

1.0 - GENERAL

- 1.1 Scope  
The work included under this section consists of furnishing all labor, material and equipment necessary to chemically treat the soil for termite control.
- 1.2 Applicator  
The chemical shall be applied by an approved Pest Control Operator, bonded and licensed in the state in which the work is performed.
- 1.3 Guarantee  
Upon completion of the soil treatment and as a condition for its final acceptance, the Pest Control Operator shall furnish to the Owner a written guarantee providing:
- A. The Pest Control Operator will furnish the Owner with a Repair and Retreatment policy which has annual inspections included within the cost of policy at no additional cost to the Owner as outlined in Items B-E below.
  - B. That the chemical having at least the required concentration and the rate and method of application complies in every respect with the standards contained herein.
  - C. That the Pest Control Operator guarantees the effectiveness of the soil treatment against termite infestation for a period of not less than five (5) years from date of treatment.
  - D. Pest Control Operator will re-inspect at least once annually during protection period. Cost of Guarantee will include annual inspections for a period of five (5) years at no additional cost to Owner.
  - E. Evidence of re-infestation within the five (5) year guarantee period will be retreated without cost to the Owner. Any damage caused by termite infestation during the five (5) year guarantee period will be repaired or replaced by the Pest Control Operator at no additional cost to the Owner.

2.0 - PRODUCTS

Provide chemicals in accordance with current laws and regulations. Notify Architect of any discrepancies.

2.1 Chemicals

BASF - Termidor (Fipronil)  
Taurus SC - Control Solutions (Fipronil)  
Bayer Environmental Science - Premise

2.2 Mixing of Chemicals

Shall be observed on site by the Contractor's Superintendent.

3.0 - EXECUTION

3.1 Application

A. Basement or Crawl Space Construction (Minimum application)

1. Apply to critical areas along foundation walls, around piers and under suspended slabs and entrance platforms.
2. Apply at a rate of 1 gallon per 2-1/2 lineal feet per foot of depth along both sides of foundation walls, piers, etc.
3. Under suspended slabs and entrance platforms, apply overall treatment at rate of 1 gallon per 10 square feet.
4. Voids of unit masonry foundation walls and piers. Apply to voids at rate of 1 gallon per 5 lineal feet.

B. Slab-On Ground Construction (Minimum application)

1. Apply an over-all treatment under entire surface of floor slab including terraces and entrance platforms. Apply at rate of 1 gallon per 10 square feet, except that if fill under slab is gravel or other absorbent material, apply at rate of 1-1/2 gallons per 10 square feet.
2. Apply to critical areas along both sides of foundation wall expansion joints, around plumbing, utility services and other features that penetrate the slab at rate of 1 gallon per 2-1/2 lineal feet per foot of depth.
3. Voids of unit masonry foundation walls. Apply to voids at rate of 1 gallon per 5 lineal feet.

END OF SECTION

1.0 - GENERAL

1.1 Scope

The work under this section consists of all finish grading, topsoil, lawns, seeding and sodding.

1.2 Extent of Lawn Area

A. The Lawn Area to receive top soil shall include the building site to the extent that will cover all unpaved areas disturbed by this construction. Blend new Lawn Area into areas of the site which are not covered under this Section.

B. Sod as indicated. Seed and straw all remaining areas disturbed by construction.

1.3 Time for Planting

When other portions of the work have progressed sufficiently the contractor may begin work for lawns and planting including the placing of topsoil. Operations shall be conducted under favorable weather conditions during the seasons which are normal for such work. Planting seasons generally shall be October 1 to March 1 for trees and plant materials, and April 1 to July 1 for planting permanent lawns.

1.4 Inspection for Acceptance

A. Inspection of the work of lawns and planting to determine the degree of completion of contract work, will be made by the architect at the conclusion of planting operations. Inspection of the work for final acceptance will be made at the end of the maintenance period.

B. After final inspection the Contractor will be notified of acceptance of all lawn and/or planting work, or if there are any deficiencies, of the requirements for completion of the work.

1.5 Guarantee and Replacement

The lawn shall be guaranteed for the duration of one full growing season after planting. The lawn shall be alive and in satisfactory growth at the end of the guarantee period.

2.0 - PRODUCTS

2.1 Materials

A. Fertilizer shall be 12-4-8 commercial fertilizer or equal and shall be uniform in composition, dry, and free-flowing. Fertilizer shall be delivered to the site in original unopened containers, each bearing the manufacturer's guaranteed analysis.

B. Lime shall be agricultural lime (Dolomite), or equal, containing not less than 85% of total carbonates, and shall be ground to such fineness that 50% will pass through a 100 mesh sieve and 90% will pass through a 20 mesh sieve.

C. Soil additive shall be 1/4" diameter or less pine bark mulch "Planting Mix".

D. Water used in this work shall be suitable for irrigation and free from ingredients harmful to plant life. Furnish hose and watering equipment as required.

2.2 Topsoil

Topsoil shall be a fertile, friable soil possessing physical and chemical characteristics typical of productive soils in the vicinity. Topsoil shall have an acidity range between ph 6.0 and ph 6.5 or shall be conditioned to fall within this range. Topsoil shall contain not less than 3%

organic matter as determined by loss on ignition of moisture-free samples dried at 100 degrees C. Topsoil shall be without admixture of subsoil and shall be clean and reasonably free from clay lumps, stones, stumps, roots or similar substances 2" or more in diameter, debris or other objects which might be a hindrance to planting operations or plant growth. A laboratory soils test to be provided by the contractor when requested.

2.3 Seed

- A. Seed for disturbed areas not indicated for sod shall be 100% hulled Bermuda or Fescue as per plans.
- B. Seed for temporary seeding shall be 100% Annual Rye Grass.
- C. At the contractor's option, areas to be seeded may be sprigged with approved Bermuda grass stolons at the rate of three (3) cubic yards per 1,000 sq. ft. of lawn. Spacing shall be maximum of 8" o.c. each way in rows.
- D. Seed shall meet the requirements of the Federal Seed Act. Seed mixtures shall be delivered in the original sealed packages bearing the producer's guaranteed analysis for percentages of mixture, purity germination, and weed seed content.

2.4 Sod

Sod shall be Tifton 419 Bermuda grass. Each piece of sod shall have a dense stand of the specified grass and shall be strongly rooted and free of pernicious weeds. It shall be mowed to a height not to exceed 3" before lifting and shall be of uniform thickness with not over 1-1/2" nor less than 1" of soil.

3.0 - EXECUTION

3.1 Preparation of Subgrade

The subsoil shall be graded uniformly and lightly compacted so that it will be parallel to proposed finish grade. Stones over 2" in size, sticks and rubbish shall be removed. No heavy objects except lawn rollers shall be moved over the lawn areas after the subgrade has been prepared.

3.2 Finished Grading

After the subgrade soil has been prepared, 4" of topsoil shall be spread evenly and lightly compacted. Topsoil other than that stockpiled shall be provided under this Section. No topsoil shall be spread in a frozen or muddy condition. Commercial fertilizer and lime shall then be scarified with a tiller into the top 3" of topsoil at the rate of 10 lbs. per 1000 sq. ft.

- A. Areas to be seeded shall be brought to finished grade and smoothed.
- B. Areas to be sodded shall be brought to within the thickness of the sod of finish grade.
- C. Areas where the topsoil has not been removed shall be scarified, smoothed, and sticks, stones and rubbish shall be removed.

3.3 Sowing of Seed

Immediately before any seed is to be sown, the ground shall be scarified as necessary and shall be raked until the surface is smooth, friable and of uniformly fine texture. Lawn areas shall be seeded evenly with a mechanical spreader at the rate of 5 lbs. of grass seed per 1000 sq. ft. of area, lightly raked and watered with a fine spray so as not to create runoff until thoroughly soaked. Fifty percent of the seed shall be sown in one direction, and the remainder at right angles to the first sowing. The method of seeding may be varied at the discretion of the contractor on his own responsibility to establish a smooth uniform turf.

3.4 Laying of Sod

Except as noted, the contractor shall lay sod in all lawn areas having a slope of 3 to 1 or steeper; a 6' diameter circle of sod around all lawn drain inlets; and where shown on the Drawings. Before any sod is laid, all soft spots and inequalities in grade shall be corrected. Sod shall be laid so that no voids occur and tamped or rolled. Topsoil shall be brushed or raked over the sodded area, rolled with 200# roller and the sod thoroughly watered.

- A. Sod on slopes 3 to 1 or steeper shall be held in place by wooden pegs driven through the sod into the soil until they are flush with the top of the sod.
- B. Strip or spot sod shall be placed so that the surface of the compacted sod will be slightly below the surrounding surface soil.

3.5 Temporary Seeding

Temporary seeding shall be promptly provided should the project be completed at a time when permanent grass cannot be planted. Seeding shall be seeded at the rate of 5 lbs. to 1000 sq. ft. of area. The contractor shall be responsible for erosional damage during the period of temporary planting. The specified fertilizer shall not be used for the Rye Grass planting. Prior to planting permanent lawn, the lawn bed shall be prepared as specified, and the Rye Grass growth shall be scarified in such a manner as to incorporate it into the soil. Should the temporary lawn be planted, it shall be maintained by occasional mowing and necessary repairs to all eroded areas until the beginning of the specified season for constructing permanent lawns.

3.6 Mulching of Seeded Areas

All seeded or sprigged areas having a slope of 4 to 1 or greater shall be mulched with a spray mulch of an approved latex-type material. Other areas may be mulched with wheat straw at the contractor's option. Spray mulch of a latex-type material shall be applied by hydroject method at the rate of 75 gals. of concentrate mixed in 1000 gals. of water per acre (23 gals. per 1000 sq. ft.).

3.7 Clean-Up

Any soil, mulch or similar material which has been brought onto paved areas by hauling operations or otherwise shall be removed promptly keeping these areas clean at all times. Upon completion of the planting, all excess soil, stones and debris which has not previously been cleaned up shall be removed from the site or disposed of as directed.

3.8 Lawn Maintenance

Lawn shall be protected and maintained by watering, mowing and replanting as necessary for at least 30 days after approximately 60% germination is evident.

END OF SECTION

## CONCRETE WALKS, CURBS AND PAVING - SECTION 02510

### 1.0 - GENERAL

- 1.1 Scope  
The work under this section consists of all concrete walks, concrete curbs and concrete paving.
- 1.2 Protection  
Maintain lights and barricades during the course of the work. Leave the area clean upon completion.

### 2.0 - PRODUCTS

- 2.1 Materials
- A. Concrete shall conform to the requirements of Concrete Section. Minimum compressive strength shall be 3000 psi at 28 days. The maximum size of coarse aggregate shall be 3/4" and maximum slump of 3". Submit concrete mix for approval.
  - B. Joint filler shall be non-extruding pre-molded materials 1/2" thick, cut to the shapes required.
  - C. Curing materials may be either cotton mats or burlap. If burlap is used, it shall be free from substances which might stain the surfaces of the freshly placed concrete. Concrete may also be cured by means of membrane-curing compound.
  - D. Form oil shall be non-staining oil which is suitable for the type of form used and which is manufactured for the purpose by a recognized manufacturer.
  - E. Reinforcing shall conform to the requirements of the CONCRETE REINFORCEMENT - SECTION 03200. Reinforcement in concrete paving and concrete walks shall be not less than W1.4 x 1.4 mesh.
- 2.2 Forms  
Forms shall be of wood or metal, straight and free of warp and of sufficient strength to resist springing during the process of depositing concrete against them. Forms shall be of a depth equal to the thickness of the concrete.

### 3.0 - EXECUTION

- 3.1 Subgrade
- A. The subgrade shall be thoroughly and uniformly compacted to 90% Proctor for walks and 95% Proctor for paving and moistened prior to placing concrete. Care shall be taken not to cause pools of water or muddy or soft subgrade.
  - B. Where soft subgrade is encountered, remove the unstable material and fill with suitable material that can be compacted as specified above.
- 3.2 Form Installation  
Forms shall be staked rigidly in place to the required lines and grades as indicated with a tolerance of not greater than 1/2" in 40'. Forms shall be clean, tight and shall not leak mortar. Forms shall be oiled before concrete is placed. Sloped sidewalks shall have 1" in 12" maximum grade with 5'-0" landing at 30'-0" maximum.

3.3 Concrete Placement

Concrete shall be placed in full compliance with requirements set forth in the Concrete Section.

3.4 Joints

Transverse expansion joints 1/2" in width shall be placed at intervals not to exceed 40' in straight runs and at locations where walks abut other concrete paving, walks, slabs or structures. The slabs between expansion joints shall be divided into blocks not to exceed 5' in length by tooled transverse control joints. The tool for scoring control joints shall penetrate 1" into the slab and produce finished edges having 1/4" radius along both sides of the joints. Every 20' a contraction joint shall be cut entirely through the slab. Exposed edges shall be tooled to a 1/4" radius. Take special note of expansion joint in the concrete paving and the joint material.

3.5 Finishing

- A. Curbs and paving shall be finished with wood trowels, to produce a sandy texture surface.
- B. Walks shall be finished to provide a plain roughened surface. Apply two (2) steel trowelings for densifying and then slightly roughen the surface by lightly applying a burlap swab, a broom or a brush. If the slab is set, the burlap swab may be slightly wetted. When using a broom or brush, no additional moisture will be permitted.
- C. All sidewalks shall be crowned equal to 1/4" for every one foot of width of walk. When a walk abuts one side of a building or wall, the walk shall slope 1/4" per foot away from wall or building.

3.6 Curing

After the surface finish is complete, walks and curbs shall be covered with double strips of water-saturated burlap or cotton mats or a membrane-curing compound applied. The burlap or cotton mats shall be kept saturated with water and left in place for at least 72 hours.

3.7 Removal of Forms

Remove forms within 24 hours after the concrete has been placed. Patch minor honeycombed areas with cement mortar, composed of one part cement and two parts fine aggregate. Major honeycombed areas will be considered as defective work and shall be removed and replaced.

END OF SECTION

## SECTION 03300 - CAST-IN-PLACE CONCRETE

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
  - 1. Footings.
  - 2. Foundation walls
  - 3. Slabs-on-grade.
- B. Related Sections include the following:
  - 1. Division 5 for metals.

