 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.

1.3 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.

1.4 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.

1.5 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 degrees F.

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 degrees 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.

1.6 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 extra paint materials in the quantities indicated below:

a. Exterior Paint: One gallon of each color applied.
b. Interior Paint: One gallon of each color applied.

PART 2 - PRODUCTS

1.7 MANUFACTURERS

A. Manufacturer Specified: As indicated.

B. Other Acceptable Manufacturers:

1. Benjamin Moore & Company
2. Duron, Inc.
3. ICI Paints
4. Sherwin-Williams

1.8 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: As indicated; where not indicated colors will be selected by the Architect from manufacturer’s full line of color selections.

PARAT 3 - EXECUTION

1.9 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.

1.10 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. Concrete Tunnel: Fill all bug holes and voids in concrete surfaces using non-shrink grout. Repair and fill all cracks. Tunnel surfaces, floor, side walls, and ceiling areas shall be smooth, without bug holes, fins, cracks, or other surfaces defects prior to the application of the paint system indicated. Vacuum and wipe clean all surfaces to provide a clean surface for paint system application.

D. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.

E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

1.11 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.

1.12 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.

1.13 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.

1.14 INTERIOR PAINT SCHEDULE

A. Concrete Masonry Units:

1. Semigloss, Latex Enamel Finish: Two coats over filled surface with total dry film thickness not less than 3.5 mils, excluding filler coat.

a. Block Filler: High-Performance latex block filler.

1) Moore: Super Craft Latex Block Filler #285.

b. Concrete Masonry: Interior enamel undercoat (primer).

1) Moore: Pristine Eco Spec Interior Latex Primer #231.

c. Finish Coat: Interior, semi-gloss, low odor, latex enamel.

1) Moore: Pristine Eco Spec Interior Latex Semi-gloss Enamel #224.

B. Plaster and Gypsum Drywall Systems:

1. Walls: Low Odor Eggshell Latex Enamel Finish: Three coats with total dry film thickness not less than 2.5 mils.

a. Primer: White, interior, latex-based primer.

1) Moore: Pristine Eco Spec Interior Latex Primer #231

b. First and Second Coats: Interior, eggshell, low odor, latex enamel.

1) Moore: Pristine Eco Spec Interior Latex Eggshell Enamel #.

2. Painted Ceilings: Low Odor Flat Latex Enamel Finish except as noted in the finish schedule: Three coats with total dry film thickness not less than 2.5 mils.

a. Primer: White, interior, latex-based primer.

1) Moore: Pristine Eco Spec Interior Latex Primer #231

b. First and Second Coats: Interior, flat 'ceiling white', low odor, latex enamel.

1) Moore: Pristine Eco Spec Interior Latex Flat Enamel #219.

C. Metals: (Primer is not required on shop-primed items.)

1. Ferrous Metal:

a. Primer:

1) Moore Interior and Exterior Rust Block #M-82.

b. Two Finish Coats over Primer over Ferrous Metal.

1) Moore DTM Water-Based Acrylic Gloss Enamel #M-28
2) Moore DTM Water-Based Acrylic Semi-gloss Enamel #M-29

c. Three Coats where Primer is not used (DTM System) over New Non-Shop Primed Ferrous Metal:

1) Moore Mooreguard Low Luster Latex DTM #103.
2) Moore MooreGlo Semi-gloss Latex DTM #096

D. Woodwork:

1. Painted Woodwork

a. One coat wood primer

1) Moore: Pristine Eco Spec Interior Latex Primer #231

b. Two finish coats: use finish as noted on schedule - semi-gloss unless otherwise noted

1) Moore: Pristine Eco Spec Interior Latex

2. Clear Sealed Woodwork: Semi-gloss unless otherwise noted

a. Three coats wood sealer

1) American Formulating & Manufacturing Polyureseal BP, Satin Finish

E. Concrete Floor:

1. Concrete Floor Sealer: Apply sealer in a thin film with a sponge mop or soft cloth, and allow 2 hours to dry. Porous surfaces may require a second coat to form a complete membrane. Rub out to soft gloss.

a. AFM Enterprises 'Watershield"

1.15 EXTERIOR PAINT SCHEDULE

A. Ferrous Metal, Primed and Unprimed:

1. Paint System, Application and Finish: Alkyd; two finish coats over prime coat; semi-gloss finish. Pre-primed requires top finish only; prime coat damaged surfaces.

a. Primer:

1) Moore: 163 IronClad Alkyd Low Lustre Metal & Wood Enamel

b. Finish Coat:

1) Moore: 133 Impervo Alkyd High Gloss Enamel

B. Zinc Coated Metal, Primed and Unprimed:

1. Paint System, Application and Finish: Alkyd; two finish coats over prime coat; Gloss finish. Pre-primed requires top finish only; prime coat damaged surfaces.

a. Primer:

1) Moore: Galvanized Metal Primer

b. Finish Coat:

1) Moore: 133 Impervo Alkyd High Gloss Enamel

END OF SECTION 09912

SECTION 10100 - VISUAL DISPLAY BOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Porcelain enamel markerboards.
2. Tackboards.

1.2 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: For each type of visual display board indicated.

C. Shop Drawings: For each type of visual display board required.

1. Include dimensioned elevations. Show location of joints between individual panels where unit dimensions exceed maximum panel length.
2. Include sections of typical trim members.
3. Show anchors, grounds, reinforcement, accessories, layout, and installation details.

D. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors and textures available for the following:

1. Markerboards: Actual sections of porcelain enamel finish for each type of markerboard required.
2. Vinyl-Fabric-Faced Cork Tackboards: Fabric swatches for each type of vinyl-fabric-faced cork tackboard indicated.

E. Samples for Verification: Of the following products, showing color and texture or finish selected. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected. Prepare Samples from the same material to be used for the Work.

1. Visual Display Boards: Sample panels not less than 8-1/2 by 11 inches, mounted on the substrate indicated for the final Work. Include a panel for each type, color, and texture required.

2. Aluminum Trim and Accessories: Samples of each finish type and color, on 6-inch- long sections of extrusions and not less than 4-inch squares of sheet or plate. Include Sample sets showing the full range of color variations expected.

F. Product Certificates: Signed by manufacturers of tackboards certifying that vinyl-fabric-faced cork tackboard materials furnished comply with requirements specified for flame-spread ratings.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain visual display boards through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide vinyl-fabric-faced tackboards with the following surface-burning characteristics as determined by testing assembled materials composed of facings and backings identical to those required in this Section per ASTM E 84 by a testing and inspecting agency acceptable to authorities having jurisdiction. Identify vinyl-fabric-faced tackboards with appropriate markings of applicable testing and inspecting agency.

1. Flame Spread: 25 or less.
2. Smoke Developed: 10 or less.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify field measurements before preparation of Shop Drawings and before fabrication to ensure proper fitting. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

1.5 WARRANTY

A. General Warranty: The special porcelain enamel 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. Porcelain Enamel Markerboard Warranty: Submit a written warranty executed by manufacturer agreeing to replace porcelain enamel markerboards that do not retain their original writing and erasing qualities, become slick and shiny, or exhibit crazing,

cracking, or flaking within the specified warranty period, provided the manufacturer's written instructions for handling, installation, protection, and maintenance have been followed.

1. Warranty Period: Life of the building.

PART 2 - PRODUCTS

1.6 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. Porcelain Enamel Markerboards:

a. Best-Rite Chalkboard Co.
b. Carolina Chalkboard Co.
c. Claridge Products and Equipment, Inc.

2. Tackboards:

a. Best-Rite Chalkboard Co.
b. Carolina Chalkboard Co.
c. Claridge Products and Equipment, Inc.

1.7 MATERIALS

A. Porcelain Enamel Markerboards: Balanced, high-pressure-laminated, porcelain enamel markerboards of 3-ply construction consisting of face sheet, core material, and backing.

1. Face Sheet: 0.024-inch-, "Vitracite," porcelain enamel clad, Type 1, stretcher-leveled aluminized-steel face sheet, as manufactured by Claridge Products and Equipment. Fuse porcelain enamel coating to steel at approximately 1000 deg F.

a. Cover Coat: Provide manufacturer's standard, light-colored, special writing surface with gloss finish intended for use with erasable dry markers.

2. Core: 3/8-inch- thick, particleboard core material complying with requirements of ANSI A208.1, Grade 1-M-1.
3. Backing Sheet: 0.015-inch- thick, aluminum-sheet backing.
4. Laminating Adhesive: Manufacturer's standard, moisture-resistant, thermoplastic-type adhesive.

B. Natural-Cork Tackboards: Single-layer, 1/4-inch- thick, seamless, compressed fine-grain, bulletin board quality, natural-cork sheet; face sanded for natural finish; complying with MS MIL-C-15116, Type II.