#### 1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

#### 1.4 SUBMITTALS

- A. Shop Drawings, General:
  - 1. Submit all shop drawings on one reproducible print and two copies only. The reproducible print will be returned. All other reproductions required by the Contractor are the responsibility of the Contractor and shall be made after reproducible is returned.
  - 2. The contractor shall fill out the Concrete Submittal Checklist and include it as part of his mix design and/or shop drawing submittal package(s). Submittals without the checklist will be returned unchecked as an incomplete submittal. The checklist sheet is located at the end of this specification section.
    - a. If there are questions, clarifications, modifications, or other items where information, a response, or approval is requested, such items must be written on the checklist. Only indicating such items on the shop drawings or within the calculations is not sufficient. Where items are not specifically listed on the checklist and subsequently not explicitly approved by the Structural Engineer of Record, such items are not to be considered approved or considered.
  - 3. All shop drawings which are resubmitted for any reason shall have all revised items clouded or identified for each submittal.
  - 4. Contract documents shall not be used for shop drawing, including erection plans or details.



- B. Product Data: For each type of product indicated.
- C. Design Mixtures: Prepare design mixes for each type and strength of concrete by either laboratory trial mixtures or field experience methods as specified in ACI 318-05 Section 5.3. If trial mixtures method used, the contractor is to provide and use an independent testing facility for preparing and reporting proposed mix designs.
1. All concrete mix designs shall include the following information:
    - a. Proportions of cement, fine and coarse aggregate and water.
    - b. Water/cement ratio, design strength, slump and air content.
    - c. Type of cement and aggregates.
    - d. Type and dosage of all admixtures.
    - e. Type, color and dosage of integral coloring compounds, where applicable.
    - f. Special requirements for pumping.
    - g. Any special characteristics of the mix which require precautions in the mixing, placing or finishing techniques to achieve the finished product specified.
    - h. Dated test data for the laboratory trial mixture or field experience method.
    - i. Material certifications (materials shall meet the requirements of section 2.5 below)
      - 1) Cementitious materials.
      - 2) Admixtures.
      - 3) Aggregates
  2. Submit written reports to Architect and Structural Engineer of Record of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until proposed mix designs have been reviewed and approved by Architect and Structural Engineer of Record.
- D. Contract documents shall not be used for shop drawing, including erection plans or details.
- E. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, wall elevations, and supports for concrete reinforcement.
- F. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.
1. Shop drawings for formwork, prepared for fabrication and erection of forms for specific finished concrete surfaces. Show form construction including jointing, special form joint or reveals, location and pattern of form tie placement, and other items that affect exposed concrete visually.
    - a. Architect's review is for general architectural applications and features only. Design of formwork for structural stability and efficiency is Contractor's responsibility.
- G. Samples: Submit samples of materials as requested by Architect, including names, sources, and descriptions for waterstops, vapor retarder and other products indicated by Architect.
- H. Qualification Data: For Installer, manufacturer and testing agency.
- I. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

J. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Fiber reinforcement.
6. Waterstops.
7. Curing compounds.
8. Floor and slab treatments.
9. Bonding agents.
10. Adhesives.
11. Vapor retarders.
12. Semirigid joint filler.
13. Joint-filler strips.
14. Repair materials.

K. Floor surface flatness and levelness measurements to determine compliance with specified tolerances.

L. Field quality-control test and inspection reports.

M. Minutes of preinstallation conference.

#### 1.5 QUALITY ASSURANCE

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

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

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

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

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. The Owner shall employ an approved Testing Agency to perform concrete and concrete related tests and inspections (that are not specifically noted as the contractor's responsibility) as required by the Building Code, Project Documents, the Architect, and the Structural Engineer of Record.

- E. The contractor shall employ at his expense an approved Testing Agency as defined above to perform the following:
  - 1. Evaluation of trial mixtures and/or concrete testing for mix design submission.
  - 2. Qualification of proposed materials and establishment of concrete mixtures.
  - 3. Other testing services needed or required by the contractor.
- F. Materials and installed work may require testing and retesting at any time during progress of work. Tests, including retesting of rejected materials for installed work, shall be done at Contractor's expense.
- G. Testing Responsibilities of the Contactor:
  - 1. Submit data on qualifications of Contractor's proposed testing agency. Use of testing services will not relieve the Contractor of the responsibility to furnish materials and construction in full compliance with the Contract Documents.
  - 2. Furnish any labor necessary to assist Owner's testing agency in obtaining and handling samples at the project site or at the source of materials.
  - 3. Advise Owners Testing Agency at least 24 hours in advance of operations to allow for completion of quality tests and assignment of personnel.
  - 4. At the Contractor's expense, provide and maintain for the sole use of the Owner's Testing agency adequate facilities for the safe storage and proper curing of concrete test specimens on the project site for initial curing as required by ASTM C31.
- H. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.
- I. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code-Reinforcing Steel."
- J. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
  - 1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
  - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
  - 3. ACI 302 "Guide for Concrete Floor and Slab Construction".
  - 4. ACI 304 "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete".
  - 5. ACI 305 "Hot Weather Concreting".
  - 6. ACI 306 "Cold Weather Concreting".
  - 7. ACI 309 "Guide for Consolidation of Concrete".
  - 8. ACI 347 "Recommended Practice for Concrete Formwork".
  - 9. Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice."
- K. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.
- L. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
  - a. Contractor's superintendent.
  - b. Independent testing agency responsible for concrete design mixtures.
  - c. Ready-mix concrete manufacturer.
  - d. Concrete subcontractor.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
  2. Products: Subject to compliance with requirements, provide one of the products specified.
  3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
  4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

#### 2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
  1. Plywood, metal, or other approved panel materials.
  2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
    - a. High-density overlay, Class 1 or better.
    - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
    - c. Structural 1, B-B or better; mill oiled and edge sealed.
    - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.
- E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces, and adhesion of membranes to concrete.
  - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- F. 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.
  - 1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
  - 2. Furnish ties that, when removed, will leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
  - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

### 2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- B. Plain-Steel Wire: ASTM A 82, as drawn.
- C. Deformed-Steel Wire: ASTM A 496.
- D. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.
- E. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

### 2.4 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
  - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
  - 2. For slabs on grade, use chairs with sand plates or prefabricated plastic supports with wide base to prevent chairs from getting pushed into subbase during concrete pour.

## 2.5 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
1. Portland Cement: ASTM C 150, Type I, gray or white. Supplement with the following:
    - a. Fly Ash: ASTM C 618, Class C or F.
      - 1) Limit use of fly ash to not exceed 25 percent of cementitious content by weight.
    - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
      - 1) Limit use of Ground Granulated Blast-Furnace Slag to not exceed 50 percent of cementitious content by weight.
  2. Blended Hydraulic Cement: ASTM C 595, Type [IS, portland blast-furnace slag] [IP, portland-pozzolan] [I (PM), pozzolan-modified portland] [I (SM), slag-modified portland] cement.
- B. Silica Fume: ASTM C 1240, amorphous silica.
- C. Normal-Weight Aggregates: ASTM C 33, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
1. Maximum Coarse-Aggregate Size: 3/4 inch (19 mm) nominal.
  2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Water: ASTM C 94/C 94M and potable.

## 2.6 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride. Use of admixture must be approved by the Structural Engineer of Record. Include admixtures as part of mix design submittal.
1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
  2. Retarding Admixture: ASTM C 494/C 494M, Type B.
  3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
  4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
  5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
  6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- C. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C. Set-Accelerating Corrosion-Inhibiting Admixtures must be approved by the Structural Engineer of Record. Include admixtures as part of mix design submittal.

1. Available Products:

- a. Boral Material Technologies, Inc.; Boral BCN.
- b. Euclid Chemical Company (The); Eucon CIA.
- c. Grace Construction Products, W. R. Grace & Co.; DCI.
- d. Master Builders, Inc.; Rheocrete CNI.
- e. Sika Corporation; Sika CNI.

D. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete. Non-Set-Accelerating Corrosion-Inhibiting Admixture must be approved by the Structural Engineer of Record. Include admixtures as part of mix design submittal.

1. Available Products:

- a. Axim Concrete Technologies; Catexol 1000CI.
- b. Boral Material Technologies, Inc.; Boral BCN2.
- c. Grace Construction Products, W. R. Grace & Co.; DCI-S.
- d. Master Builders, Inc.; Rheocrete 222+.
- e. Sika Corporation; FerroGard-901.

E. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis. See architectural drawings and site plan for concrete requiring color pigment.

1. Available Manufacturers:

- a. Bayer Corporation.
- b. ChemMasters.
- c. Conspec Marketing & Manufacturing Co., Inc.; a Dayton Superior Company.
- d. Davis Colors.
- e. Elementis Pigments, Inc.
- f. Hoover Color Corporation.
- g. Lambert Corporation.
- h. Scofield, L. M. Company.
- i. Solomon Colors.

2. Color: As selected by Architect from manufacturer's full range.

## 2.7 WATERSTOPS

A. Flexible PVC Waterstops: CE CRD-C 572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Available Manufacturers:

- a. Bometals, Inc.
- b. Greenstreak.
- c. Meadows, W. R., Inc.
- d. Tamms Industries, Inc.
- e. Vinylex Corp.

2. Profile: As indicated.
3. Dimensions: As indicated; nontapered.

## 2.8 VAPOR RETARDERS

- A. Underslab Vapor Barrier 1: 15 mil minimum thickness, Multi-layer, fabric-, cord-, grid-, or aluminum-reinforced, high density polyethylene, or polyolefin equivalent, complying with ASTM E 1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single ply polyethylene is prohibited.
  1. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations in vapor retarder.
  2. Basis of Design Product:
    - a. STEGO INDUSTRIES LLC Product Stego Wrap (15-mil) Vapor Barrier ; [www.stegoindustries.com](http://www.stegoindustries.com)
  3. Other Acceptable products
    - a. Fortifiber Building Systems Group Product Moistop Ultra® 15; [www.fortifiber.com](http://www.fortifiber.com).
    - b. Reef Industries Product Griffolyn 15 Mil ; [www.reefindustries.com](http://www.reefindustries.com).
    - c. W.R. Meadows Inc. Product PERMINATOR 15 ; [www.wrmeadows.com](http://www.wrmeadows.com).
    - d. Substitutions: See Section 01 6000 - Product Requirements.
- B. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.
- C. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a 3/8-inch (9.5-mm) sieve, 10 to 30 percent passing a No. 100 (0.15-mm) sieve, and at least 5 percent passing No. 200 (0.075-mm) sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

## 2.9 FLOOR AND SLAB TREATMENTS

- A. General: The contractor shall coordinate and insure that all floor and slab treatments, curing materials and compounds, finish floor materials, related materials, paints, and repair compounds are compatible.
- B. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces. To be applied where concrete indicated to be sealed in Architectural Drawings.
  1. Available Products:
    - a. Burke by Edoco; Titan Hard.
    - b. Conspex Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Intraseal.
    - c. Dayton Superior Corporation; Day-Chem Sure Hard.
    - d. Euclid Chemical Company (The); Euco Diamond Hard.
    - e. L&M Construction Chemicals, Inc.; Seal Hard.
    - f. Meadows, W. R., Inc.; Liqui-Hard.
    - g. Nox-Crete Products Group, Kinsman Corporation; Duranox.



- C. For additional information on color stained concrete see 03032 Color Stained concrete specifications.

## 2.10 CURING MATERIALS

- A. General: The contractor shall coordinate and insure that all floor and slab treatments, curing materials and compounds, finish floor materials, related materials, paints, and repair compounds are compatible. Evaporation retarder shall not be used where epoxy floor covering is to be placed; slab shall be wet cured with Absorptive Cover or Moisture-Retaining Cover as indicated below.
  - 1. The contractor shall verify and be responsible for insuring the VOC emission limits of authorities having jurisdiction are not exceeded during the project.
- B. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
  - 1. Available Products:
    - a. Burke by Edoco; BurkeFilm.
    - b. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Aquafilm.
    - c. Dayton Superior Corporation; Sure Film.
    - d. Euclid Chemical Company (The); Eucobar.
    - e. L&M Construction Chemicals, Inc.; E-Con.
    - f. Meadows, W. R., Inc.; Sealtight Evapre.
    - g. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
    - h. Sika Corporation, Inc.; SikaFilm.
- C. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
- D. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet or natural fiber matting attached to plastic sheet backing. Acceptable product is Aquacure by DRC, exclusive distributor - Greenstreak Group, Inc. 800-325-9504, or equal.
- E. Water: Potable.
- F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating. Review curing compounds with manufacturer and waterproofing manufacturer to make sure curing compound does not inhibit adhesion.
  - 1. Available Products:
    - a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
    - b. Burke by Edoco; Aqua Resin Cure.
    - c. ChemMasters; Safe-Cure Clear.
    - d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; W.B. Resin Cure.
    - e. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
    - f. Euclid Chemical Company (The); Kurez DR VOX.
    - g. Kaufman Products, Inc.; Thinfilm 420.
    - h. Lambert Corporation; Aqua Kure-Clear.
    - i. L&M Construction Chemicals, Inc.; L&M Cure R.
    - j. Meadows, W. R., Inc.; 1100 Clear.

- k. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.
  - l. Symons Corporation, a Dayton Superior Company; Resi-Chem Clear Cure.
  - m. Tamms Industries, Inc.; Horncure WB 30.
  - n. Unitex; Hydro Cure 309.
  - o. US Mix Products Company; US Spec Maxcure Resin Clear.
  - p. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.
- G. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
- 1. Available Products:
    - a. Anti-Hydro International, Inc.; AH Clear Cure WB.
    - b. Burke by Edoco; Spartan Cote WB II.
    - c. ChemMasters; Safe-Cure & Seal 20.
    - d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Cure and Seal WB.
    - e. Dayton Superior Corporation; Safe Cure and Seal (J-18).
    - f. Euclid Chemical Company (The); Aqua Cure VOX.
    - g. Kaufman Products, Inc.; Cure & Seal 309 Emulsion.
    - h. Lambert Corporation; Glazecote Sealer-20.
    - i. L&M Construction Chemicals, Inc.; Dress & Seal WB.
    - j. Meadows, W. R., Inc.; Vocomp-20.
    - k. Metalcrete Industries; Metcure.
    - l. Nox-Crete Products Group, Kinsman Corporation; Cure & Seal 150E.
    - m. Symons Corporation, a Dayton Superior Company; Cure & Seal 18 Percent E.
    - n. Tamms Industries, Inc.; Clearseal WB 150.
    - o. Unitex; Hydro Seal.
    - p. US Mix Products Company; US Spec Hydrasheen 15 percent
    - q. Vexcon Chemicals, Inc.; Starseal 309.
- H. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 18 to 25 percent solids, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
- 1. Available Products:
    - a. Burke by Edoco; Spartan Cote WB II 20 Percent.
    - b. ChemMasters; Safe-Cure Clear.
    - c. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; High Seal.
    - d. Dayton Superior Corporation; Safe Cure and Seal (J-19).
    - e. Euclid Chemical Company (The); Diamond Clear VOX.
    - f. Kaufman Products, Inc.; SureCure Emulsion.
    - g. Lambert Corporation; Glazecote Sealer-20.
    - h. L&M Construction Chemicals, Inc.; Dress & Seal WB.
    - i. MBT Protection and Repair, Div. of ChemRex; MasterKure-N-Seal VOC.
    - j. Meadows, W. R., Inc.; Vocomp-20.
    - k. Metalcrete Industries; Metcure 0800.
    - l. Nox-Crete Products Group, Kinsman Corporation; Cure & Seal 200E.
    - m. Sonneborn, Div. of ChemRex; Kure-N-Seal.
    - n. Symons Corporation, a Dayton Superior Company; Cure & Seal 18 Percent E.
    - o. Tamms Industries, Inc.; Clearseal WB STD.
    - p. Unitex; Hydro Seal 18.
    - q. US Mix Products Company; US Spec Radiance UV-25

- r. Vexcon Chemicals, Inc.; Starseal 0800.
- I. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
- 1. Available Products:
    - a. Burke by Edoco; Cureseal 1315.
    - b. ChemMasters; Spray-Cure & Seal Plus.
    - c. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Sealcure 1315.
    - d. Dayton Superior Corporation; Day-Chem Cure and Seal (J-22UV).
    - e. Euclid Chemical Company (The); Super Diamond Clear.
    - f. Kaufman Products, Inc.; Sure Cure 25.
    - g. Lambert Corporation; UV Super Seal.
    - h. L&M Construction Chemicals, Inc.; Lumiseal Plus.
    - i. Meadows, W. R., Inc.; CS-309/30.
    - j. Metalcrete Industries; Seal N Kure 0.
    - k. Sonneborn, Div. of ChemRex; Kure-N-Seal 5.
    - l. Tamms Industries, Inc.; LusterSeal 300.
    - m. Unitex; Solvent Seal 1315.
    - n. US Mix Products Company; US Spec CS-25
    - o. Vexcon Chemicals, Inc.; Certi-Vex AC 1315
- J. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
- 1. Available Products:
    - a. Burke by Edoco; Cureseal 1315 WB.
    - b. ChemMasters; Polyseal WB.
    - c. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Sealcure 1315 WB.
    - d. Euclid Chemical Company (The); Super Diamond Clear VOX.
    - e. Kaufman Products, Inc.; Sure Cure 25 Emulsion.
    - f. Lambert Corporation; UV Safe Seal.
    - g. L&M Construction Chemicals, Inc.; Lumiseal WB Plus.
    - h. Meadows, W. R., Inc.; Vocomp-30.
    - i. Metalcrete Industries; Metcure 30.
    - j. Symons Corporation, a Dayton Superior Company; Cure & Seal 31 Percent E.
    - k. Tamms Industries, Inc.; LusterSeal WB 300.
    - l. Unitex; Hydro Seal 25.
    - m. US Mix Products Company; US Spec Radiance UV-25.
    - n. Vexcon Chemicals, Inc.; Vexcon Starseal 1315.
- K. For additional information on finishing and sealing floor surfaces to receive color stained concrete see COLOR STAINED CONCRETE - RESURFACING - SECTION 03032

## 2.11 RELATED MATERIALS

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

- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 typically unless noted or aromatic polyurea at traffic areas with a Type A shore durometer hardness range of 90 to 95 per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
  - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Reglets: Fabricate reglets of not less than 0.0217-inch- (0.55-mm-) thick, galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

## 2.12 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.
  - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
  - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
  - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
  - 4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.
  - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
  - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
  - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.
  - 4. Compressive Strength: Not less than 5000 psi (34.5 MPa) at 28 days when tested according to ASTM C 109/C 109M.

## 2.13 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
  - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

- B. Concrete type, slump, air content, and maximum water to cementitious content shall be as shown on the Structural Drawings.
- C. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
  - 1. Fly Ash: 25 percent.
  - 2. Combined Fly Ash and Pozzolan: 25 percent.
  - 3. Ground Granulated Blast-Furnace Slag: 50 percent.
  - 4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
  - 5. Silica Fume: 10 percent.
  - 6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
  - 7. Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
- D. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.
- E. Admixtures: Use admixtures according to manufacturer's written instructions.
  - 1. Use of admixture must be approved by the Structural Engineer of Record. Include admixtures as part of mix design submittal
  - 2. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
  - 3. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
  - 4. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
  - 5. Use corrosion-inhibiting admixture in concrete mixtures where indicated.
- F. Slump Limits: Proportion and design mixes to result in slump at point of placement as shown on the drawings.
  - 1. When use of a Type I or II plasticizing admixture conforming to ASTM C 1017 or when a Type F or G high range water reducing admixture conforming to ASTM C494 is permitted, concrete shall have a slump of 2 to 4 inches before the admixture is added and a maximum slump of 8 inches at the point of delivery after the admixture is added.
- G. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

#### 2.14 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Building Members: Proportion normal-weight concrete mixture as follows:
  - 1. Minimum Compressive Strength: As indicated in drawings.
  - 2. Maximum Water-Cementitious Materials Ratio: As indicated in drawings.

3. Slump Limit: As indicated in drawings. 8 inches (200 mm), plus or minus 1 inch (25 mm), for concrete with verified slump indicated in drawings before adding high-range water-reducing admixture or plasticizing admixture].
4. Air Content: As indicated in drawings, at point of delivery for 3/4-inch (19-mm) nominal maximum aggregate size.

## 2.15 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

## 2.16 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
  1. Mixing and delivery time shall not exceed 90 minutes.
  2. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
  1. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
  2. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
  3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

## PART 3 - EXECUTION

### 3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
  1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.
  2. Class C, 1/2 inch (13 mm) for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.

- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
  - 1. Install keyways, reglets, recesses, and the like, for easy removal.
  - 2. Do not use rust-stained steel form-facing material.
- 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 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.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

### 3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
  - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

### 3.3 REMOVING AND REUSING FORMS

- A. General: 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 (10 deg C) for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
  - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 75 percent of its 28-day design compressive strength.

2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
  - C. 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 exposed concrete surfaces unless approved by Architect.

### 3.4 VAPOR RETARDERS

- A. Plastic Vapor Retarders: Convene preconstruction meeting prior to starting work. Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.
  1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.
- B. Bituminous Vapor Retarders: Place, protect, and repair vapor retarders according to manufacturer's written instructions.

### 3.5 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" and Structural Drawings for placing reinforcement.
  1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
  1. Weld reinforcing bars according to AWS D1.4, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
- F. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.
- G. Zinc-Coated Reinforcement: Repair cut and damaged zinc coatings with zinc repair material according to ASTM A 780. Use galvanized steel wire ties to fasten zinc-coated steel reinforcement.



### 3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install 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. Do not continue reinforcement through sides of strip placements of floors and slabs.
  - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
  - 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 no further than 90' on center. Locate joints midway between piers integral with walls, near corners, and in concealed locations where possible.
  - 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
  - 7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
  - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
  - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
  - 3. Slab reinforcement shall not cross contraction joints.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
  - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
  - 2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
  - 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

### 3.7 WATERSTOPS

- A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

### 3.8 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. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
  - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
  - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
  - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
  - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) 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 mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
  - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  - 2. Maintain reinforcement in position on chairs during concrete placement.
  - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
  - 4. Slope surfaces uniformly to drains where required.
  - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with the recommendations and intent of 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 average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301. Deliver concrete to meet the following minimum temperatures immediately after placement:
    - a. 55 deg F for sections less than 12in. in the least dimension.
    - b. 50 deg F for sections 12in. to 36in. in the least dimension.
    - c. 45 deg F for sections 36in. to 72in. in the least dimension.
    - d. 40 deg F for sections greater than 72in. in the least dimension.
    - e. The temperature of concrete as placed shall not exceed these values by more than 20 deg F.

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 specified and approved in mixture designs.

G. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F (32 deg C) 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. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

### 3.9 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: 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 defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

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

### 3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with the recommendations and intent of ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch (6 mm) in 1 direction.
  - 1. Apply scratch finish to surfaces indicated by Architect and to receive concrete floor toppings, to receive mortar setting beds for bonded cementitious floor finishes.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
  - 1. Apply float finish to surfaces indicated by Architect to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
  - 1. Apply a trowel finish to surfaces indicated by Architect, exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
  - 2. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:
    - a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated by Architect, where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
  - 1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
  - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- G. Slip-Resistive Finish: Before final floating, apply slip-resistive aggregate or aluminum granule finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:

1. Uniformly spread 25 lb/100 sq. ft. (12 kg/10 sq. m) of dampened slip-resistive aggregate or aluminum granules over surface in 1 or 2 applications. Tamp aggregate flush with surface, but do not force below surface.
2. After broadcasting and tamping, apply float finish.
3. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aggregate or aluminum granules.

H. Dry-Shake Floor Hardener Finish: After initial floating, apply dry-shake floor hardener to surfaces according to manufacturer's written instructions and as follows:

1. Uniformly apply dry-shake floor hardener at a rate of 100 lb/100 sq. ft. (49 kg/10 sq. m) unless greater amount is recommended by manufacturer.
2. Uniformly distribute approximately two-thirds of dry-shake floor hardener over surface by hand or with mechanical spreader, and embed by power floating. Follow power floating with a second dry-shake floor hardener application, uniformly distributing remainder of material, and embed by power floating.
3. After final floating, apply a trowel finish. Cure concrete with curing compound recommended by dry-shake floor hardener manufacturer and apply immediately after final finishing.

### 3.11 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by 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 at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

### 3.12 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with the recommendations and intent of ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after

loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces 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 (300-mm) lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
  - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
  - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
  - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project..
3. Curing Compound: Apply 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.
  - a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a 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. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

### 3.13 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions to concrete floors indicated in Architectural Drawings to be troweled and sealed.
1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.

2. Do not apply to concrete that is less than seven days' old unless otherwise required by manufacturer.
  3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.
- B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

### 3.14 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
1. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

### 3.15 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension in solid concrete, but not less than 1 inch (25 mm) in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
  2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
  3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
  2. After concrete has cured at least 14 days, correct high areas by grinding.
  3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
  4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
  5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
  6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
  7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

### 3.16 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports. Also see specification 01410 Structural Tests and Special inspections for additional information.
- B. Inspections:
1. Steel reinforcement placement.
  2. Steel reinforcement welding.
  3. Headed bolts and studs.
  4. Verification of use of required design mixture.
  5. Concrete placement, including conveying and depositing.
  6. Curing procedures and maintenance of curing temperature.
  7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:



1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.
  - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
7. Compression Test Specimens: ASTM C 31/C 31M.
  - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
  - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
  - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days. Compression test specimens for days not specified shall be at the contractor's expense.
  - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Structural Engineer of Record but will not be used as sole basis for approval or rejection of concrete.

13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete at the Contractor's expense when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Structural Engineer of Record. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
  14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
  15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- D. Measure floor and slab flatness and levelness according to ASTM E 1155 (ASTM E 1155M) within 24 hours of finishing.

## CONCRETE SUBMITTAL CHECKLIST

*This submittal checklist must be provided with all concrete and reinforcing steel packages that are to be submitted to Structural Design Group. Absence of a properly completed checklist may result in the return of the submittal unchecked or as revise and resubmit.*

<b>MIX DESIGN</b>		
Included?	Description	Location in project documentation where this requirement is located.
<input type="checkbox"/>	Field data or trial mixture strength data	Spec Section 03300, Part I, Subsection 1.4
<input type="checkbox"/>	Verify Mix Design Constraints Limit Fly Ash to 25% Limit Proportions per Spec Section 03300, Part II, Subsection 2.5 W/C ratio, Air, Slump per General Notes	Spec Section 03300, Part II, Subsection 2.5  General Notes – Section 4.0
<input type="checkbox"/>	Mix Design Data: 1. Proportions of cement, fine and coarse aggregate and water. 2. Water/cement ratio, design strength, slump and air content. 3. Type of cement and aggregates. 4. Type and dosage of all admixtures. 5. Type, color and dosage of integral coloring compounds, where applicable. 6. Special requirements for pumping. 7. Any special characteristics of the mix which require precautions in the mixing, placing or finishing techniques to achieve the finished product specified. 8. Material certifications 1) Cementitious materials. 2) Admixtures. 3) Aggregates .	Spec Section 03300, Part I, Subsection 1.4  Spec Section 03300, Part I, Subsection 2.5, 2.6
<b>REBAR SHOP DRAWINGS</b>		
Included?	Description	Location in project documentation where this requirement is located.
<input type="checkbox"/>	Submit all shop drawings on one reproducible print and two reproductions only.	General Notes - Section 2.0 Spec Section 03300, Part I, Subsection 1.4
<input type="checkbox"/>	Contract documents not used for shop drawing.	Spec Section 03300, Part I, Subsection 1.4
<input type="checkbox"/>	Resubmitted shop drawings have all revised items clouded or identified.	Spec Section 03300, Part I, Subsection 1.4
<input type="checkbox"/>	Any requested information, clarifications, requests for approvals, modifications, etc. as listed in Spec Section 03300, Part I, Subsection 1.4 are included by the contractor below.	Spec Section 03300, Part I, Subsection 1.4

**FORMWORK, RE-SHORE, OTHER SHOP DRAWINGS**

Included?	Description	Location in project documentation where this requirement is located.
<input type="checkbox"/>	Submit all shop drawings on one reproducible print and two reproductions only.	General Notes - Section 2.0 Spec Section 03300, Part I, Subsection 1.4
<input type="checkbox"/>	Contract documents not used for shop drawing, including erection plans or details	Spec Section 03300, Part I, Subsection 1.4
<input type="checkbox"/>	Resubmitted shop drawings have all revised items clouded or identified.	Spec Section 03300, Part I, Subsection 1.4
<input type="checkbox"/>	Any requested information, clarifications, requests for approvals, modifications, etc. as listed in Spec Section 03300, Part I, Subsection 1.4 are included by the contractor below.	Spec Section 03300, Part I, Subsection 1.4
<input type="checkbox"/>	Calculations stamped by an Engineer registered in the state where the project is located.	Spec Section 03300, Part I, Subsection 1.4

**QUESTIONS, ETC. PER SECTION 03300, PART I, SUBSECTION 1.4**

END OF SECTION 03300

1.0 - GENERAL

1.1 Related Documents

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

1.2 Summary

- A. This Section includes unit masonry assemblies consisting of , but not limited to the following:

1. Concrete Masonry Units
2. Brick unit masonry
3. Mortar and Grout
4. Insulation in masonry walls

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

1. Division 7 Section "Flashing and Sheet Metal" for exposed sheet-metal flashing installed in masonry
2. Division 7 Section-07910 - "Joint Sealants" for sealing joint in mockup
3. Division 7 - 07720 - Wall flashing
4. Division 7 - Section 07180 -Dampproofing
5. Division 8 - Section "FRP Doors"
6. Division 8 - Section 08110 -Hollow Metal Doors and Frames

- C. Products installed but not furnished under this Section include the following:

1. Hot dip-galvanized Steel lintels for unit masonry
2. Wood nailers and blocking built into unit masonry
3. Manufactured reglets in masonry joints for metal flashing specified in Division 7 Section "Flashing and Sheet Metal."