1.8 ACCESSORIES

A. Metal Trim and Accessories: Fabricate frames and trim of not less than 0.062-inch-thick, extruded-aluminum alloy, size and shape as indicated, to suit type of installation. Provide straight, single-length units. Keep joints to a minimum. Miter corners to a neat, hairline closure.

1. Marker Tray: Manufacturer's standard, continuous, box-type, aluminum tray with slanted front and cast-aluminum end closures for each marker board.

1.9 FABRICATION

A. Markerboards: Laminate facing sheet and backing sheet to core material under pressure with manufacturer's recommended flexible, waterproof adhesive.

1. Cut joints straight and true. Space joints symmetrically. Fit and match panels before shipment to provide a continuous, uniform writing surface.

B. Assembly: Provide factory-assembled markerboard and tackboard units, unless field-assembled units are required.

1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.

1.10 FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

B. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

C. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 607.1.

PART 3 - EXECUTION

1.11 EXAMINATION

A. Examine wall surfaces, with Installer present, for compliance with requirements and other conditions affecting installation of visual display boards.

1. Surfaces to receive markerboards shall be free of dirt, scaling paint, and projections or depressions that would affect smooth, finished surfaces of markerboards.
2. Surfaces to receive tackboards shall be dry and free of substances that would impair the bond between tackboards and substrate.
3. Do not proceed with installation until unsatisfactory conditions have been corrected.

1.12 INSTALLATION

A. Deliver factory-built visual display boards completely assembled in one piece without joints, where possible. If dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site. Use splines at joints to maintain surface alignment.

B. Install units in locations and at mounting heights indicated and according to manufacturer's written instructions. Keep perimeter lines straight, plumb, and level. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

C. Markerboards: Align and level joints between adjoining panels and apply manufacturer's recommended joint filler compound. Hone and finish joints to a continuous even plane.

D. Coordinate Project-site-assembled units with grounds, trim, and accessories. Join parts with a neat, precision fit.

1.13 ADJUSTING AND CLEANING

A. Verify that accessories required for each unit have been properly installed and that operating units function properly.

B. Clean units according to manufacturer's written instructions.

END OF SECTION 10100

SECTION 10155 – TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes toilet compartments and screens as follows:

1. Type: Solid polymer resin (plastic).
2. Compartment Style: Floor mounted overhead braced.
3. Screen Style: Wall hung.

1.2 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: For each type and style of toilet compartment and screen specified. Include details of construction relative to materials, fabrication, and installation. Include details of anchors, hardware, and fastenings.

C. Shop Drawings: For fabrication and installation of toilet compartment and screen assemblies. Include plans, elevations, sections, details, and attachments to other work.

1. Show locations of reinforcement and cutouts for compartment-mounted toilet accessories.

D. Samples for Initial Selection: Manufacturer's color charts consisting of sections of actual units showing the full range of colors, textures, and patterns available for each type of compartment or screen indicated.

E. Samples for Verification: Of each compartment or screen color and finish required, prepared on 6-inch- square Samples of same thickness and material indicated for Work.

F. Products - Recycled Content: Provide certification from manufacturer on product’s recycled content.

1.3 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.

PART 2 - PRODUCTS

1.4 MANUFACTURERS

A. Manufacturer – Basis of Design: Santana Products, Inc.

1.5 MATERIALS

A. General: Provide materials that have been selected for surface flatness and smoothness. Exposed surfaces that exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are unacceptable.

B. Solid Polymer Resin: High-density polyethylene (HDPE) with homogenous color throughout. Provide material not less than 1-inch-thick with seamless construction and eased edges in color and pattern as follows:

1. Colors and Patterns: Two colors and patterns in each room as selected by Architect from manufacturer's full range of colors and patterns.
2. Recycled Content: Minimum 50% recycled material content.

C. Pilaster Shoes and Sleeves (Caps): Solid-plastic, polymer-resin pilasters.

D. Full-Height, Full Length (Continuous) Brackets: Manufacturer's standard design for attaching panels and screens to walls and pilasters of the following material:

1. Material: Solid-plastic.

E. Hardware and Accessories: Manufacturer's standard design, heavy-duty extruded aluminum with bright-anodized finish.

1. Door Strike/Keeper: Nominal 6-inches long, extruded aluminum secured with stainless steel fasteners. Provide with black vinyl bumper.
2. Latch: Manufacturer’s standard.

3. Coat Bumper/Hook: Chrome plated zamac.
4. Hinges: 8-inch aluminum wrap-around type. Provide 3 inches for doors larger than 30 inches in width.

F. Head Rail: Extruded aluminum with anti-grip design. Manufacturer's standard finish. Install using stainless steel fasteners.

G. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum strip in manufacturer's standard finish.

H. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

I. Provide overhead miscellaneous steel framing as required to support and brace partitions from base building structure.

1.6 FABRICATION

A. General: Provide standard doors, panels, screens, and pilasters fabricated for compartment system. Provide units with cutouts and drilled holes to receive compartment-mounted hardware, accessories, and grab bars, as indicated.

1. Provide internal reinforcement in metal units for compartment-mounted hardware, accessories, and grab bars, as indicated.

B. Solid-Plastic, Polymer-Resin Compartments and Screens: Provide aluminum heat-sink strips at exposed bottom edges of HDPE units to prevent burning.

C. Overhead-Braced-and-Floor-Anchored Compartments: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions. Make provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.

1. Provide manufacturer's standard overhead cross bracing.

D. Wall-Hung Screens: Provide units in sizes indicated of same construction and finish as compartment panels, unless otherwise indicated.

1. Provide metal-faced screens with integral full-height flanges for attachment to wall.

E. Doors: Unless otherwise indicated, provide 24-inch- wide in-swinging doors for standard toilet compartments and 36-inch- wide out-swinging doors with a minimum 32-inch- wide clear opening for compartments indicated to be handicapped accessible.

1. Hinges: Manufacturer's standard self-closing type that can be adjusted to hold door open at any angle up to 90 degrees.
2. Latch and Keeper: Manufacturer's standard surface-mounted latch unit with combination rubber-faced door strike and keeper designed for emergency access. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be handicapped accessible.
3. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.

PART 3 - EXECUTION

1.7 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, plumb, and level. Secure units in position with manufacturer's recommended anchoring devices.

B. Overhead-Braced-and-Floor-Anchored Compartments: Secure pilasters to floor and level, plumb, and tighten. Secure continuous head rail to each pilaster with not less than 2 fasteners. Hang doors and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

C. Screens: Attach with anchoring devices according to manufacturer's written instructions and to suit supporting structure. Set units level and plumb and to resist lateral impact.

1.8 ADJUSTING AND CLEANING

A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation.

B. Provide final protection and maintain conditions that ensure toilet compartments and screens are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 10155

SECTION 10416 - DIRECTORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Internally illuminated directories.

1.2 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: For each model indicated. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes.

C. Shop Drawings: For each type of directory required.

1. Include dimensioned plans, elevations and details, large-scale sections of typical members, and other components. Show anchors, grounds, reinforcement and layout, and indicate finishes.
2. Include setting drawings, templates, and directions for installing anchor bolts and other anchorages to be installed as a unit of Work in other Sections.
3. Wiring diagrams from manufacturer for illuminated directories.

D. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors and textures available for the following:

1. Aluminum Trim and Accessories: 4-inch- long sections of extrusions and not less than 2-inch squares of sheet or plate for each exposed metal surface showing available metal finishes.

E. Samples for Verification: Of the following products, showing color and texture, or finish selected. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected. Prepare Samples from the same material to be used for the Work.

1. Aluminum Trim and Accessories: Samples of each finish type and color, on 6-inch- long sections of extrusions and not less than 4-inch squares of sheet or plate.

2. Message Strips: Samples of message strips in color selected with sample of typography specified.

F. Product Certificates: Signed by manufacturers of vinyl-fabric-faced cork tackboards certifying that the products furnished comply with requirements specified for flame-spread ratings.

G. Products - Recycled Content: Provide certification from manufacturer on product's recycled content.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who is an authorized representative of the building directory manufacturer for installation and maintenance of units required for this Project.

1. The Installer shall be capable of providing replacement message strips within 10 working days of receipt of an order.

B. Source Limitations: Obtain building directories through one source from a single manufacturer.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of building directories and are based on the specific model indicated. Other manufacturers' building directories with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."

1. Do not modify intended aesthetic effects, 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. Fire-Test-Response Characteristics: Provide vinyl-fabric-faced tackboards with the following surface-burning characteristics as determined by testing assembled materials composed of facings and backings identical to those required in this Section per ASTM E 84 by a testing and inspecting agency acceptable to authorities having jurisdiction. Identify vinyl-fabric-faced tackboards with appropriate markings of applicable testing and inspecting agency.