1.3 Submittals

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

- B. Product data for each different masonry unit, accessory, and other manufactured product specified.

- C. Samples for initial selection of the following:

1. Unit masonry samples in full size form showing the full range of colors and textures available for each different exposed masonry unit required.

- D. Samples for verification of 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.

- a. Include size-variation data for Type FBS brick, verifying that actual range of sizes for brick falls within ASTM C 216 dimension tolerances.
  - b. Weep holes/vents in color to match mortar color.
- 2. Accessories embedded in the masonry.
- E. List of Materials Used in Construction Mockups: List generic 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.
- F. Material certificates for the following, signed by manufacturer and Contractor, certifying that each material complies with requirements.
  - 1. Each different cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.
  - 2. Each material and grade indicated for reinforcing bars.
  - 3. Each type and size of joint reinforcing.
  - 4. Each type and size of anchors, ties, and metal accessories.
- G. Material test reports from a qualified independent testing agency, employed and paid by Contractor or manufacturer, indicating and interpreting test results relative to compliance of the following proposed masonry materials with requirements indicated:
  - 1. Mortar complying with property requirements of ASTM C 270.
  - 2. Grout complying with property requirements of ASTM C 476.
  - 3. Masonry units complying with property requirements of ASTM C90.
- H. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.4 Quality Assurance

- A. Clay Masonry Unit Test: For each clay masonry unit indicated, per ASTM C 67
- B. Concrete Masonry Unit Test: For each different concrete masonry unit indicated, per ASTM C 140
- C. Mortar Test: Test mortar properties per test methods of ASTM C 270
- D. Evaluate mortar composition and properties per ASTM C 780
- E. Grout Test: Test grout for compressive strength per ASTM C 1019
- F. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

- G. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one source and by a single manufacturer for each different product required.
- H. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.
- I. Mockup: Prior to installing unit masonry, construct sample wall panel(s) to verify selections made under sample submittals and to demonstrate aesthetic effects as well as other qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of Work.
  - 1. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."
  - 2. Locate mockups on site in the locations indicated or, if not indicated, as directed by Architect.
    - a. Include exterior face brick wall with field and accent brick and a control joint.
    - b. Seal control joint complying with Division 7 Section "Joint Sealants".
  - 3. Build mockups for the following types of masonry full thickness, including face and back-up wythes as well as accessories. Include a sealant-filled joint at least 16 inches long in each mockup.
    - a. Typical exterior face brick wall with through wall flashing installed for a 24 inch length in corner of mockup approximately 16" down from top of mockup with a 12 inch length of flashing left exposed to view (omit masonry above half of flashing).
    - b. Typical interior masonry unit wall.
    - c. Clean exposed faces of mockups with masonry cleaner "Sure Klean 600" or other masonry manufacturer approved cleaner.
    - d. Protect accepted mockups from the elements with weather-resistant membrane.
  - 4. Notify Architect one week in advance of the dates and times when mockups will be constructed.
  - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed work.
    - a. Acceptance of mockup 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.
    - b. Approval of mockups does not constitute approval of deviations from Contract Documents contained in mockups, unless such deviations are specifically approved by Architect in writing.
    - c. When directed, demolish and remove mockups from Project site.
    - d. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 Special Inspections

Cooperate and adhere to the requirements of 2021 International Building Code - Special Inspections. All masonry and masonry reinforcing shall be subject to special inspections and



observations, at stage intervals deemed necessary, by the Owners' third party Inspector, Engineer and/or the Architect prior to grout filling.

1.6 Special Markings

- A. The contractor shall chalk-line mark the floor slab for masonry wall locations.
- B. The contractor shall mark on the floor slab location of reinforcing dowels to serve grouted cells so as to be clear as to locations of vertical cell reinforcement.
- C. The contractor shall mark the concrete sub-floor with temporary marker paint to identify location of structural CMU reinforcing dowels so as to accurately locate reinforced cells during wall erection. Markings should be transferred to CMU surfaces as installation allows.
- D. Prefabricated Corner and "T" Wall Reinforcing - upon arrival to the job site and while material is in bundle state, the ends shall be spray painted in the field with permanent bright red paint for easy recognition during site inspections.

1.7 Special Sequencing

- A. After the special markings have been provided and prior to the start of CMU installation, an inspection of the concrete floor slab and CMU reinforcing dowels shall be required.
- B. CMU wall construction designed to receive structural reinforcement and cell grouting shall be installed in such sequencing as to consolidate the work of placing reinforcement and cell grouting to minimum concentrate intervals encompassing such significant quantities as to warrant truck delivery of ready-mixed grout.
- C. The work event of placing structural reinforcement and grouting shall require continuous special observation by the Owner's third party Inspector(s) as required by the 2021 International Building Code. Grout mix samples shall be required for testing purposes. The General Contractor shall directly schedule special masonry observations at least 24 hours in advance and notify Architect accordingly. Cost associated with special sequencing shall be considered and included in base bid.

1.8 Delivery, Storage, and Handling

- A. Store masonry units on elevated platforms, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not install until they are in an air-dried condition.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained, and contamination avoided.
- D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 Project Conditions

- A. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches 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 mortar splatter by coverings spread on ground and over wall surface.
  2. Protect sills, ledges, and projections from mortar droppings.
  3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
  4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt on completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit masonry damaged by frost or freezing conditions. Comply with the following requirements:
1. Cold-Weather Construction: When the ambient temperature is within the limits indicated, use the following procedures:
    - a. 40 to 32 deg F: Heat mixing water or sand to produce mortar temperatures between 40 and 120 deg F
  2. Cold-Weather Protection: When the mean daily temperature is within the limits indicated, provide the following protection:
    - a. 40 to 25 deg F: Cover masonry with a weather-resistant membrane for 48 hours after construction.
    - b. 25 to 20 deg F: Cover masonry with insulating blankets or provide enclosure and heat for 48 hours after construction to prevent freezing. Install wind breaks when wind velocity exceeds 15 mi./h.
    - c. 20 deg F and Below: Provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for 48 hours after construction.
  3. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried out, but not less than 7 days after completion of cleaning.
- E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F and above.

## 2.0 - PRODUCTS

### 2.1 Manufacturers

- A. **Manufacturers:** Subject to compliance with requirements, provide products by the following:
1. **Brick:**
    - a. Acme Brick Co.
    - b. Belden Brick Co.
    - c. Cherokee Sanford Group, Inc.
    - d. US Brick
    - e. Boren
    - f. Triangle
    - g. Boral
    - h. Tri-State
  2. **Portland Cement, Mortar Cement, Masonry Cement, and Lime:**
    - a. Essroc Materials, Inc.
    - b. Glen-Gery Corporation
    - c. Lafarge Corporation
  3. **Joint Reinforcement, Ties, and Anchors:**
    - a. Dur-O-Wal, Inc.
    - b. Heckman Building Products, Inc.
    - c. Hohmann & Barnard, Inc.
    - d. Wire-Bond

### 2.2 Concrete Masonry Units

- A. **General:** Provide shapes indicated and as follows for each form of concrete masonry unit required:
1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding and other special conditions.
  2. Bullnose units are required for all outside corners of vertical surfaces, unless otherwise indicated.
- B. **Concrete Masonry Units:** ASTM C 90 and as follows:
1. **Unit Compressive Strength:** Provide units with minimum average net-area compressive strength of 2,000 psi.
  2. **Weight Classification:** **NORMAL**
  3. **Aggregates:** Do not use aggregate made from pumice, scoria or tuff.
  4. **Provide Type N-I moisture-controlled units**
  5. **Size:** Manufactured to the actual dimensions indicated on Drawings within tolerances specified in the applicable referenced ASTM specification. Typical unit 8" nominal, 6" nominal, 4" nominal, or 12" nominal as indicated on drawings.

### 2.3 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. Face Brick: ASTM C 216 and as follows:
1. Grade and Unit Compressive Strength: Provide units with grade and minimum average net-area compressive strength indicated below:
    - a. Grade: SW. With color through brick to match existing school brick predominant on buildings in the school complex or as otherwise selected by the architect.
  2. Type: FBS. With color through brick as selected by the architect.
  3. Size: Bricks manufactured to the following actual dimensions within tolerances specified in ASTM C 216:
    - a. Standard: 3-5/8 inches thick by 2-1/4 inches high by 7-5/8 inches long.
  4. Application: Use where brick is exposed, unless otherwise indicated.
  5. Color and Texture: As selected by the architect.
- D. Brick Schedule
1. Contractor to provide an allowance (materials only) for the brick. See Section 01020 – Allowances.

#### 2.4 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. Masonry Cement: ASTM C91
- C. Hydrated Lime: ASTM C 207, Type S (for CMU) Type N (for face brick).
- D. 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.
- E. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch, use aggregate graded with 100 percent passing the No. 16 sieve.
  1. White-Mortar Aggregates: Natural white sand and or ground white stone.
- F. Aggregate for Grout: ASTM C 404.
- G. 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.

- H. 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.
- I. Ready-Mixed Mortar: Cementitious materials, water, and aggregate complying with requirements specified in this Article; combined with set-controlling admixtures to produce a ready-mixed mortar complying with ASTM C 1142.
- J. Water: Potable.
- K. Products: Subject to compliance with requirements, provide one of the following:
  - 1. Cold Weather Admixture:
    - a. "Accelguard 80"; Euclid Chemical Co.
    - b. "Morset"; W. R. Grace & Co.
  - 2. Mortar shall be approved equal to Lafarge as selected by Architect from full range of mortar colors available.

## 2.5 Ties and Anchors, General

- A. General: Provide ties and anchors specified in subsequent articles that comply with requirements for metal and size of this Article, unless otherwise indicated. Provide ties that will extend into the brick veneer a minimum of one half of the veneer width.
- B. Wire: As follows:
  - 1. Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating for wire ties and anchors in exterior walls.
  - 2. Wire Diameter: 0.1875 inch.

## 2.6 Bent Wire Ties and Cornices

- A. Individual units prefabricated from bent wire to comply with requirements indicated below:
  - 1. Type for Masonry where Wythes are of Different Material: Adjustable ties composed of 2 parts; 1 with pintles, the other with eyes; with maximum misalignment of 1-1/4 inches. Ties shall be long enough to extend through rigid wall insulation and into outer wythe a minimum of 2 inches.
- B. Joint Reinforcement: Provide welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10', with prefabricated corner and tee units, and complying with requirements indicated below:
  - 1. Width: Fabricate joint reinforcement in units with widths of approximately 2" less than nominal width of walls and partitions as required to provide mortar coverage of not less than 5/8" on joint faces exposed to exterior and 1/2" elsewhere.
  - 2. Ladder design with cross rods spaced not more than 16" o.c. One side rod for each face shell of concrete masonry back-up and one rod for brick wythe.
  - 3. Wire Size: 0.1875" diameter for deformed rods; No. 9 cross rods.  
Hot dipped galvanized, Class 3. H. Reinforcing:
  - 4. Brick to block ties: 3/16" diameter adjustable double hook & eye; Hohmann & Barnard Lox-All Adjustable Eye-Wire, Dur-o-wall or equal.

## 2.7 Embedded Flashing Materials

- A. Vinyl Flashing:
  - 1. Thickness: 40 mil thick.
  - 2. Application: Use where flashing is fully concealed in masonry
- B. Adhesive for Flashings: Of type recommended by manufacturer of flashing material for use indicated.
- C. Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to the following:
  - 1. Vinyl Flashing:
    - a. Gibraltar
    - b. Nervastral
    - c. AFCO

## 2.8 Miscellaneous Masonry Accessories

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Type 2, Class A, Grade 1; compressible up to 35 percent; of width and thickness indicated; formulated from Neoprene.
- B. Preformed Metal Control-Joints: Heckman 16 oz. copper – Type 93U, designed to fit brick size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Weep Holes: Provide the following:
  - 1. Wicking material: Cotton sash cord in length required to produce 2 inch exposure on exterior and 18 inches in cavity between wythes.
- E. Sealer for Brick: Prosoco-Siloxane-Weather Seal
- F. Rebar Positioners: 3/16" diameter, hot-dipped galvanized and provided at 48" vertical centers in each reinforced cell.

## 2.9 Wall Reinforcement and Anchors

- A. Continuous wall reinforcement at 16" o.c. for all masonry walls shall be hot-dipped galvanized and of either truss or ladder design with tabs for exterior two Wythe walls. Reinforcement shall have not less than No. 9 steel wire cross rods and No. 9 deformed side rods. Wires shall conform to ASTM A82. Reinforcement shall have a drip when used in cavity walls, use rectangular pintle sections 16" o.c. in back-up masonry and adjustable double eyelet sections in face brick where rigid insulation is indicated or required in cavity space or where face brick and back-up masonry is not run up together. Use manufacturer's pre-formed corners and intersecting sections and splice as recommended. Basis of material selection shall be Hohmann & Barnard #270 or approved equals by Heckmann Building Products, Wire Bond and Dur-O-Wall.

## 2.10 Masonry Cleaners

- A. Job Mixed Detergent Solution: Solution of ½ cup dry measure tetrasodium polyphosphate and 1/2 cup dry measure laundry detergent dissolved in 1 gallon of water.
- B. Proprietary Detergent Solution: Manufacturer's standard strength cleaner designed for removing mortar/grout stains, efflorescence and other new construction stains from new masonry surfaces as acceptable to masonry material manufacturer. "Sure Klean" No. 600 Detergent; ProSoCo, Inc., or approved equal. Do not use acid cleaners.

## 2.11 Mortar and Grout Mixes

- A. General: Do not add admixtures including coloring pigments, air-entraining agents, accelerators, retarders, water repellent agents, anti-freeze compounds or other admixtures, unless otherwise indicated.
  - 1. Do not use calcium chloride in mortar or grout.
- B. Mixing: Combine and thoroughly mix cementitious, water and aggregates in a mechanical batch mixer; comply with referenced ASTM standards for mixing time and water content.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification, for types of mortar required, unless otherwise indicated.
  - 1. Limit cementitious materials in mortar to portland cement-lime.
  - 2. Use Type S or N mortar.
- D. Colored Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required. Do not exceed pigment-to-cement ratio of 1-to-10, by weight.
- E. Grout for Unit Masonry: Comply with ASTM C 476 for grout for use in construction of reinforced and non-reinforced unit masonry. Use grout of consistency indicated or if not otherwise indicated, of consistency (fine or coarse) at time of placement which will completely fill all spaces intended to receive grout. Grout to have minimum 2,500 psi compressive strength at 28 days when tested in accordance with ASTM C1019.
  - 1. Use fine grout in grout spaces less than 2" in horizontal direction, unless otherwise indicated.
  - 2. Use coarse grout in grout spaces 2" or more in least horizontal dimension, unless otherwise indicated.

## 3.0 - EXECUTION

### 3.1 Examination

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of unit masonry. Do not proceed with installation until unsatisfactory conditions have been corrected.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of unit masonry.
2. Examine rough-in and built-in construction to verify actual locations of piping connections prior to installation.

3.2 General

- A. Lay out all masonry work according to the dimensions shown on the drawings. No work shall be laid unless the temperature is 35° F. and rising.
- B. All masonry work shall be laid straight, level, plumb, and true. Exterior walls shall be laid continuously around the entire structure and in no case racked up more than five (5) feet.
- C. Build in all flashing, anchors, reinforcing, inserts, wall plugs, lintels, bearing plates, bond beams and items as required to accommodate the work of others.
- D. All special details such as chases, openings, expansion joints, projections, corbels, etc., shall be built as required and/or indicated on the drawings.
- E. Lay all masonry, brick and block in full bed of mortar completely filling all joints with mortar. Allow for caulking joints at all window and door frames, and at all wall intersections.
- F. Joints of all exposed masonry surfaces shall be finished after the mortar has taken its initial set. Use a straight edge for horizontal joints. Vertical joints shall be in alignment from top to bottom.
- G. At the end of each day or when rain or frost is imminent, the tops of masonry walls and similar surfaces shall be properly protected by covering top of wall with a strong waterproof membrane well secured in place.
- H. Consult all other trades in advance and make provisions for the installation of their work to avoid cutting and patching. Do all cutting and patching of masonry required to accommodate work of others.
- I. Unfinished work shall be stepped back to permit joining of new work. Masonry work may be toothed only when approved. Before connecting new work with work previously built, sweep clean, remove loose mortar and thoroughly wet the old brick.
- J. As the work progresses, mortar daubs and smears shall be cleaned from masonry work.
- K. Door frames shall be set before the masonry walls are built. As the masonry walls are built around these frames, the inside of the frames shall be grouted solid with mortar. NOTE: See HOLLOW METAL DOORS AND FRAMES - SECTION 08110 for requirements to coat interior of frames prior to grouting.
- L. Extend all rated walls to the underside of structural deck above unless otherwise approved. Fit walls neatly with all joints filled where two levels of ceiling occur, extend walls to high level. Extend all partition walls to 8" above adjacent ceiling.
- M. Weep holes: Provide weep holes in head joints 32" o.c. at thru wall flashing where air space is not open downward. Weep holes shall be below finish floor line and above finish grade.



- N. MORTAR IN CONTACT WITH COPPER PIPING WILL NOT BE ACCEPTED. Coordinate with plumbing or mechanical contractor if copper is encountered without sleeving/insulation. Anticipate additional corrective work.

### 3.3 Installation, General

- A. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual thickness of the masonry units, using units of thickness indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections of the Specifications.
- C. Leave openings for equipment to be installed before completion of masonry. After installing equipment, complete masonry to match construction immediately adjacent to the opening.
- D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting, where possible. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Mix units for exposed unit masonry from several pallets or cubes as they are placed to produce uniform blend of colors and textures.
- F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
- G. Wetting of Brick: Wet brick prior to 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 the water so they are damp but not wet at the time of laying.

### 3.4 Construction Tolerances

- A. Variation from Plumb: For vertical lines and surfaces of columns, walls, and arrises, do not exceed 1/4 inch in 10 feet, nor 3/8 inch in 20 feet, nor 1/2 inch in 40 feet or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet, nor 1/2 inch in 40 feet or more. For vertical alignment of head joints, do not exceed plus or minus 1/4 inch in 10 feet, nor 1/2 inch maximum.
- B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet, nor 1/2 inch in 40 feet or more. For top surface of bearing walls, do not exceed 1/8 inch in 10 feet, nor 1/16 inch within width of a single unit.
- C. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls, and partitions, do not exceed 1/2 inch in 20 feet, nor 3/4 inch in 40 feet) or more.
- D. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4 inch nor plus 1/2 inch.
- E. Variation in Mortar-Joint Thickness: Do not vary from bed-joint thickness indicated by more than plus or minus 1/8 inch with a maximum thickness limited to 1/2 inch. Do not vary bed-joint thickness from bed-joint thickness of adjacent course by more

than 1/8 inch. Do not vary from head-joint thickness indicated by more than plus or minus 1/8 inch. Do not vary head-joint thickness from adjacent head-joint thickness by more than 1/8 inch. Do not vary from collar-joint thickness indicated by more than minus 1/4 inch or plus 3/8 inch.

### 3.5 Laying Masonry Walls

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets. Avoid the use of less-than-half-size units at corners, jambs, and where possible at other locations.
- B. Lay walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.
- C. Bond Pattern for Exposed Masonry:
  - 1. Match existing
- D. Lay concealed masonry with all units in a wythe as above. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- E. Stopping and Resuming Work: In each course, rack back 1/2-unit length for one-half running bond or 1/3-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 prior to laying fresh masonry.
- F. Built-in Work: As construction progresses, build-in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.
- G. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.
- H. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
- I. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- J. Build non load-bearing interior partitions full height of story to underside of solid floor or roof structure above and as follows:
  - 1. Install compressible filler in joint between top of partition and underside of structure above.
  - 2. Wedge non load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.

### 3.6 Mortar Bedding and Jointing

- A. Lay hollow concrete masonry units as follows:
  - 1. With full mortar coverage on horizontal and vertical face shells.
  - 2. Bed all webs in mortar.
  - 3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.

4. Maintain joint widths indicated, except for minor variations required to maintain bond alignment. If not indicated, lay walls with 3/8-inch joints.
  5. Fill bottom course of all CMU solid with mortar.
  6. Fill all courses of CMU adjacent to fill in area of ramp and stage solid with mortar.
- B. Lay solid brick-size masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not furrow bed joints or slush head joints.
1. Lay all brick with full head and bed joints.
  2. At cavity walls, bevel beds away from cavity to minimize mortar protrusions into cavity. As work progresses, trowel mortar fins protruding into cavity flat against cavity face of brick.
  3. Maintain joint widths indicated, except for minor variations required to maintain bond alignment. If not indicated, lay walls with 1/4-to-3/8-inch joints. Three brick courses and three mortar courses in 8-inch vertical to course with CMU.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.
- D. Cut joints flush for masonry walls that are to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

### 3.7 Structural Bonding of Multiwythe Masonry

- A. Use individual metal ties installed in horizontal joints to bond wythes together. Provide ties as shown, but not less than 1 metal tie for 4 sq. ft. of wall area spaced not to exceed 24 inches o.c. horizontally and vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.
- B. Corners: Provide interlocking masonry unit bond in each course at corners, unless otherwise shown. Provide continuity with horizontal joint reinforcing 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, provide same type of bonding specified for structural bonding between wythes and space by providing continuity with horizontal joint reinforcing at corners by using prefabricated "T" units.

### 3.8 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.
  2. Tie exterior wythe to back-up with individual metal ties. Stagger alternate courses.

### 3.9 Anchoring Masonry to Structural Members

- A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

1. Space weldable rebar couplers at horizontal bond beams as indicated, but not more than 24 inches o.c. vertically.

### 3.10 Cavity Wall and Masonry Cell Insulation

- A. On units of plastic board insulation, place small dabs of adhesive, spaced approximately 12 inches o.c. both ways on inside face or attach to inside face with plastic fasteners designed for his purpose. Verify compatibility of adhesive and bituminous damproofing specified in Division 7. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.
- B. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

### 3.11 Horizontal Joint Reinforcement

- A. General: Provide continuous horizontal joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2" elsewhere. Lap reinforcing a minimum of 6 inches.
  1. Space reinforcement not more than 16 inches vertically o.c.
  2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
  3. Provide reinforcement in mortar joints 1 block course above and below wall openings and extending 12 inches beyond opening.
    - a. Reinforcing above is in addition to continuous reinforcement.
- B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.

### 3.12 Control and Expansion Joints

- A. General: Install control and expansion joints in unit masonry where indicated. Build-in related items as the 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 by installing preformed control-joint gaskets designed to fit standard sash block.
- C. Form expansion joints in brick made from clay or shale by forming an 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." Maintain joint free and clear of mortar.

### 3.13 Lintels

- A. Install steel lintels where indicated.

- B. Provide pre-cast 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.
- C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

### 3.14 Flashing, Weep Holes, and Vents

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to the downward flow of water in the wall, and where indicated.
- B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Place through-wall flashing on sloping bed of mortar and cover with mortar. Seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer before covering with mortar.
- C. Install flashing as follows:
  - 1. At composite masonry walls, including cavity walls, extend flashing from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 4 inches and through the 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 the inner wythe and turn up approximately 2 inches unless otherwise indicated.
  - 2. 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 up not less than 2 inches to form a pan.
  - 3. Flashing installation is to be inspected and approved in writing by Architect before proceeding with masonry work.
- 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. Form weep holes with product specified in Part 2 of this Section.
  - 2. Form weep holes by keeping head joints free and clear of mortar.
  - 3. Space weep holes 24 inches o.c.
- E. Trim wicking material used in weep holes flush with outside face of wall after mortar has set.
  - 1. Install through-wall flashing and weep holes above horizontal blocking.
- F. Install reglets and nailers for flashing and other related construction where shown to be built into masonry.

### 3.15 Grouting of CMU Walls

- A. Contractor to notify Owner's Testing Agent prior to all grouting of steel reinforced CMU.
- B. All cavities with steel reinforcing to be cleaned of all debris and broken CMU prior to filling with grout.
- C. All reinforcing steel in cells to be filled with grout or concrete to be continuous with laps as required by code.

- D. Grout for filled masonry cells is not to be dropped more than five (5) feet.

### 3.16 Repairing, Pointing and Cleaning

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units; install in fresh mortar or grout, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point-up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for application of sealants.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears prior to tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
  - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
  - 3. Protect adjacent stone and non-masonry 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 bucket and brush hand-cleaning method described in BIA Technical Note No. 20 Revised, using approved masonry cleaner.
  - 6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain present on exposed surfaces.
- E. Protection: Provide final protection and maintain conditions that ensure unit masonry is without damage and deterioration at time of Substantial Completion.

### 3.17 Sealing of Brick

- A. Take precautions to avoid harm to building occupants, pedestrians, nearby property and all non-masonry surfaces from contact with sealer and fumes. Protect and/or divert auto and pedestrian traffic.
- B. Test masonry (minimum 4 ft x 4 ft area) before overall application to assure compatibility and desired water repellent results. (Treated and cured masonry should shed water and not wet out.) Apply tests using the same equipment as for job application and allow to cure 24 to 48 hours. Test panels should remain available for inspection by Architect.
- C. Surface Preparation:
  - 1. Fill all cracks and voids to avoid penetration of fumes into the building. (Such openings may permit moisture, sealer or sealer fumes to penetrate wall.) Make sure that all caulks and sealants are in place and completely cured.
  - 2. Clean dirt, oil and other contaminants from the surface. Use appropriate proprietary cleaners (do not use raw acids) where necessary. Rinse with pressure equipment at 500 to 1,500 psi to thoroughly remove all detergent

residues. Do not apply to surfaces that are wet to the touch. Best results are obtained on dry surfaces. Internal moisture should also be dissipated.

3.18 Masonry Waste Disposal

- A. Recycling: Undamaged, excess masonry materials are Contractor's property and shall be removed from the project site.

END OF SECTION

1.0 - GENERAL

- 1.1 Scope  
Furnish and install all miscellaneous metals as indicated on drawings, including that shown only on Architectural Drawings, and/or as specified.
- 1.2 Submittals  
Submit shop drawings for approvals.
- 1.3 Applicable Standards  
Fabrication and erection, except as specified otherwise, shall be in accordance with American Institute of Steel Construction (AISC) Specifications for the Design, Fabrication and Erection of Structural Steel for Building.
- 1.4 Qualification  
Manufacturer's names, models, or catalog numbers, referred to herein are intended to show the type, quality and intent of items required. Products of other manufacturers equal or better in quality, similar in design are acceptable subject to the Architect's approval.
- 1.5 Substitutions  
Substitutions of sections or modifications of details shall be submitted with the shop drawings for approval. Approved substitutions, modifications, and necessary changes in related portions of the work shall be coordinated by the contractor and shall be accomplished as no additional cost.