1. Flame Spread: 25 or less.
2. Smoke Developed: 10 or less.

E. Listing and Labeling: Provide electrically operated fixtures specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify rough openings for directories 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 building directories without field measurements. Coordinate wall construction to ensure actual opening dimensions correspond to established dimensions.

1.5 EXTRA MATERIALS

A. Deliver extra blank message strips to Owner. Furnish extra message strips that match message strips installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Message-Strip Units: Furnish blank, full-size, message-strip units equal to 10 percent of amount installed for Owner's future use.

PART 2 - PRODUCTS

1.6 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. Illuminated Directories:

a. Andco Industries Corporation.
b. Apco Graphics.
c. ASI Sign System, Inc.

1.7 MATERIALS

A. Aluminum Extrusions: Manufacturer's standard extruded-aluminum sections with not less than the strength and durability properties specified in ASTM B 221 for 6063-T5 alloy.

B. Laminated Glass: ASTM C 1172; Kind LA (2 lites of annealed Type I glass); 2 lites of 3-mm-thick Type I (transparent glass, flat); Class 1 (clear); Quality q3 (glazing select); float glass laminated to a dark neutral-bronze-colored, 0.030-inch- thick, transparent polyvinyl butyral interlayer with a luminous transmittance of 9 percent.

1. Interlayer Product: Subject to compliance with requirements, provide Monsanto No. 360900 Saflex Interlayer.

1.8 ILLUMINATED DIRECTORIES

A. Rear-Illuminated Directories: For each directory required, provide a surface-mounted, rear-illuminated-type directory consisting of a cabinet with an operable transparent cover, containing a concealed illumination system, and a retainer frame containing a header panel and message strips. Graphics for message strips, header panels, and other designs shall be in the letter style, size, spacing, and arrangement indicated.

1. Cabinet Housing: Provide perimeter cabinet frame fabricated from aluminum extrusions of the profile indicated, mitered and welded with an aluminum-sheet rear cover panel. Provide structural reinforcement to prevent racking and misalignment.
2. Frameless Cover Design: 6-mm-thick, bronze, acrylic cover, with acrylic returns to engage the perimeter frame.
3. Reveal-Type Frame and Cover Design: 6-mm-thick, bronze, laminated glass in an extruded-aluminum frame. Mount cover frame on concealed hinges to form a reveal between the cover frame and the inner edge of perimeter cabinet frame.

4. Film-Type Message Strips: Removable, negative-film message strips in interchangeable, interlocking, glass-reinforced plastic carriers approximately 7 inches long.

    a. Provide blank negative-film message strips for each carrier in the directory.

        1) Letter Size: 1/4 inch.
        2) Letter Style: Helvetica Medium.
        3) Letter Case: Capitals and lowercase.

5. Rear-Illumination System: Provide a removable and accessible fluorescent-strip fixture system with reflective interior surfaces for uniform illumination of message strips and header panel with minimum halation and without light leaks. Include lamps and internal wiring with single concealed electrical connection to the building system. Coordinate electrical characteristics with the power supply provided.

    a. Ballasts: Low-temperature, high-power-factor, low-energy, fluorescent lamp ballasts that comply with Certified Ballast Manufacturers Association standards and carry its label. Provide exterior ballasts for exterior signs.

1.9 ACCESSORIES

A. Fasteners: Provide screws, bolts, and other exposed fastening devices of the same material as the items being fastened. Fasteners for applications on the exterior and exposed to the weather shall be hot-dip galvanized, stainless steel, or aluminum. Provide types, gages, and lengths to suit installation conditions. Use theft-proof fasteners where exposed to view.

B. Hardware: Provide building directories with the following hardware:

1. Hinges: Continuous-type piano hinges.
2. Locks: Furnish each cover with manufacturer's standard lock; key locks alike. Furnish 2 keys per lock.

1.10 FABRICATION

A. General: Fabricate directories to requirements indicated, including dimensions, design, and thickness and finish of materials. Use metals and shapes of thickness, with reinforcing if needed, to produce flatness, free of oil canning, and to impart strength for size, design, and application indicated.

1. Fabricate perimeter cabinet and cover frames with reinforced corners, mitered to a hairline fit, with no exposed fasteners.
2. Hardware for Covers: Equip covers with hardware of type indicated.
3. Weatherproofing: For units located on the exterior, provide weatherproof construction, including weather-stripping and venting provisions for condensation control.

1.11 FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

B. Colors: Where message strips, header panels, or other items, other than frames or glazing materials, require color selection to distinguish letters or graphic images from the background or for other purposes, provide colors as selected by Architect from manufacturer's full range of colors.

C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

D. Class I, Color Anodic Finish: AA-M12C22A42/A44 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 606.1 or AAMA 608.1.

1. Color: As selected by Architect from the full range of industry colors and color densities.

PART 3 - EXECUTION

1.12 EXAMINATION

A. Examine wall surfaces, with the Installer present, for compliance with requirements and other conditions affecting installation of building directories.

1. Do not proceed with installation until unsatisfactory conditions have been corrected.

1.13 INSTALLATION

A. Install units plumb and level, in locations and with mountings shown. Securely attach to supporting structure with concealed fasteners, according to manufacturer's written installation instructions.

1.14 CLEANING AND PROTECTING

A. At completion of installation, clean surfaces according to manufacturer's written instructions.

B. Protect installed directories from damage until acceptance by Owner at the time of Substantial Completion.

END OF SECTION 10416

SECTION 10431 - SIGNS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Signs.

1.2 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with the Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.

1.3 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: For materials indicated.

PART 2 - PRODUCTS

1.4 SIGNS

A. Exterior Signs: All exterior signs shall be in compliance with UF Construction Standards and Physical Plant Division "Policy & Procedure Documentation System" and UF "Campus Exterior Sign Policy".

B. Directional Signs: All directional signs shall be in conformance with ADA Guidelines and UF Construction Standards and UF "Campus Exterior Sign Policy".

C. Fabrication: Signs shall be fabricated by Physical Plant Division to conform to the University's standard design.

PART 3 - EXECUTION

1.5 INSTALLATION

A. Signs shall be installed by Physical Plant Division.

END OF SECTION 10431

SECTION 10505 - METAL LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Wardrobe lockers, including the following:

a. Double tier.

1.2 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of locker and bench.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other Work.

1. Show locker fillers, trim, base, sloping tops, and accessories. Include locker-numbering sequence.

D. Samples for Verification: For the following products, in manufacturer's standard sizes, showing the full range of color, texture, and pattern variations expected. Prepare Samples from the same material to be used for the Work.

1. Lockers.

E. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals specified in Division 1.

F. Products - Recycled Content: Provide certification from manufacturer on product’s recycled content.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain locker units and accessories through one source from a single manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver lockers until spaces to receive them are clean, dry, and ready for locker installation.

B. Protect lockers from damage during delivery, handling, storage, and installation.

C. Deliver master keys, control keys, and combination control charts to Owner.

1.5 COORDINATION

A. Coordinate size and location of concrete bases. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."

PART 2 - PRODUCTS

1.6 LOCKERS

A. Model and Manufacturer – Basis of Design: “Corregidoor Lockers” by DeBourgh;

1. Dimensions: 12” width, 12” depth, 72” height

1.7 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 366/A 366M, matte finish, suitable for exposed applications, and stretcher leveled or roller leveled to stretcher-leveled flatness.

B. Galvanized Steel Sheet: ASTM A 653/A 653M, commercial quality, G60 coating designation; mill phosphatized; suitable for exposed applications, and stretcher leveled or roller leveled to stretcher-leveled flatness.

C. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591/A 591M, commercial quality, coating Class C; mill phosphatized; suitable for exposed applications; and stretcher leveled or roller leveled to stretcher-leveled flatness.

D. Fasteners: Zinc- or nickel-plated steel, slotless-type exposed bolt heads, and self-locking nuts or lock washers for nuts on moving parts.

1.8 WARDROBE LOCKERS

A. Body, Frames, and Doors: Manufacturer’s standard construction.

B. Hinges: Steel, full loop, five or seven knuckle; tight pin; minimum 2 inches high. Weld to inside of door frame and attach to door with at least two factory-installed fasteners that are completely concealed and tamper resistant when door is closed.

1. Provide at least three hinges for each door more than 42 inches high and at least two hinges for each door 42 inches high or less.

C. Projecting Handle and Latch: Manufacturer's standard, positive automatic, prelocking, pry-resistant latch and pull; chromium-plated, heavy-duty, vandal-resistant, lift-up handle, as follows:

1. Provide minimum three-point latching for each door more than 42 inches high; minimum two-point latching for each door 42 inches high or less.

a. Provide strike and eye for padlock.

2. Provide single-point gravity or spring-actuated latch with padlock lug.

1.9 LOCKER ACCESSORIES

A. Interior Equipment: Furnish each locker with the following items, unless otherwise indicated:

1. Hooks: Manufacturer's standard zinc-plated, ball-pointed steel. Provide one double-prong ceiling hook, and not fewer than two single-prong wall hooks for single-, double-, and triple-tier units. Attach hooks with at least two fasteners.
2. Coat Rods: Manufacturer's standard galvanized steel. Provide rod in lieu of ceiling hook for lockers 18 inches deep or greater.

B. Number Plates: Manufacturer's standard etched, embossed, or stamped, aluminum number plates with numerals at least 3/8 inch high. Number lockers in sequence indicated. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.

C. Continuous Metal Base: Minimum 0.0598-inch- thick steel sheet, channel or zee profiled for stiffness, fabricated in lengths as long as practicable to enclose base and base ends of lockers, and finished to match lockers.

1. Height: 6 inches.

D. Continuously Sloping Tops: Manufacturer's standard, fabricated from minimum 0.0359-inch- thick steel sheet, for installation over lockers with separate flat tops. Fabricate tops in lengths as long as practicable, without visible fasteners at splice locations, finished to match lockers. Provide fasteners, filler plates, supports, and closures, as follows:

1. Closures: Vertical-end type.
2. Closures: Hipped-end type.
3. Sloped top corner fillers, mitered.

E. Recess Trim: Manufacturer's standard; fabricated from minimum 0.0478-inch- thick steel sheet, minimum 2-1/2-inch face width, and finished to match lockers. Fabricate trim in lengths as long as practicable.

F. Filler Panels: Manufacturer's standard; fabricated from minimum 0.0478-inch- thick steel sheet in an unequal leg angle shape, and finished to match lockers. Provide slip joint filler angle formed to receive filler panel.

G. Finished End Panels: Manufacturer's standard; fabricated from minimum 0.0239-inch-thick steel sheet, finished to match lockers, and designed for concealing exposed ends of nonrecessed lockers.

1. Provide one-piece panels for double-row (back-to-back) locker ends.

H. Center Dividers: Manufacturer's standard; fabricated from minimum 0.0239-inch- thick steel sheet, full-depth, vertical partitions between bottom and shelf, and finished to match lockers.

1.10 FABRICATION

A. Unit Principle: Fabricate each locker with an individual door and frame, individual top, bottom, back, and shelves, and common intermediate uprights separating compartments.

B. All-Welded Construction: Preassemble lockers by welding all joints, seams, and connections, with no bolts, screws, or rivets used in assembly. Grind exposed welds flush.

C. Fabricate lockers square, rigid, and without warp, with metal faces flat and free of dents or distortion. Make exposed metal edges free of sharp edges and burrs, and safe to touch. Weld frame members together to form a rigid, one-piece assembly.

1. Form locker-body panels, doors, shelves and accessories from one-piece steel sheet, unless otherwise indicated.

1.11 FINISHES, GENERAL

A. Finish all steel surfaces and accessories, except prefinished stainless-steel and chrome-plated surfaces.

B. Finish Painting: Refer to Division 9 Section "Painting."

C. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

D. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

E. 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.

1.12 STEEL SHEET FINISHES

A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond. Use manufacturer's standard methods.

B. Powder-Coated Finish: Immediately after cleaning and pretreating, electrostatically apply manufacturer's standard baked-polymer finish consisting of a thermosetting powder topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

1.13 EXAMINATION

A. Examine concrete bases for suitable conditions where metal lockers are to be installed.

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

1.14 INSTALLATION

A. Install metal lockers and accessories level, plumb, rigid, and flush according to manufacturer's written instructions.

B. Assemble knocked-down lockers with standard fasteners, with no exposed fasteners on door faces and face frames.

C. Connect groups of all-welded lockers together with standard fasteners, with no exposed fasteners on face frames.

D. Anchor lockers to floors and walls at intervals recommended by manufacturer, but not more than 36 inches o.c. Install anchors through backup reinforcing plates where necessary to avoid metal distortion, using concealed fasteners.

E. Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.

1. Attach recess trim to recessed lockers with concealed clips.
2. Attach sloping top units to lockers, with closures at exposed ends.

F. Attach finished end panels with fasteners only at perimeter to conceal exposed ends of nonrecessed lockers.

G. Anchor locker benches to floors Uniformly space pedestals not more than 72 inches apart, and securely fasten to bench top and anchor to floor.

1.15 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust doors and latches to operate easily without binding. Verify that integral locking devices operate properly.

B. Clean interior and exposed exterior surfaces and polish stainless-steel and nonferrous-metal surfaces.

C. Protect lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit locker use during construction.

D. Touch up marred finishes, or replace locker units that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 10505

SECTION 10520 - FIRE-PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Fire-protection cabinets for the following:

a. Portable fire extinguishers.

2. Fire-protection accessories.

1.2 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection specialties.

1. Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

C. Products - Recycled Content: Provide certification from manufacturer on product’s recycled content.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain fire extinguishers and cabinets through one source from a single manufacturer.

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

1.4 COORDINATION

A. Coordinate size of cabinets to ensure that type and capacity of fire extinguishers indicated and provided by Owner under separate Contract are accommodated.

PART 2 - PRODUCTS

1.5 MANUFACTURERS

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

1. Fire-Protection Cabinets:

a. J.L. Industries, Inc.
b. Larsen's Manufacturing Company.
c. Potter-Roemer; Div. of Smith Industries, Inc.

1.6 MATERIALS

A. Cold-Rolled Steel Sheet: Carbon steel, complying with ASTM A 366/A 366M, commercial quality, stretcher leveled, temper rolled.

B. Stainless-Steel Sheet: ASTM A 666/A 666M, Type 302 or Type 304 alloy.

1.7 FIRE-PROTECTION CABINETS

A. Cabinet Construction: Provide manufacturer's standard box (tub), 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.

1. Fire-Rated Cabinets: Listed and labeled to meet requirements of ASTM E 814 for fire-resistance rating of wall where it is installed.

a. Construct fire-rated cabinets with double walls fabricated from 0.0478-inch-thick, cold-rolled steel sheet lined with minimum 5/8-inch- thick, fire-barrier material.
b. Provide factory-drilled mounting holes.

2. Cabinet Metal: Stainless steel sheet.

B. Cabinet Type: Suitable for the following:

1. One 10-pound ABC type fire extinguisher.

C. Cabinet Mounting: Suitable for the following mounting conditions:

1. Semi-Recessed: Cabinet box partially recessed in walls of shallow depth to suit style of trim indicated.

D. Cabinet Trim Style: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.
1. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

a. Flat Trim: 1/4- to 5/16-inch backbend depth.

E. Cabinet Trim Material: Manufacturer's standard, as follows:

1. Stainless steel sheet, #4 finish.

F. Door Material: Manufacturer's standard, as follows:

1. Stainless steel sheet, #4 finish.

G. Door Glazing: Manufacturer's standard, as follows:

1. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, as follows:

a. Class 1 (clear).
b. Thickness: 6 mm.

H. Door Style: Manufacturer's standard design, as follows:

1. Fully glazed panel with frame.

I. Door Construction: Fabricate doors according to manufacturer's standards, of materials indicated, and coordinated with cabinet types and trim styles selected.

1. Provide minimum 1/2-inch- thick door frames, fabricated with tubular stiles and rails, and hollow-metal design.
2. Provide inside latch and lock for break-glass panels.

J. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam-action latch, or exposed or concealed door pull and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 degrees.

1.8 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

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.

1.9 STAINLESS-STEEL FINISHES

A. General: Remove or blend tool and die marks and stretch lines into finish. Grind and polish surfaces to produce uniform, directionally textured polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

B. Directional Polish: No. 4 finish.

1. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

1.10 EXAMINATION

A. Examine roughing-in for cabinets to verify actual locations of piping connections before cabinet installation.

B. Examine walls and partitions for suitable framing depth and blocking where cabinets are to be installed.

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

1.11 INSTALLATION

A. Comply with manufacturer's written instructions for installing fire-protection specialties.

B. Install in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

1. Prepare recesses for cabinets as required by type and size of cabinet and trim style.
2. Fasten cabinets to structure, square and plumb.

1.12 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust cabinet doors that do not swing or operate freely.

B. Refinish or replace cabinets and doors damaged during installation.

C. Provide final protection and maintain conditions that ensure that cabinets and doors are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 10520

SECTION 10705 – INTERIOR SUN CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Day-lighting louvers.

1.2 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: For products indicated. Include manufacturer's specifications and installation instructions, details of construction relative to materials, dimensions of individual components, profiles, and finishes.

1. Include maintenance data for cleaning and lubrication.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other Work. Include details relative to installation including fasteners, anchors, and accessories.

D. Samples for Initial Selection: Submit a sample of daylight device showing specific surface finishes with intended method of anchorage and accessories required.