2.0 - PRODUCTS

- 2.1 General Materials
- A. Metals shall be free from defects impairing strength, durability, or appearance and of the best commercial quality for the purposes specified. All materials shall be new materials and shall have structural properties to sustain safely or withstand strains or stressed to which normally subjected. All exposed fastenings shall be of same material, color and finish as the metal to which applied unless otherwise shown.
  - B. Provide all accessories such as anchors, hangers, belts, toggle bolts, expansion bolts, rods, shelf angles, clip angles, shims, connections, stiffeners, reinforcements, screws, etc., required for proper complete fabrication, assembly and installation of all miscellaneous steel, metal work and masonry. Bolts, screws, expansion bolts, toggle bolts, etc, shall be brass, bronze, stainless steel or aluminum when used with these metals.
  - C. Steel lintels and miscellaneous structural shapes where called for shall be of shapes, lengths and weights, as shown and detailed on the drawings, spanning openings where so indicated, shall be complete with bolts, anchors, etc., for building in. Lintels shall not have less than eight (8") inch bearing upon masonry.
  - D. Galvanized steel shall be hot-dipped galvanized in accordance with the Standard Specifications of the American Hot-Dip Galvanizing Association. Galvanizing shall be done after fabrication.
  - E. All materials shall be well formed to shape and size with sharp lines. Conceal fasteners where practical. Thickness of metals and details of assembly and



supports shall give ample strength.

- F. Welding shall conform to American Welding Society's Standard Code for Arc and Gas Welding in Building Construction. Welding shall be continuous along entire area of contact, except where tack welding is specifically shown or specified. Tack welding will not be permitted on exposed surface. Grind all exposed welds smooth.

## 2.2 Painting and Protective Coating

- A. Thoroughly clean off all miscellaneous metal, using power tool cleaning to remove all dirt, grease, rust, and scale and foreign matter.
- B. Treat only concealed galvanized metal with galvanized metal primer as per manufacturer's directions before painting. Exposed galvanized metal to be primed and finished under Painting Section.
- C. Unless otherwise specified, paint all metal items, including concealed galvanized metal, one shop coat of Red or Grey oxide zinc chromate TT-P-636-C. Surfaces inaccessible after assembly shall be painted before assembly. Work paint thoroughly into joints, etc. Do not paint bronze, aluminum or stainless steel.
- D. Insulate faces of all metals in contact with different metals, wood, masonry, and/or concrete; give each contact surface one coat approved alkali-resistant bituminous paint. Let both surfaces dry before installing metals.

## 2.3 Miscellaneous Metal Items

The following items are intended as a guide to such work in this project and do not necessarily limit the scope of this section.

- A. All structural shapes indicated and/or required.
- B. Miscellaneous Steel Lintels. Provide miscellaneous steel lintels indicated on Architectural and/or Structural Drawings or as required. All miscellaneous steel lintels are subject to structural engineer's review and approval.
- C. Windstop Angle between new and existing construction shall be 4" x 4" x 1/4" continuous angle with vertical slots 16" o.c.; #10 gauge galvanized wire masonry loops 16" o.c. Fill joint to within 1/2" of each face; sealant each side.
- D. Metal Ladders - Provide steel ladders where indicated of 3/8" x 2-1/2" steel bar stringers spaced 20" o.c. with 3/4" square bar rungs set at 45 degrees and welded to stringer 12" o.c. Anchor ladder to masonry with clip angles or bent plates designed to hold rungs 8" from wall. Space anchors not more than 5'-0" o.c. Prime paint under this Section. At each non-caged ladder over 14 ft. in height shall be provided with a climbing safety system equal to VI-GO Ladder Climbing Safety System as manufactured by Miller by Sperran. (See Elevator Pit and Roof Access Ladders.)
- E. Downspout Boots shall be equal to Jay R Smith MFG. Co. (Smith Industries) special downspout boots. Cast Iron Body with 3" Bronze Access Plug and Strap with 5/16" Dia. Cast Holes for flat head bolts, Typical. 5 x 4 Size.
- F. Expansion Joint Systems (As Indicated and/or as required)
  - 1. Floor to floor expansion joint system shall be flush type as approved equal to Model GFT - RFX as manufactured by C/S System Corporation or Model TMB Series as manufactured by Nystrom.

- a. Floor to floor expansion joints shall be provided with a 2 hr. fire barrier component as approved equal to ARe-Flex®, Between floor series as manufactured by C/S Systems Corporation.
2. Wall to Wall expansion joint system (As Indicated and/or as required)
  - a. Shall be surface mount type as approved equal to Wall-to-Wall Joint Systems. Basis-of-Design Product: Construction Specialties, Inc. Model SFW. Type: Vertical cover plate. Exposed Metal: Aluminum. Finish: Class II, clear anodic.
  - b. Fire-Resistance Rating: Provide joint system and fire-barrier assembly with a rating not less than that of adjacent construction. Typical: Wall to wall expansion joints shall be provided with a 2 hr. fire barrier component as approved equal to "Re-Flex" by Construction Services or "Pyro-Flex" by MM Systems Corporation.
  - c. Moisture Barrier – Manufacturer's Standard

### 3.0 - EXECUTION

#### 3.1 Fabrication

- A. Verify measurements in field for work fabricated to fit job conditions.
- B. Fabricate form work true to detail with clean, straight, sharply defined profiles. Iron shall have smooth finished surfaces unless indicated otherwise. Shearing and punching shall leave clean, true lines and surfaces.
- C. Fastenings shall be concealed where practical. Thickness of metal and details of assembly and supports shall give ample strength and stiffness. Joints exposed to the weather shall be formed to exclude water. Provide holes and connections for the work of other trades.
- D. Joints shall be rigid at adjoining sections for a strong assembly. Weld or rivet permanent connections. Welds shall be continuous and finished flush and smooth on surfaces that will be exposed after installation. Do not use screws or bolts where it can be avoided; where screws or bolts are used, the heads shall be countersunk, screwed up tight and threads nicked to prevent loosening. Unexposed welded joints may be continuous or spot welded as required. Remove weld spatter from adjacent surfaces.

#### 3.2 Installation

- A. Erect work in thorough, first class manner with mechanics experienced in the erection of iron work.
- B. Work shall be strong, secure, and adequate for the purpose intended.
- C. Schedule delivery of items to be built into the masonry so as not to delay the progress of the work and to coordinate for proper installation.
- D. Place and properly secure to form work items such as anchors, sleeves, and inserts which are to be cast in concrete.

END OF SECTION

1.0 - GENERAL

1.1. Summary

- A. Provide all labor, materials, equipment and services, and perform all operations required for complete installation of Expansion Control and related work as indicated on the drawings and specified herein.
- B. Work Included: The work of this section shall include, but not be limited to the following:
  - 1. Floor expansion joint cover assemblies.
  - 2. Fire barrier systems.
- C. Related Work Specified Elsewhere
  - 1. Unit Masonry - Section 04200.
  - 2. Sealants and Caulking - Section 07910.

1.2. Quality Assurance

- A. Materials and work shall conform to the latest edition of reference specifications specified herein and to all applicable codes and requirements of local authorities having jurisdiction.
- B. Fire Performance Characteristics:
  - 1. Fire Resistance: Where indicated, provide expansion joint cover assemblies identical to those of assemblies whose fire resistance and cycling capability has been determined per UL 2079 by Underwriter Laboratories, Inc. Fire rating not less than the rating of adjacent construction.
  - 2. Surface Burning Characteristics: Composite fiberglass interior wall and ceiling covers shall be U.L.® Tested, classified and labeled reflecting a Class I fire rating in accordance with UL-723 (ASTM E84-91a) test procedures.
- C. Loading Characteristics:  
Standard Floor Covers: Shall be designed to withstand a minimum load of 500 lbs. without damage or permanent deformation. Heavy duty covers should withstand a point load of 2,000 lbs.
- D. Single-Source Responsibility: Obtain expansion joint cover assemblies from one source from a single manufacturer.

1.3. Submittals

- A. Product Data: Submit copies of manufacturer's latest published literature for materials specified herein for approval and obtain approval before materials are fabricated and delivered to the site. Data to clearly indicate movement capability of cover assemblies and suitability of material used in exterior seals for UV exposure.
- B. Certificates: Material test reports from qualified independent testing laboratory indicating and interpreting test results relative to compliance of fire-rated expansion joint assemblies with requirements indicated.

- C. Shop Drawings: Submit shop drawings for work specified herein for approval and obtain approval prior to fabrication and shipment of materials to the job site. Shop Drawings showing full extent of expansion joint cover assemblies; include large-scale details indicating profiles of each type of expansion joint cover assembly, splice joints between sections, joinery with other types, special end conditions, anchorage's, fasteners, and relationship to adjoining work and finishes. Include description of materials and finishes and installation instructions.
- D. Samples: Samples of materials specified herein shall be submitted for approval, and approval obtained before materials are delivered to the site. Samples shall include the following:
  - 1. Samples for each type of metal finish indicated on metal of same thickness and alloy to be used in work. Where normal color and texture variations are to be expected, include 2 or more units in each set of samples showing limits of such variations.
  - 2. Samples of each type of flexible seal to be used in work with color samples as above.

#### 1.4 Delivery, Storage and Handling

- A. Exercise proper care in the handling of all work so as not to injure the finished surface, and take proper precautions to protect the work from damage after it is in place.
- B. Deliver materials to the job site ready for use, and fabricated in as large sections and assemblies as practical. Assemblies shall be identical to submitted and reviewed shop drawings, samples and certificates.
- C. Store materials under cover in a dry and clean location off the ground. Remove materials that are damaged or otherwise not suitable for installation from the job site and replace with acceptable materials at no additional cost.

#### 1.5 Project Conditions

Where necessary, check actual locations of walls and other construction to which work must fit, by accurate field measurements before fabrication. Show recorded measurements on final shop drawings and coordinate fabrication schedule with construction progress to avoid delay of work.

### 2.0 - PRODUCTS

#### 2.1 Manufacturers

Expansion joint cover assemblies specified herein and indicated on the drawings shall be manufactured by Construction Specialties, 3 Werner Way, Lebanon, NJ 08833, or other manufacturers with prior written approval.

#### 2.2 Materials

- A. Aluminum : ASTM B 221, alloy 6063-T5 for extrusions; ASTM B 209, alloy 6061-T6, sheet and plate.  
Protect aluminum surfaces in contact with cementitious materials with heavy metal free high solids primer or chromate conversion coating.

- B. Extruded Preformed Seals: Single or multilayered rubber extrusions as classified under ASTM D 2000, designed with or without continuous, longitudinal, internal baffles and formed to fit compatible frames, in color as selected by architect from manufacturer's standard colors.
- C. Fire Barriers: Designed for indicated or required dynamic structural movement without material degradation or fatigue in accordance with ASTM E 1399. Tested in maximum joint width condition as a component of an expansion joint cover in accordance with UL 2079 including hose stream testing of wall assemblies at full-rated period by Underwriters Laboratories Inc.
- D. Accessories: Manufacturer's standard anchors, fasteners, set screws, spacers, flexible vapor seals and filler materials, drain tubes, adhesive and other accessories compatible with material in contact, as indicated or required for complete installations.

### 2.3 Fabrication

- A. General: Provide expansion joint cover assemblies of design, basic profile, materials, and operation indicated. Select units comparable to those indicated or required to accommodate joint size, variations in adjacent surfaces, and structural movement. Furnish units in longest practicable lengths to minimize number of end joints. Provide hairline-mitered corners where joint changes directions or abuts other materials. Include closure materials and transition pieces, tee-joints, corner, curbs, cross-connections, and other accessories as required to provide continuous joint cover assemblies.
- B. Interior Expansion Joint Covers
  - 1. Floor-to- Floor Joint Cover
    - a. Flush Cover Assemblies: Provide a prefabricated continuous glide plate made of an extruded aluminum of the design indicated. The finish shall be aluminum with a Class II clear, anodic finish as CS Group (Construction Specialties) Model # PC-2G.
  - 2. Floor-to-Wall Cover
    - a. Flush Cover Assemblies: Provide a prefabricated continuous glide plate made of an extruded aluminum of the design indicated. The finish shall be aluminum with a Class II clear, anodic finish as CS Group (Construction Specialties) Model # PCW-2G.
- C. Fire Barrier Systems
  - 1. Prefabricated fire barrier assemblies tested in accordance with ANSI/UL 2079 for two-hour certification unless otherwise detailed and in compliance with ASTM E 1399. Material to carry UL labeled and be subject to Underwriters Laboratories follow-up service for quality assurance. Systems to be installed strictly in accordance with the manufacturer's installation instructions. All as C/S Fire Barrier manufactured by CS Group (Construction Specialties)
  - 2. For joint widths up to and including 24", the barrier shall be supplied in maximum lengths to minimize field splicing. The fire barrier shall consist of intumescent blankets layered to provide a flame and insulation barrier and to accommodate the specified dynamic movement—all as CS Group (Construction Specialties) Model # FB-97.
  - 3. For all joints within enclosed spaces such as chase walls, fire barrier system to include .032" thick galvanized steel cover where conventional expansion joint cover is not used.

- D. Metal Finishes
  - 1. Comply with NAAM "Metal Finishes Manual" for finish designations and application recommendations, except as otherwise indicated. Apply finishes in factory after products are fabricated. Protect finishes on exposed surfaces with protective covering before shipment.
  - 2. Aluminum Finishes  
Paint Finish: Shall be inhibited thermocured primer, .02 mil minimum dry film thickness and thermocured fluorocarbon coating containing full 70% Kynar 500 resin, 1.0 mil minimum dry film thickness. Provide color indicated or, if not indicated, as selected by Architect from manufacturer's standard colors.

### 3.0 - EXECUTION

#### 3.1 Examination

- A. Make a thorough examination of all surfaces receiving the work of this Section and before starting the installation, notify the Architect, in writing, of any defect which would affect the satisfactory completion of the work of this section.

#### 3.2 Preparation

- A. Examine the Contract Drawings and specifications in order to insure the completeness of the work required under this Section.
- B. Verify all measurements and dimensions at the job site and cooperate in the coordination and scheduling of the work of this Section with the work of related trades, with particular attention given to the installation of items embedded in concrete and masonry so as not to delay job progress.
- C. Provide all templates as required to related trade for location of all support and anchorage items.

#### 3.3 Installation

- A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for all phases of work, including preparation of substrate, applying materials, and protection of installed units.
- B. Provide anchorage devices and fasteners where necessary for securing expansion joint cover assemblies to in-place construction, including threaded fasteners with drilled-in fasteners for masonry and concrete where anchoring members are not embedded in concrete. Provide fasteners of metal, type, and size to suit type of construction indicated and provide for secure attachment of expansion joint cover assemblies.
- C. Perform all cutting, drilling and fitting required for installation of expansion joint covers. Install joint cover assemblies in true alignment and proper relationship to expansion joints and adjoining finished surfaces measured from established lines and levels.
- D. Allow adequate free movement for thermal expansion and contraction of metal to avoid buckling.
- E. Set floor covers at elevations to be flush with adjacent finished floor materials. If necessary, shim to level, but ensure base frames have continual support to prevent rocking and vertical deflection.

- F. Locate anchors at interval recommended by manufacturer, but not less than inches from each end and not more than 24 inches on centers.
- G. Maintain continuity of expansion joint cover assemblies with end joints held to a minimum and metal members aligned mechanically using splice joints. Cut and fit ends to produce joints that will accommodate thermal expansion and contraction of metal to avoid buckling of frames.
- H. Adhere flexible filler materials (if any) to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.
  - 1. Installation of Extruded Preformed Seals: Install seals to comply with manufacturer's instruction and with minimum number of end joints.
  - 2. For straight sections provide preformed seals in continuous lengths.
  - 3. Vulcanize or heat-seal all field splice joints in preformed seal material to provide watertight joints using manufacturer's recommended procedure.
  - 4. Apply manufacturer's approved adhesive, epoxy, or lubricant-adhesive to both frame interfaces prior to installing preformed seal.
  - 5. Seal transitions in accordance with manufacturer's instruction.
- I. Installation of Fire Barrier
  - 1. Install fire barrier in accordance with federal, state and local building codes using manufacturer's recommended procedures.
  - 2. Install transition and end joints to provide continuous fire resistance and in manufacturer's instructions.

#### 3.4 Cleaning and Protection

Do not remove strippable protective material until finish work in adjacent areas is complete. When protective material is removed, clean exposed metal surfaces to comply with manufacturer's instructions.

END OF SECTION

1.0 - GENERAL

1.1 Scope

- A. The work under this section consists of all finish carpentry, millwork and related items.
- B. Millwork shall be defined as follows: "All exterior and interior woodwork exposed to view in the finished building, except lumber yard or specialty items. All exposed wood, plywood, hard plastic and wood doors are included."
- C. All millwork shall be produced by the same source of supply to coordinate matching of materials.

1.2 Submittals

- A. Shop drawings shall be furnished on all millwork to the architect for approval prior to fabrication. These drawings to show size, arrangement, type of material, connections and relationship to adjacent work.
- B. All shop drawings shall show species of woods and the manufacturer's name for all manufactured items.
- C. When required, contractor shall submit a sample unit as requested.
- D. Submit samples of decorative laminate colors, patterns, and textures for semi-exposed materials for architect's selection. Samples of other materials or hardware shall be available if requested.

1.3 Applicable Standards

- A. The Quality Standards of the American Woodwork Institute (AWI) shall apply and, by reference, are made a part of this specification.
- B. Millwork materials and workmanship not shown, specified, or normally furnished to a higher degree of quality shall conform to custom grade requirements of the AWI Quality Standards.

1.4 Delivery and Storage

- A. When all millwork items are ready for shipment to the job site, the architect shall be notified through the contractor so that either may inspect the work in the mill prior to shipment.
- B. All materials shall be inspected by the contractor's superintendent upon receipt at the job site. No faulty or damaged materials shall be received. It shall be the contractor's responsibility to produce finished items of work in first class condition.
- C. No interior millwork shall be delivered until the building has been dried out. Heat shall be required in cold or humid weather.
- D. No trim shall be delivered or placed until the areas of the building in which the trim is to be placed are thoroughly dry and ready for the installation. The building shall be enclosed and heated. Allow wood to acclimate for 7-10 days prior to installation.



## 2.0 - PRODUCTS

### 2.1 General

- A. All materials shall be of the best of their respective kinds. All materials used in finished work shall be clear, free from cracks, checks, knots and other imperfections that may interfere with the proper completion of the work and any warped or otherwise imperfect work shall be removed and replaced.
- B. All plywood shall have a grade-trademark which shall identify each panel of plywood as to type, grade and conformance to CS45 or CS122 (current issues). If use is exposed to weather or excessive moisture, plywood shall be of the exterior type. Exposed faces and faces to receive plastic laminates shall be "A" grade. Panels used for concealed cabinet parts may be C-D grade. Thickness and application details shall be as shown on drawings or required for the intended use.

### 2.2 Interior Woodwork

- A. Lumber used for painted interior woodwork, unless otherwise indicated, shall be one of the following:
  - 1. Fir - Coast or Inland Douglas White
  - 2. Pine - Ponderosa, Southern
  - 3. Redwood
  - 4. Cypress
  - 5. Yellow Poplar
  - 6. Grade of lumber used shall be second grade for paint finish, except cypress may be third grade.
- B. Hardwood: All references to hardwood shall imply stain grade oak.
- C. All interior plywood to be painted shall be Natural Birch.
- D. All interior woodwork and plywood to be stained or finished natural shall be Premium Grade Select White Birch or as specified on drawings. Veneer shall be rotary cut or as indicated on drawings or related specification sections. Semi-exposed parts, as defined by AWI, of natural or stained casework shall be Natural Birch.
- E. Lumber shall be kiln dried with an average moisture content of 6% to 11%.
- F. Particle board shall be U. S. Plywood Corp. "Novoply" Weyerhaeuser Company "Timblend", or approved equal of thickness shown. Factory sanded or sealed or filled, 2 sides.

### 2.3 Thickness of Members

All thicknesses shall be in accordance with the maximum possible dressed size from standard lumber. If widths or thicknesses are not available in hardwood, gluing may be used on widths over 5-1/4" or thicknesses over 1-1/6".

### 2.4 Workmanship

- A. All exposed surfaces and edges shall be finished smooth and be free of saw cuts, marks or defacement. All joints shall be accurately and neatly made and fit.
- B. End grain shall be concealed. Exposed edges of plywood shall present a finish the

same as the finished sides.

- C. Work shall be scribed and fit to other finished surfaces in a careful manner. Should other work be damaged or disturbed, it shall be made good at the expense of this contractor.
- D. Work shall be assembled at the mill insofar as is practicable and delivered ready for erection. When necessary to cut and fit on job, the material shall be made up with ample allowance for cutting.
- E. This contractor shall verify all measurements at the building and shall examine all adjoining work on which his work is dependent.
- F. Millwork shall be executed in accordance with the approved shop drawings, the workmanship shall be of first quality and the construction of all parts shall be of the best current practice. The work shall be assembled so as to hold together with close joints, fastenings shall be concealed, and all work shall be properly and firmly backed and blocked as required. Provision shall be made for expansion and shrinkage.
- G. Exposed surfaces shall be machine-sanded to an even, smooth surface, nails set, ready for finishing or pre-finishing when noted. All woodwork shall be dry, clean, and smooth before any finishing materials are applied. All nail holes, cuts, cracks and other defects shall be treated so as to be unnoticeable.
- H. All wood surfaces to be set against masonry and/or concealed after erection shall be given a heavy coat of sealer. All woodwork to have paint finish shall be primed under the PAINTING SECTION.
- I. All transparent finished (i.e., stained) woodwork shall be shop finished by Millwork Contractor.
- J. All caulking to match laminate or stain color.
- K. All millwork/casework cabinets in contact with finish floor shall receive scheduled base.

#### 2.12 Carpentry and Millwork Items

- A. The following millwork items are intended to guide such work in this project and do not necessarily limit the scope of this section.
- B. Where not otherwise specified, shelving, cabinet work and millwork of all types shall conform with requirements of Premium Grade of "Quality Standards of the Architectural Woodwork Industry" (Architectural Woodwork Institute).
- C. Wood Base and Shoe Mould - Shall be as detailed on drawings. Base shoe mould lengths to be maximized wherever possible. Wood scraps and remnants used for base material is NOT acceptable. Minimum 8' lengths.

#### 2.13 Materials and Construction

- A. MDF (Medium Density Fiberboard)  
Shall be equal to Premier7 MDF, Plus Grade. MDF is to be shop finished by Millwork Contractor with a transparent stain. The actual surface of the MDF is to be visible through the stain color. Stain colors are to match paint selections indicated on drawings. Millwork Contractor to provide stain samples to Architect for approval prior to fabrication.

- B. Panels - End panels, shelves, bottoms and partitions of 3/4" Birch plywood, "Good" grade on all surfaces or plastic laminate covered particle board as approved. All other surfaces may be A grade fir plywood. All edges exposed to sight shall be self edged and sanded smooth and flush.

### 3.0 - EXECUTION

#### 3.1 Shop Assembly

When it is possible, all items of millwork which can be carried into the building through doorways or windows shall be shop assembled. When it is impractical to shop assemble the entire item in one piece, it shall be shop assembled in sections and perfectly fitted in place on the job by thoroughly experienced and competent mechanics. Where job joining requires gluing, it shall be done by the same method used in the Shop.

#### 3.2 Installation

- A. All finish carpentry and millwork of every sort shall be put up plumb or level, and straight and true. Trim put up with proper grounds and firmly secured. All work fitted and scribed to other work in a careful manner as not to injure the surface in any way. All nailing shall be blind wherever possible, but where not possible, the nailing driven and set so as to be not visible in the finish.
- B. All trim to be free from defects impairing durability or fitness for receiving finish. All trim properly sanded at mill and hand sanded at the job.
- C. Finished surfaces of interior millwork, detailed or scheduled to be painted, shall be left ready for treatment by the painter. The jointing and framing of all members of the finished millwork shall be executed in accordance with the best and latest recognized mill practice.
- D. This contractor shall cooperate with contractors for other trades with which his work comes in contact.

END OF SECTION

1.0 - GENERAL

1.1 Summary

A. Section Includes:

1. Provide a complete vapor-protective, composite sheet membrane waterproofing system.
2. Work includes all applicable sealants, waterstops and waterproofing flashings needed to ensure a complete waterproof and vapor-protective membrane system for buried concrete and masonry components.

B. Related Work:

Documents affecting work of the Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and Sections in Division 1.

1.2 Submittals

A. Comply with Specification Section 01350.

B. Product Data:

1. Materials list of items proposed to be provided under this Section.
2. Manufacturer's specifications and other data needed to provide compliance with the specified requirements.
3. Shop drawings and/or catalog illustrations in sufficient detail to show installation and interface of the work of this Section with the work of adjacent trades.
4. Manufacturer's current recommended installation procedures which, when reviewed by Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.
5. Written documentation of applicator's qualifications, including reference projects of similar scope and complexity, with current phone contacts of Architects and Owners for verification.

C. Mock-Up:

1. Prior to installation, prepare a sample panel of the work of this Section at a location on the job site where approved by the Architect.
2. Make the sample panel in dimensions approved by the Architect and with one panel for each of the various types of installation.
3. Show all aspects of the work of this Section to the quality specified.
4. Make necessary adjustments in the sample panel(s) and secure the Architect's approval.
5. The sample panel(s), when approved by the Architect, will be used as a datum point for comparison with the remainder of the work of this Section for the purpose of acceptance or rejection.
6. Upon approval of the Architect, the sample panel(s) may become actual part of the installation required for this Work.

1.3 Quality Assurance

- A. Use adequate numbers of skilled workmen thoroughly trained and experienced in the necessary crafts and completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

- B. Application qualifications:
    1. Applicator shall have at least three years' experience in installing materials of types specified and shall have successfully completed at least three projects of similar scope and complexity.
    2. Applicator shall designate a single individual as project foreman who shall be on site at all times during installation.
  - C. Convene a pre-installation job site conference three weeks prior to commencing work of this Section:
    1. Secure attendance by the Architect, Contractor, Applicator and authorized representatives of the vapor-protective waterproofing system manufacturer and interfacing trades.
    2. Examine drawings and specifications affecting work of this Section, verify all conditions, review installation procedures and coordinate scheduling with interfacing portions of the Work.
- 1.4 Delivery, Storage and Handling
- A. Deliver materials to job site in manufacturer's unopened containers with all labels intact and legible at all times.
  - B. Maintain the products in a dry condition during delivery, storage, handling, installation and concealment.
- 1.5 Substrate Conditions
- A. Provide applicator with substrates that are free of standing water, dirt and debris, loose material, voids and protrusions or deformations which may inhibit application or performance of waterproofing.
    1. Where work of this Section will be installed on earth retaining system, fill gaps and voids in earth retaining system to conform with waterproofing manufacturer's requirements; remove nails in wood lagging.
    2. Where work of this Section will be installed on concrete and/or masonry, provide substrates that are free of voids deeper than 3/8" and free of surface protrusions more than 1/4" above the surface.
    3. Where work of this Section will be installed on concrete footings or mud slab, provide smooth finish to surfaces scheduled to receive the vapor-protective waterproofing.
    4. Where work of this Section will include bentonite waterstop strips, provide smooth concrete surfaces as required for installation.
    5. Rigidly install penetrations of vapor-protective waterproofing for detailing procedures.
  - B. Groundwater:
    1. Where work of this Section will encounter groundwater, provide waterproofing manufacturer with sufficient groundwater samples taken from Project at logged locations for manufacturer's laboratory analysis.
    2. Manufacturer shall provide written report confirming laboratory testing with regard to suitability of waterproofing system for installation in Project conditions.
- 1.6 Warranty
- A. Deliver to the Architect signed copies of the following written warranties against defective materials and workmanship for a period of Five Years following date of completion. Warrant that installed waterproofing system shall be free of defects including waterproofing failure resulting from substrate cracking up to 1/8 inch.

- B. Warranties shall include:
  - 1. Manufacturer's standard five-year warranty covering materials.
  - 2. Applicator's standard five-year warranty covering workmanship.