E. Mockup: Provide operating mock-up of full size 8' unit with hinge and support mechanism.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain sun control devices through one source from a single manufacturer.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

1.5 MANUFACTURERS

A. Manufacturer – Basis of Design:

1. Construction Specialties, Inc., Cranford, New Jersey (908) 272-5200

B. Other Acceptable Manufacturer:

1. ASCA, Inc., Basking Ridge, New Jersey (908) 221-1000

1.6 MATERIALS

A. Aluminum Extrusions: ASTM B 221, alloy 6063-T5 or T-6.

B. Aluminum Sheet: ASTM B 209, alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

1. Thickness: 0.040-inches, minimum.

C. Core: Molded rigid cellular polystyrene board; 2.0 pounds per cubic foot density.

D. Polystyrene Insulation: ASTM C 578 for Type 1.

1. Density: 2.0 pounds per cubic foot (pcf).
2. Flame-Spread and Smoke-Developed Indexes: 25 and 450 or less, respectively, per ASTM E 84.

E. Fasteners: Of same basic metal and alloy as fastened metal or 300 Series stainless steel, unless otherwise indicated. Do not use metals that are incompatible with joined materials.

1. Use types and sizes to suit unit installation conditions.
2. Use hex-head or Phillips pan-head screws for exposed fasteners.

1.7 FABRICATION

A. General: Assemble units in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Louver Blades and Vertical Supports: Minimum 0.040-inch thick aluminum sheet. Louver blade configuration shall be as indicated with polystyrene core. Aluminum seams shall be butt joint configurations. End caps shall be die cut aluminum.

C. Vertical Supports: Minimum 0.040 inch thick aluminum sheet. Aluminum seams shall be butt joint configurations. End caps shall be die cut aluminum.

D. Anchors: Include anchorages and accessories required for complete assembly.

E. Operation: Louver shall be designed to rotate downward 90-degrees.

1.8 ALUMINUM FINISHES

A. General: Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.

B. High-Performance Organic-Coating Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Fluoropolymer Two-Coat Coating System: Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.

a. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

1.9 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

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

1.10 INSTALLATION

A. Locate and place units level, plumb, and at indicated alignment with adjacent work.

B. Form closely fitted joints with exposed connections accurately located and secured.

C. Repair damaged finishes. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

1.11 ADJUSTING AND CLEANING

A. Test operation of units and adjust as needed to produce fully functioning units that comply with requirements.

B. Clean exposed surfaces to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.

C. Before final inspection, clean exposed surfaces in accordance with manufacturer's instructions and recommendations.

D. Restore units damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 10705

SECTION 10801 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Toilet accessories.

1.2 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.

C. Setting Drawings: For cutouts required in other work; include templates, substrate preparation instructions, and directions for preparing cutouts and installing anchoring devices.

D. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required. Use designations indicated in the Toilet and Bath Accessory Schedule and room designations indicated on Drawings in product schedule.

E. Maintenance Data: For accessories to include in maintenance manuals specified in Division 1. Provide lists of replacement parts and service recommendations.

F. Products - Recycled Content: Provide certification from manufacturer on product's recycled content.

1.3 QUALITY ASSURANCE

A. Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved by Architect.

1.4 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.5 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Manufacturer's Mirror Warranty: Written warranty, executed by mirror manufacturer agreeing to replace mirrors that develop visible silver spoilage defects within minimum warranty period indicated.

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

PART 2 - PRODUCTS

1.6 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (satin), in 0.0312-inch minimum nominal thickness, unless otherwise indicated.

B. Sheet Steel: ASTM A 366/A 366M, cold rolled, commercial quality, 0.0359-inch minimum nominal thickness; surface preparation and metal pretreatment as required for applied finish.

C. Galvanized Steel Sheet: ASTM A 653/A 653M, G60.

D. Chromium Plating: ASTM B 456, Service Condition Number SC 2 (moderate service), nickel plus chromium electrodeposited on base metal.

E. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, nominal 6.0 mm thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD-M-411.

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

G. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

1.7 FABRICATION

A. General: One, maximum 1-1/2-inch- diameter, unobtrusive stamped manufacturer logo, as approved by Architect, is permitted on exposed face of accessories. On interior surface not exposed to view or back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.

B. General: Names or labels are not permitted on exposed faces of accessories. On interior surface not exposed to view or on back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.

C. Surface-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.

D. Recessed Toilet Accessories: Unless otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors and access panels with full-length, stainless-steel hinge. Provide anchorage that is fully concealed when unit is closed.

E. Framed Glass-Mirror Units: Fabricate frames for glass-mirror units to accommodate glass edge protection material. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.

1. Provide galvanized steel backing sheet, not less than 0.034 inch and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not an acceptable filler material.

F. Mirror-Unit Hangers: Provide mirror-unit mounting system that permits rigid, tamper- and theft-resistant installation, as follows:

1. One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
2. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.

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

PART 3 - EXECUTION

1.8 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units level, plumb, and square at locations indicated, according to manufacturer's written instructions for substrate indicated.

C. Install grab bars to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

1.9 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

1.10 TOILET AND BATH ACCESSORY SCHEDULE

A. Manufacturer – Basis of Design: Bobrick Washroom Equipment, Inc.

B. Accessories:

1. Recessed Paper Towel Dispenser/ Waste Receptacle: B-

2. Toilet Tissue Dispenser:

3. Book Shelf:

4. Utility Shelf:

5. Grab Bar (36 inch):

6. Grab Bar (42 inch):

7. Mirror:

a. Size: As indicated.

8. Soap Dispenser:

9. Coat Hook:

10. Sanitary Napkin Disposal:

11. Not Used

12. Not Used

13. Mop Hanger

14. ADA Compliant Mirror:

15. Mirror: Refer to

    a. Size: As indicated.

16. Recessed Feminine Napkin/ Tampon Vendor:

END OF SECTION 10801

SECTION 11132 - PROJECTION SCREENS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Projection screens; front projected, electrically operated.

1.2 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: Submit product data for screen specified.

C. Shop Drawings: Show layout and types of projection screens. Include the following:

1. Connections to suspension systems for recess-mounted screens.
2. Anchorage details.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain projection screens through one source from a single manufacturer. Obtain each screen 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.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver projection screens until building is enclosed, other construction within spaces where screens will be installed is substantially complete, and installation of screens is ready to begin.

PART 2 - PRODUCTS

1.5 FRONT-PROJECTION SCREENS

A. Material and Viewing Surface of Front-Projection Screens: Provide screens manufactured from mildew- and flame-resistant fabric of type indicated for each type of screen specified and complying with the following requirements:

1. Matte-white viewing surface with gain characteristics complying with FS GG-S-00172D(1) for Type A screen surface.
2. Material: Vinyl-coated glass-fiber optic.
3. Mildew Resistance: Provide mildew-resistant screen fabrics as determined by FS 191A/5760.
4. Fire-Test-Response Characteristics: Provide projection-screen fabrics identical to materials that have been tested for flame resistance according to both small- and large-scale tests of NFPA 701.
5. Seamless Construction: Provide screens in sizes indicated without seams.
6. Edge Treatment: Black masking borders.

7. Drop Length: Provide extra drop length of 4 inches.

    a. Length of Drop: 2 feet.
    b. Color: Black.
    c. Location: At bottom of screen.

8. Size of Viewing Surface: As indicated.

B. Manually Operated Screens: Spring-roller-operated units for wall or ceiling installation and with case, screen, mounting accessories, and other components necessary for a complete installation. Screen case fabricated from steel sheet not less than 0.0299 inch, with flat back design and vinyl covering or baked-enamel finish.

1. Available Products and Manufacturers:

    a. Model C, Heavy Duty; Da-Lite Screen Co., Inc.
    b. Luma 2 Heavy Duty; Draper Shade & Screen Co., Inc.

C. Electrically Operated Screens with Automatic Ceiling Closure: Units designed and fabricated for recessed installation in ceiling with bottom of case composed of 2 panels fully enclosing screen, motor, and wiring; 1 panel hinged and designed to open and close automatically when screen is lowered and fully raised, and the other panel

removable or hinged open for access to interior of case; and complying with the following requirements:

1. Screen Case with Motor in Roller: Wood or medium-density-fiberboard sides and top with metal-lined wiring compartment and aluminum or medium-density-fiberboard bottom panels, factory primed and constructed as follows:

    a. Offset mount bottom panels so their bottom surface will align flush with adjoining ceiling and the bottom edges of case sides and ends will be recessed behind ceiling finish.
    b. Provide single or double top as standard with manufacturer.

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

1. Matte-White Viewing Surfaces:

    a. Matte White; Da-Lite Screen Co., Inc.
    b. Fiberglass Matte White; Draper Shade & Screen Co., Inc.

2. Electrically Operated Front-Projection Screens:

    a. Boardroom Electrol; Da-Lite Screen Co., Inc.
    b. Envoy; Draper Shade & Screen Co., Inc.

3. Control: Low-voltage control system consisting of a control unit with 24-V power supply and remote, 3-position switches at locations indicated with metal device boxes and cover plates for flush wall mounting.

    a. Provide key-operated power-supply switch.

PART 3 - EXECUTION

1.6 INSTALLATION

A. General: Install projection screens at locations indicated to comply with screen manufacturer's written instructions.

B. Install front-projection screens with screen cases in position and relationship to adjoining construction indicated. Securely anchor to supporting substrate in a manner that produces a smoothly operating screen with vertical edges plumb and viewing surface flat when screen is lowered.

1. Test electrically operated units to verify that screen, controls, limit switches, closure, and other operating components are in optimum functioning condition.

2. Test manually operated units to verify that screen operating components are in optimum functioning condition.

1.7 PROTECTING AND CLEANING

A. Protect projection screens after installation from damage during construction. If damage occurs despite such protection, remove and replace damaged components or entire unit as required to provide units in their original, undamaged condition.

END OF SECTION 11132

SECTION 12484 - FLOOR MATS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Roll-up aluminum-tread rail floor mats with plastic hinges.

1.2 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: Include manufacturer's specifications and installation instructions, construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of floor mat and frame specified.

C. Shop Drawings: For floor mats and frames. Show assembly, joint locations, installation details, layout, plans, elevations, sections, details of patterns or designs, accessories, anchors, and attachments to other Work.

1. Coordinate Shop Drawings showing oversized recess for deferred installation of frames with concrete work.

D. Samples for Initial Selection: For each type of floor mat and frame indicated.

E. Samples for Verification: 12-inch- square assembled sections of floor mats, frame members, and tread rails with selected tread surface showing each type of metal finish and color of exposed floor mats, tread rails, frames, and accessories required.

F. Maintenance Data: For cleaning and maintaining floor mats to include in maintenance manuals.

G. Products - Recycled Content: Provide certification from manufacturer on product’s recycled content.

1.3 QUALITY ASSURANCE

A. Accessibility Requirements: Comply with the Florida Accessibility Code for Building Construction, October 1997 Edition.

B. Source Limitations: Obtain floor mats and frames through one source from a single manufacturer.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify blocked-out openings in floors by field measurements before fabrication and indicate measurements on Shop Drawings.

1.5 COORDINATION

A. Coordinate size and location of oversized recesses in concrete work to receive floor mats and frames. Defer frame installations until building enclosure is completed and related interior finish work is in progress. Concrete, reinforcement, and formwork requirements are specified in Division 3.

B. Coordinate integral installation of recessed frames and anchors with placing of concrete slab so frames are positioned accurately.

PART 2 - PRODUCTS

1.6 WALK OFF MATS

A. Manufacturer – Basis of Design: PediTred II; Construction Specialties, Inc.

1. Inserts: Serrated aluminum.

B. Other 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. Balco, Inc.

1.7 METAL FRAME MATERIALS

A. Extruded Aluminum: ASTM B 221, alloy 6061-T6 or alloy 6063-T5, T6, or T52 as standard with manufacturer.

1.8 CONCRETE FILL AND GROUT MATERIALS

A. Provide concrete materials complying with Division 3 for grout and fill around and under recessed mats and frames that produce concrete equivalent in strength to cast-in-place concrete slabs. For concrete fill, adjust aggregate size to not exceed one-third fill thickness.

1.9 FABRICATION

A. General: Where possible, verify sizes by field measurement before shop fabrication.

B. Floor Mats: Shop fabricate units to greatest extent possible in sizes as indicated. If not otherwise indicated, provide single unit for each mat installation; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes. Miter corner joints in framing elements with hairline joints or provide prefabricated corner units without joints.

C. Recessed Metal Mat Frames: Extruded aluminum, of size and style to fit floor mat type specified, for permanent recessed installation, complete with corner pins or reinforcement and anchorage devices.

1. Fabricate edge-frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible, with hairline joints equally spaced and pieces spliced together by straight connecting pins.

1.10 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

1.11 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. 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 611.

PART 3 - EXECUTION

1.12 EXAMINATION

A. Examine substrates, and floor conditions, and floor recesses for compliance with requirements for location, sizes, minimum recess depth, and other conditions affecting installation of floor mats and frames.

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

1.13 INSTALLATION

A. Install recessed mat frames to comply with manufacturer's written instructions. Set mat tops at height recommended by manufacturer for most effective cleaning action; coordinate top of mat surfaces with bottom of doors that swing across mats to provide clearance between door and mat.

1. For installation in terrazzo flooring areas, provide allowance for grinding and polishing of terrazzo without grinding surface of recessed frames. Coordinate with other trades as required.
2. Install necessary shims, spacers, and anchorages for proper location and secure attachment of frames.
3. Install grout and fill around frames and, if required to set mat tops at proper elevations, in recesses under mats. Finish grout and fill smooth and level.

1.14 PROTECTION

A. After completing frame installation and concrete work, provide temporary filler of plywood or fiberboard in recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

B. Defer installation of floor mats until Project is near Substantial Completion.

END OF SECTION 12484

SECTION 12491 - HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following types of blinds and accessories:

1. Mini-blinds with aluminum louver slats.

1.2 DEFINITIONS

A. Mini-blind: Blind with nominal 1-inch- wide louver slat.

1.3 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.

C. Shop Drawings: Show location and extent of horizontal louver blinds. Include elevations, sections, details, and dimensions not shown in Product Data. Show installation details, mountings, attachments to other Work, operational clearances, and relationship to adjoining work.

D. Samples for Initial Selection: For each colored component of each type of horizontal louver blind indicated.

1. Include similar Samples of accessories involving color selection.

E. Samples for Verification: For the following products, prepared on Samples from the same material to be used for the Work.

1. Louver Slat: Not less than 12 inches long.
2. Tapes: Full width, not less than 6 inches long.
3. Horizontal Louver Blind: Full-size unit, not less than 16 inches wide by 24 inches long.
4. Valance: Full-size unit, not less than 12 inches wide.

F. Window Treatment Schedule: Include horizontal louver blinds in schedule using same room designations indicated on Drawings.

G. Product Certificates: For each type of horizontal louver blind product, signed by product manufacturer.

H. Product Test Reports: For each type of horizontal louver blind product.

I. Maintenance Data: For horizontal louver blinds to include in maintenance manuals. Include the following:

1. Methods for maintaining horizontal louver blinds and finishes.
2. Precautions about cleaning materials and methods that could be detrimental to finishes and performance.
3. Operating hardware.

J. Products - Recycled Content: Provide certification from manufacturer on product's recycled content.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain horizontal louver blinds through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide horizontal louver blinds with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Flame-Resistance Ratings: Passes NFPA 701.

C. Corded Window Covering Product Standard: Provide horizontal louver blinds complying with WCMA A 100.1.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver blinds in factory packages, marked with manufacturer and product name, and location of installation using same room designations indicated on Drawings and in a window treatment schedule.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install horizontal louver blinds until construction and wet and dirty finish work in spaces, including painting, 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 horizontal louver blinds are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

1.7 HORIZONTAL LOUVER BLINDS, ALUMINUM LOUVER SLATS

A. Product and Manufacturer – Basis of Design: 1" Mark 1 Levelor Blind w/ shearview slats; Levolor Contract; a Newell Company; Levolor.

1. Color: White.

B. Mounting: As indicated on Drawings, mounting permitting easy removal and replacement without damaging blind or adjacent surfaces and finishes; with spacers and shims required for blind placement and alignment indicated.

1. Provide intermediate support brackets if end support spacing exceeds spacing recommended by manufacturer for weight and size of blind.

PART 3 - EXECUTION

1.8 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

1.9 HORIZONTAL LOUVER BLIND INSTALLATION

A. Install blinds level and plumb and aligned with adjacent units according to manufacturer's written instructions, and located so exterior louver edges in any position are not closer than 1 inch to interior face of glass. Install intermediate support as required to prevent deflection in headrail. Allow clearances between adjacent blinds and for operating glazed opening's operation hardware, if any.

1.10 ADJUSTING

A. Adjust horizontal louver blinds to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

1.11 CLEANING AND PROTECTION

A. Clean blind surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that horizontal louver blinds are without damage or deterioration at time of Substantial Completion.

C. Replace damaged blinds that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 12491

SECTION 12494 - ROLLER SHADES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes manually operated roller shades.

1. Location: Refer to the Daylighting Control Schedule.

1.2 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.

C. Shop Drawings: Show location and extent of roller shades. Include elevations, sections, details, and dimensions not shown in Product Data. Show installation details, mountings, and attachments to other Work, operational clearances, and relationship to adjoining work.

D. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:

1. Ceiling suspension system members and attachment to building structure.
2. Ceiling-mounted or penetrating items including light fixtures; air outlets and inlets; speakers; sprinklers; recessed shades; and special moldings at walls, column penetrations, and other junctures of acoustical ceilings with adjoining construction.
3. Shade mounting assembly and attachment.
4. Size and location of access to shade operator and adjustable components.

E. Samples for Initial Selection: For each colored component of each type of roller shade indicated.

1. Include similar Samples of accessories involving color selection.

F. Samples for Verification:

1. Complete, full-size operating unit not less than 16 inches wide for each type of roller shade indicated.

2. For the following products:

a. Shade Material: Not less than 12-inch- square section of fabric, from dye lot used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of material.
b. Valance: Full-size unit, not less than 12 inches long.

G. Window Treatment Schedule: Include roller shades in schedule using same room designations indicated on Drawings.

H. Product Certificates: For each type of roller shade product, signed by product manufacturer.

I. Product Test Reports: For each type of roller shade product.

J. Qualification Data: For Installer.

K. Maintenance Data: For roller shades to include in maintenance manuals. Include the following:

1. Methods for maintaining roller shades and finishes.
2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.
3. Operating hardware.

L. Products - Recycled Content: Provide certification from manufacturer on product's recycled content.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Installer Qualifications: An experienced installer who has completed installation of roller shades similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Source Limitations: Obtain roller shades through one source from a single manufacturer.

D. Fire-Test-Response Characteristics: Provide roller shade band materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Flame-Resistance Ratings: Passes NFPA 701.

E. Corded Window Covering Product Standard: Provide roller shades complying with WCMA A 100.1.

F. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.

1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in factory packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in a window treatment schedule.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and wet and dirty finish work in spaces, including painting, 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 roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

1.6 MANUFACTURERS

A. Manufacturer – Basis of Design: MechoShade Systems, Inc.

1.7 ROLLER SHADES

A. Product Description:

1. Operation: Manual, with offset chain operator.

B. Sunscreen Material: Fire resistant shade material.

1. Product and Manufacturer: Group 1310, fabric number 718, semi-translucent; Hexcel Fabrics.
2. Material Width: As required.
3. Bottom Hem: Straight.
4. Material Color: Refer to the Schedule.

C. Rollers: Electro-galvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets; with manufacturer's standard method for attaching shade material. Provide capacity for one roller shade band per roller.

D. Direction of Roll: Reverse, from front of roller.

E. Mounting Brackets: Fascia end caps, fabricated from steel finished to match fascia or headbox.

F. Fascia: L-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; continuous panel concealing front and bottom of shade roller, brackets, and operating hardware and operators; length as indicated; removable design for access.

G. Top/Back Cover: L shaped; material and finish to match fascia; combining with fascia and end caps to form a six-sided headbox enclosure sized to fit shade roller and operating hardware inside.

H. Pocket-Style Headbox: U-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; with a bottom cover consisting of slot opening of minimum dimension to allow lowering and raising of shade and a removable or openable, continuous metal access panel concealing shade roller, brackets, and operating hardware and operators within.

I. Bottom Bar: Extruded aluminum, with plastic or metal capped ends. Provide exposed-to-view, external-type bottom bar with concealed weight bar as required for smooth, properly balanced shade operation.

J. Shade Operation: Manual; with continuous loop bead chain, clutch, and cord tensioner and bracket lift operator.

1. Pull: Manufacturer's standard handgrip engaged pull.

2. Position of Operator: Left side of roller, as determined by hand of user facing shade from inside.
3. Bead Chain: Stainless steel.
4. Operating Function: Stop and hold shade at either fully open or fully closed positions only.

K. Valance: As indicated by manufacturer's designation for style and color.

L. Mounting: Inside mounting permitting easy removal and replacement without damaging roller shade or adjacent surfaces and finishes.

1.8 ROLLER SHADE FABRICATION

A. Product Description: Roller shade consisting of a roller, a means of supporting the roller, a flexible sheet or band of material carried by the roller, a means of attaching the material to the roller, a bottom bar, and an operating mechanism that lifts and lowers the shade.

B. Concealed Components: Corrosion-resistant-coated materials.

1. Lifting Mechanism: With permanently lubricated moving parts.

C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 degrees F:

1. Shade Units Installed between (Inside) Jambs: Edge of shade not more than 1/4 inch from face of jamb. Length equal to head to sill dimension of opening in which each shade is installed.
2. Shade Units Installed Outside Jambs: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

D. Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting fascia, roller, and operating hardware and for hardware position and shade mounting method indicated.

E. Installation Fasteners: Not fewer than two fasteners per bracket, fabricated from metal noncorrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories under conditions of normal use.

F. Color-Coated Finish: For metal components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

G. Colors of Metal and Plastic Components Exposed to View: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

1.9 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

1.10 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and located so shade band is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

1.11 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

1.12 CLEANING AND PROTECTION

A. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 12494

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DIVISION 8 - DOORS AND WINDOWS

DIVISION 9 - FINISHES

DIVISION 10 - SPECIALTIES

DIVISION 11 - EQUIPMENT

DIVISION 12 - FURNISHINGS

END OF TABLE OF CONTENTS

SECTION 14240 - HYDRAULIC ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Hydraulic passenger elevators.

1.2 DEFINITIONS

A. Defective Elevator Work: Operation or control system failures; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; the need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.

1.3 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Certification: Deliver an original copy of the Certificates of Operation from the State of Florida Division of Elevator Inspections to the Physical Plant Division Facilities Department located in Building 702 (Phone: 352-392-2855) at, or prior to, time of Final Inspection.

C. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information.

D. Shop Drawings: Show plans, elevations, sections, and large-scale details indicating service at each landing, machine room layout, coordination with building structure, relationships with other construction, and locations of equipment and signals. Indicate variations from specified requirements, maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.

E. Samples: For exposed finishes of cars, hoistway doors and frames, and signal equipment; 3-inch- square samples of sheet materials; and 4-inch lengths of running trim members.

F. Manufacturer/Installer Certificates: Signed by elevator Manufacturer/Installer certifying that hoistway, pit, and machine room layout and dimensions, as shown in contract documents and supplemental submittals, and electrical service, including emergency generator, as shown and specified, function as a complete elevator system. Work shall result in a legal, operating system in accordance with State of Florida requirements.

G. Maintenance Manuals: Include operation and maintenance instructions, parts listing with sources indicated, recommended parts inventory listing, emergency instructions, and similar information. Submit for Owner's information at Project closeout as specified in Division 1.

1. Include diagnostic and repair information available to manufacturer's and Installer's maintenance personnel.

H. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Elevator manufacturer or an experienced installer approved by elevator manufacturer who has completed elevator installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Regulatory Requirements: In addition to local governing regulations, comply with applicable provisions in ASME A17.1, "Safety Code for Elevators and Escalators."

C. Accessibility Requirements: In addition to local governing regulations, comply with Section 4.10 in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines (ADAAG)."

1.5 COORDINATION

A. Coordinate installation of sleeves, block outs, and items that are embedded in concrete or masonry for elevator equipment. Furnish templates and installation instructions and deliver to Project site in time for installation.

B. Furnish well casing and coordinate delivery with related excavation work.

C. Coordinate locations and dimensions of other work relating to hydraulic elevators including pit ladders, sumps, and floor drains in pits; entrance subsills; and electrical service, electrical outlets, lights, and switches in pits and machine rooms.

1.6 WARRANTY

A. Special Warranty: Written warranty, signed by the Installer agreeing to repair, restore, or replace defective elevator work within specified warranty period.

1. Warranty Period: 12 months from date of Substantial Completion.

1.7 SERVICE CONTRACT

A. Monthly Service Contract: In addition to the standard warranty provide a montyly service contract beginning at Substantial Completion, provide a monthly service contract for a period of 12 months beginning on the date of Substantial Completion.

1. Maintenance service shall be accomplished by skilled employees of the elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Provide parts and supplies as used in the manufacture and installation of original equipment.

2. Perform maintenance, including emergency callback service, during normal working hours.

3. Include 24-hour-per-day, 7-day-per-week emergency callback service.

a. Response Time: Two hours or less.

PART 2 - PRODUCTS

1.8 HYDRAULIC ELEVATORS

A. Model and Manufacturers – Basis of Design: MX Series; KONE, Inc.

1. Capacity: 2500 pounds
2. Speed: 125 feet per minute.
3. Hydraulic Fluid: Non-toxic biodegradeable oil meeting or exceeding U.S. Government EPA section 101(14), known as CERCLA, an Sara title III, Section 313.
4. Operation: MIPROM HS Selective Collective.
5. Voltage: As indicated.
6. Signal Fixture Design:
7. Car Direction Lantern:
8. Hall Lantern(s):
9. Hall Position Indicator:
10. Signal Fixture Faceplace/Trim Material and Finish: #4 Stainless steel.
11. Elevator Cab: #4 Stainless steel.
12. Handrail: 2-inch flat stainless steel at sides, #4 finish.
13. Wall Panels: Flush, laminate plastic.

B. Other Acceptable Manufacturers:

1. Thyssen (Dover) Elevator Group North America
2. Otis Elevator Company
3. Schindler Elevator Company

1.9 MATERIALS AND COMPONENTS

A. General: Provide standard elevator system. Where components are not otherwise indicated, provide standard components as required for a complete system.

B. Piping: Provide size, type, and weight piping recommended by manufacturer, and provide flexible connectors to minimize sound and vibration transmissions from power unit.

1. Provide dielectric couplings at plunger/cylinder units.
2. Casing for Underground Piping: PVC pipe complying with ASTM D 1785 joined with PVC fittings complying with ASTM D 2466 and solvent cement complying with ASTM D 2564.

C. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work where installation of devices is specified in another Specification Section.

D. Car Frame and Platform: Welded steel units.

1. For freight elevators, provide special heavy-duty units where indicated for power truck loading, designed to withstand impacts and wheel loadings indicated.

E. Finish Materials: Provide the following materials and finishes for exposed parts of elevator car enclosures, car doors, hoistway entrance doors and frames, and signal equipment as indicated:

1. Satin Stainless Steel: ASTM A 666, Type 304, with No. 4, directional satin finish.

F. Roller Guides: Provide roller guides at top and bottom of car and counterweight frames.

1.10 OPERATION SYSTEMS

A. Passenger Elevators: Provide microprocessor based elevator control and operation system for each elevator or group of elevators as required to provide type of operation system indicated.

B. Elevator Operation:

1. Single Elevator: Provide "selective collective automatic operation" as defined in ASME A17.1.

C. Auxiliary Operations: In addition to primary operation system features, provide the following operational features for elevators where indicated.

1. Standby Power Operation: On activation of standby power, cars are returned to a designated floor and parked with doors open. Only one car may be moved upward at a time, with priority given to loaded cars. If a car cannot be returned after two attempts, each of a preselected length of time, it is removed from the system. When all cars have been returned or removed from the system, one car is automatically placed in service. If car selected for service cannot operate within 60 seconds, the system removes car from service and places another car in service. Cars can be manually put in service on standby power, either for return operation or for regular operation, by switches in control panel located at fire command station. Manual operation causes automatic operation to cease.

D. Automatic Leveling: Provide with automatic leveling devices.

1.11 SIGNAL EQUIPMENT

A. General: Provide signal equipment for each elevator or group of elevators with hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Fabricate lighted elements of acrylic or other permanent, nonyellowing translucent plastic.

B. Car Control Stations: Provide semi-recessed car control stations. Mount in return panel adjacent to car door, if not otherwise indicated.

1. Buttons shall be lighted and vandal-proof.

C. Emergency Communication System – Hands Free Phone Only: Provide system that complies with ASME A17.1 and the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines (ADAAG)." On activation, system dials preprogrammed number of monitoring station and identifies elevator location to monitoring station. System provides two-way voice communication without using a handset and provides visible signals that indicate when system has been activated and when monitoring station has responded. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.

D. Fire Department Communication System: Provide stainless steel flush-mounted cabinet in each car and required conductors in traveling cable for fire department communication system specified in Division 16 Sections.

E. Telephone Cabinet: Provide stainless steel recessed telephone cabinet with door mounted at handicap height.

F. Car Position Indicator: For all elevator cars, provide illuminated-signal type, digital-display type, or segmented type, located above car door or above car control station. Also provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served.

1. Include travel direction arrows if not provided in car control station.

G. Hall Push-Button Stations: Provide hall push-button stations at each landing for each elevator or group of elevators as indicated.

1. Provide units with flat faceplate for mounting with body of unit recessed in wall.
2. Provide units with direction-indicating buttons; two buttons at intermediate landings; one button at terminal landings.

H. Directional Lanterns: Provide units with illuminated arrows.

1. Place lanterns in both jambs of entrance frame for each elevator. Mount at a minimum of 72 inches above finished floor.
2. With each lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.

I. Hall Position Indicators: Provide illuminated-signal type or digital-display type, located above each hoistway entrance at ground floor. Provide units with flat faceplate for mounting with body of unit recessed in wall.

1. Integrate ground-floor hall lanterns with hall position indicators.

J. Corridor Call Station Pictograph Signs: Provide signs matching hall push-button stations with text and graphics according to ASME A17.1, Appendix H.

1.12 DOOR REOPENING DEVICES

A. Infrared Array: Provide door-reopening devices with a uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more of the light beams shall cause doors to stop and reopen.

1.13 PASSENGER ELEVATOR CAR ENCLOSURES

A. General: Provide manufacturer's standard enameled-steel car enclosures with removable wall panels, suspended ceiling, trim, accessories, access doors, doors, power door operators, sills (thresholds), lighting, and ventilation.

1. Floor Finish: Vinyl composition tile.

2. Wall Panels:

a. Stainless Steel Panels: Textured stainless steel equal to 5WL Rigidtex.

3. Stainless-Steel Doors: Flush, hollow-metal construction, fabricated from stainless steel sheet; #4 finish.
4. Sills: Extruded metal, with grooved surface, 1/4 inch thick.
5. Ceiling: Acrylic eggcrate lens.
6. Lighting: Fluorescent lighting.
7. Handrails: Stainless steel, profile as indicated; #4 finish; continuous along width of wall.
8. Trim: Stainless steel.
9. Base: Stainless steel, #4 finish.

1.14 PASSENGER HOISTWAY ENTRANCES

A. General: Provide manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Provide frame size and profile to coordinate with hoistway wall construction.

1. Where gypsum board wall construction is indicated, provide self-supporting frames with reinforced head sections.

B. Materials and Fabrication: Provide manufacturer's standards but not less than the following:

1. Stainless-Steel Frames: Formed stainless-steel sheet.
2. Stainless-Steel Doors: Flush, hollow-metal construction, fabricated from stainless steel.
3. Sills: Extruded metal, with grooved surface, 1/4 inch thick.
4. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107.

PART 3 - EXECUTION

1.15 EXAMINATION

A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Verify critical dimensions, and examine supporting structure and other conditions under which elevator work is to be installed. Proceed with installation only after unsatisfactory conditions have been corrected.

1. For the record, prepare a written report, endorsed by Installer, listing dimensional discrepancies and conditions detrimental to performance.

1.16 INSTALLATION

A. Excavation for Jack: Drill excavation in each elevator pit to accommodate installation of cylinders; comply with applicable requirements in Division 2 Section "Earthwork."

1. Provide waterproof well casings as necessary to retain walls of well hole.

B. Install cylinders in protective casings within well hole or casing. Before installing protective casing, remove water and debris from well hole or casing and provide permanent waterproof seal at bottom of well casing. Fill void space between protective casing and cylinder with corrosion-protective filler.

1. Align cylinders and fill space between well casing and protective casing with fine sand.

C. Install cylinders plumb and accurately centered for elevator car position and travel. Anchor securely in place, supported at pit floor. Seal between well casing and pit floor with 4 inches of nonshrink, nonmetallic grout.

D. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.

E. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts designed to effectively prevent transmission of vibrations to structure and thereby eliminate sources of structure-borne noise from elevator system.

F. Piping: Install piping above the floor. No underground hydraulic oil lines are acceptable.

G. Install piping above the floor, where possible. Where not possible, cover underground piping with permanent protective wrapping before backfilling.

H. Lubricate operating parts of systems as recommended by manufacturers.

I. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay installation of sills and frames until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

J. Leveling Tolerance: 1/4 inch, up or down, regardless of load and direction of travel.

K. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.

1.17 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of elevator installation and before permitting use (either temporary or permanent) of elevators, perform acceptance tests as required and recommended by ASME A17.1 and by governing regulations and agencies.

B. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times tests are to be performed on elevators.

1.18 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 operational failure and other building emergencies. Train Owner's personnel in procedures to follow in identifying sources of operational failures or malfunctions. Confer with Owner on requirements for a complete elevator maintenance program.

1. Provide a minimum of 4 hours of training, contained in one session, to University maintenance personnel on the proper operation and maintenance of the installation.

B. Make a final check of each elevator operation with Owner's personnel present and before date of Substantial Completion. Determine that operation systems and devices are functioning properly.

1.19 PROTECTION

A. Temporary Use: Do not use elevators for construction purposes unless cars are provided with temporary enclosures, either within finished cars or in place of finished cars, to protect finishes from damage.

B. Protections: Provide protective coverings, barriers, devices, signs, and other procedures to protect elevators. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so that no evidence remains of correction work. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

END OF SECTION 14240