## 2.0 - PRODUCTS

### 2.1 General

- A. General:
  - 1. Provide a complete envelope from finish grade to below of dual-waterproofing, vapor-protective, composite sheet membrane system composed of high-density polyethylene having a sodium-bentonite face with a protective laminate layer of spun polypropylene designed for buried concrete or masonry construction having the following attributes.
    - a. Acceptable products:
      - 1. Paramount Paraseal LG
      - 2. Paramount Paraseal GM
  - 2. Clay-Tite Waterproofing Membrane System by W.R. Meadows - Sealtite is also a pre-approved Waterproofing System. Use as recommended by Manufacturer.
- B. Membrane Properties:

Equal to Paramount Paraseal LG for use on buried vertical and horizontal surfaces such as backfilled foundation and retaining walls and below slab or mud slab with bentonite-side down:

  - 1. Puncture resistance 169 lbs. ASTM E 154
  - 2. Tensile strength 4,000 psi ASTM D412
  - 3. Water vapor permance 0.03 perms ASTM E96
  - 4. Percent elongation 700 percent ASTM D638, Type 4 Dumbbell
  - 5. Resistance to hydrostatic head 150 feet ASTM D751
  - 6. Warranted crack-bridging capability 1/8 inch
- C. Membrane Waterproofing required at substrate surfaces at areas of stone masonry provide Fluid-Applied, Elastomeric Coal-Tar Free Waterproofing such as TREMproof 201/60R or pre-approved equal.

### 2.2 Accessories

- A. For installation at horizontal-to-vertical junctures, provide Paramount Paragranular loose bentonite granules in weatherproof 50 lb. bags and capable of swelling to occupy a minimum volume of 17 ml when 2 grams are dispersed into deionized water.
- B. For detailing vertical junctures and penetrations, provide Paramount Paramastic non-hydrated expandable mastic of trowelable consistency containing not less than 55 percent high swelling Wyoming sodium-bentonite.
- C. Provide the following fasteners as needed:
  - 1. Case-hardened steel nail with fluted shank having a minimum 1" length and a minimum 1" diameter cap for use on green concrete and masonry substrates.
  - 2. Powder shot steel pin having a minimum 3/4" diameter washer for use on

concrete substrates.

3. Steel staples approved by membrane manufacturer for use according to Project conditions.
- D. Provide the following seam tapes as needed:
1. Paramount Permanent Seam Tape reinforced, rubberized-asphaltic waterproofing seam tape 4" wide by 60 mils thick for simple lap sealing of membrane.
  2. Paramount Para JT Tape non-reinforced, adhesive tape of partially cross-linked polymeric elastomers 2" wide by 1/8" thick for molding form-fit seals around difficult contours and for integral seam seals within overlaps.
- E. Provide Paramount Paraterm Bar extruded aluminum bar with upper flange to receive sealant for terminations at grade line and on parapet walls.
- F. Provide Vulkem 116/227 Sealant one- or two-part, gun-grade polyurethane sealant for completing termination seals and other sealing recommended by manufacturer.
- G. Provide Vulkem 101/102 Elastomeric Flashing 100 percent solids polyurethane, liquid-applied, elastomeric waterproofing flashing.
- H. Provide Paramount Parastick 'N' Dry pressure sensitive, double-sided tape laminate of bentonite sandwiched between a netting and non-woven fabric for wrapping through-concrete imbeds and other detailing.
- I. Provide Paramount Superstop flexible, reinforced, bentonite-laminate waterstop strips 1/2 " by 1" by 20'-0" with pressure-sensitive adhesive backing for sealing static cold joints in concrete.
- J. Provide Paramount Paraprimer versatile adhesive bonding agent formulated for use with tapes and pressure-sensitive waterproofing accessories.
- K. Provide Paramount Paradrain composite drainage mats composed of rot resistant non-woven filter fabric on high-density polyethylene drainage core.
- L. Provide base sheet of minimum 6 mil polyethylene sheet for use as hydration barrier.
- M. Provide protection course as recommended by the waterproofing system manufacturer.
- 2.3 Other Materials  
Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor and approved by the vapor-protective waterproofing system manufacturer as compatible, subject to review of the Architect.

### 3.0 - EXECUTION

#### 3.1 Surface Conditions

- A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section and to prevent damage to installed waterproofing.
- B. Applicator shall examine the areas and conditions under which work of this Section will be performed.
1. Verify conformance with manufacturer's requirements.
  2. Report unsatisfactory conditions in writing to the Architect.
  3. Do not proceed until unsatisfactory conditions are corrected.

### 3.2 Preparation

- A. General: Surface preparation and detailing procedures shall be in accordance with this Specification and Drawings. Comply with waterproofing system manufacturer's instructions except where more stringent requirements are indicated or specified.
- B. Lay out project to determine and anticipate conditions prior to start of work.
- C. Note termination and penetration conditions to determine methods for creating a waterproof and vapor-protective envelope. Verify that where below-grade waterproofing extends to grade, other waterproofing provides for substrate continuing above grade.

### 3.3 Installation

- A. General: Install waterproofing system in accordance with manufacturer's instructions, recommendations and specific project instructions as applies to the Work.
  - 1. Coves: Form 2" coves with granular bentonite at horizontal-to-vertical junctures such as footings and horizontal shelves; form 2" coves with sealant, elastomeric flashing or non-reinforced tape at vertical inside corners, under ledges and at penetrations.
  - 2. Place membrane in manner that assures minimum handling; fit closely to and seal around inlets, outlets and other penetrations; press membrane tight to corner surfaces and securely fasten.
  - 3. Priming: Prime concrete, masonry and metal surfaces with substrate primer immediately prior to application of tapes and pressure-sensitive waterproofing accessories. Prime membrane surfaces immediately prior to application of tapes as required for a tight seal.
  - 4. Taping: Tape seams closely following membrane placement and immediately roll-press using 2" wide hand-held seam roller to affect a tight seal.
  - 5. Graseline terminations: Terminate membrane system with termination bar finished off with bead of sealant or terminate to elastomeric flashing using reinforced seam tape.
  - 6. Construction joints: Protect static construction joints in concrete with flexible, reinforced, bentonite-laminate waterstop strips; install to suitable hardened concrete surface prior to subsequent concrete placement.
  - 7. All shingles shall be hand nailed. Installation with a Nail gun shall not be permitted.
  - 8. Coordinate with gymnasium equipment for floor sleeves and electrical control boxes and provide waterproofing membrane system to encompass thickened slab areas for such equipment as required.
- B. Below Slab Installation: Bentonite-side down use Paraseal LG Membrane:
  - 1. Install polyethylene base sheets with edges lapped 5" over stable, smoothed and compacted subgrade or mud slab; trim base sheet away from penetrations and terminations.
  - 2. Install membrane bentonite-side down with edges lapped 3" minimum over polyethylene base sheets; position membrane sheets to stagger end laps 12"; tape seams with reinforced seam tape and roll-press to affect a vapor tight seal.



3. Install vapor-protective waterproofing to wrap footings and grade beams where shown on Drawings.
  4. Turn membrane up 6" minimum along bottom edges of slabs, wrapped footings and wrapped grade beams. Install double layer of membrane along bottom edges of slabs, wrapped footings and wrapped grade beams extending 6" minimum from edges in each direction. Avoid overlaps coinciding between layers. Provide for tie-in of subsequent membrane installation.
  5. Install membrane across top surfaces of unwrapped footings or mud slab and turn up 4" minimum onto vertical faces of concrete walls and columns. Terminate leading edges with continuous seam tape and continuous waterstop strip in accordance with manufacturer's recommendations to affect a vapor tight seal.
  6. Install vapor-protective waterproofing to overlap 4" minimum onto top surfaces of unwrapped grade beams and carry to extend indicated on Drawings. Terminate leading edges with continuous seam tape and continuous waterstop strip in accordance with manufacturer's recommendations to affect a vapor tight seal.
  7. Waterproof penetrations in accordance with manufacturer's recommendations.
  8. Verify membrane is protected from damage caused by rebar and support chairs.
  9. Inspect and repair damaged material immediately; before concrete placement, manufacturer's representative must inspect the system and issue to the Architect a report of acceptable installation.
- C. Backfilled Wall Installation: Paraseal LG Membrane:
1. Install membrane sheets in vertical or horizontal lifts with HDPE-side facing applicator to prepared surfaces conforming to manufacturer's requirements.
    - a. Vertical orientation: Securely fasten membrane 12" on center along top edge with sheet extending onto footing surfaces and overlapping below-slab membrane 6"; install subsequent membrane sheets to overlap previous sheets 1-1/2" minimum; securely fasten membrane 24" on center through both sheets at overlaps; securely fasten 18" on center to tops of footing surfaces and horizontal shelves; tape seams with reinforced seam tape and roll-press to affect a vapor tight seal.
    - b. Horizontal orientation: Start membrane at lowest portion of wall; securely fasten membrane 24" on center along top edge with sheet extending onto footing surfaces and overlapping under slab membrane 6"; install subsequent membrane sheets to overlap previous sheets minimum 1-1/2" in shingle fashion with staggered end laps; securely fasten membrane 24" on center through both sheets at overlaps; securely fasten 18" on center to tops of footing surfaces and horizontal shelves; tape seams with reinforced seam tape and roll-press to effect a vapor tight seal.
  2. Waterproof penetrations in accordance with manufacturer's recommendations.
- D. Blindside Wall Installation: Paraseal GM-LG Membrane:
1. Ensure that vertical surfaces to receive waterproofing system conform to manufacturer's requirements as applicable to the earth retaining system

employed prior to commencing installation.

2. Install waterproofing membrane starter-strip with bentonite-side facing applicator to vertical surfaces of earth retaining system prior to placement of concrete footings or foundation mat slab.
  3. Prepare all vertical inside corners that occur along the earth retaining system by fastening a minimum 12" wide strip of membrane with bentonite-side facing applicator pressed tight into corner; securely fasten along both edges 24" on center.
  4. Remove bentonite from face of membrane inside overlaps, extending 2" in from lap leading edges, by removing factory installed edge tape or by scraping; install membrane sheets vertically with bentonite-side facing installer and mechanically fasten along lap edges cleaned of bentonite at 24" on center; restrict fasteners to lap edges cleaned of bentonite.
  5. Wipe clean HDPE surfaces inside overlaps just prior to contacting with tape using lint free white cloths soaked in solvent; install non-reinforced integral seam tape to HDPE surfaces cleaned of bentonite along lap edges strictly aligning the adhesive mass on membrane leading edge, not behind it, covering completely all mechanical fasteners; roll-press seam tape into place prior to removal of the release-paper backing.
  6. Install subsequent membrane sheets to overlap previous sheets 4"; remove release-paper backing from seam tape within overlaps and roll-press membrane sheets together to affect a vapor tight seal.
  7. Verify which penetrations must be accessed after concrete placement for completion of waterproofing detail treatment and ensure that sufficient access to membrane is provided within a formed boxout; verify which penetrations will not be accessed after concrete placement for completion of waterproofing detail treatment and effect final detailing procedures prior to erection of concrete formwork or shotcreting/guniting; seal all penetrations in accordance with manufacturer's current procedures as required to seal against both water and vapor.
  8. Protect vapor-protective waterproofing system from excessive rain.
  9. Inspect and repair damages to vapor-protective waterproofing system immediately prior to erection of concrete formwork or shotcreting/guniting; ensure that concrete directly contacts membrane.
  10. Complete waterproofing details and terminations at gradeline coordinating with other trades.
- E. Drainage Mat Installation:  
Install drainage mat units where finish floor is below grade according to manufacturer's installation instructions as shown in installation manuals. Extend drainage to brake grade with positive fall.

END OF SECTION

1.0 - GENERAL

1.1 Section Includes

- A. Surface preparation.
- B. Application of a solvent type liquid applied dampproofing membrane.

**Note:** This product shall not be installed until adjacent roof construction has been dried-in. CMU walls must be dry on both sides before application.

1.2 Related Sections

- A. Section 03300 - Cast-in-Place Concrete.

1.3 References

- A. Spray or Brush-on dampproofing coating
  - 1. ASTM D4479-00 - Standard Specification for Asphalt Roof Coatings - Asbestos-Free.
- B. Trowel applied dampproofing coating
  - 1. ASTM D4586-00 - Standard Specification for Asphalt Roof Cement, Asbestos-Free.

1.4 Submittals

- A. Comply with Section 01350 - Submittal Procedures.
- B. Submit manufacturer's product data and application instructions.

1.5 Delivery, Storage, and Handling

- A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Store materials in a clean dry area in accordance with manufacturer's instructions.
- C. Store at temperatures of 40°F (5°C) and above to facilitate handling.
- D. Do not store at temperatures above 90°F (32°C) for extended periods.
- E. Keep away from sparks and flames.
- F. Protect materials during handling and application to prevent damage or contamination.

1.6 Environmental Requirements

- A. Product not intended for uses subject to abuse or permanent exposure to the elements.
- B. Do not apply membrane when air or surface temperatures are below 35°F (2°C).
- C. Do not apply to frozen concrete.
- D. Do not apply when rain is imminent.

## 2.0 - PRODUCTS

### 2.1 Manufacturer

- A. W.R. Meadows, Inc or pre- approved manufacturer with similar solvent based products.

### 2.2 Materials

- A. Spray applied solvent dampproofing should be an asbestos-free, non-fibred asphalt compound that meets the U.S. EPA Architectural Coatings Rule requirements for VOC content.
  - 1. Spray-Mastic by W.R. Meadows.
- B. Brush applied solvent dampproofing should be an asbestos-free, fibred, asphalt compound that meets the U.S. EPA Architectural Coatings Rule requirements for VOC content. For use to protect exterior below-grade masonry walls.
  - 1. Semi-Mastic by W.R. Meadows.
- C. Trowel applied solvent dampproofing should be a heavy bodied, asbestos-free fibred, asphalt compound that meets the U.S. EPA Architectural Coatings Rule requirements for VOC content. For exterior below grade masonry wall surface application.
  - 1. Trowel-Mastic by W.R. Meadows.

### 2.3 Accessories

- A. Waterproofing Protection Course: Protection Course.
- B. Rolled Matrix Drainage System: Mel-Drain™ Rolled Matrix Drainage System.

## 3.0 - EXECUTION

### 3.1 Examination

- A. Examine surfaces to receive membrane. Notify Architect if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected.

### 3.2 Surface Preparation

- A. Protect adjacent surfaces not designated to receive dampproofing.
- B. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's instructions.
- C. Do not apply dampproofing to surfaces unacceptable to manufacturer.
- D. Concrete surfaces must be clean, smooth and free of standing water.
- E. Patch all holes and voids and smooth out any surface misalignments.

### 3.3 Application

- A. Apply dampproofing in accordance with manufacturer's instructions.
- B. Ensure accessory materials are compatible with membrane and approved by membrane manufacturer.

3.4 Protection

- A. Protect membrane on vertical and horizontal applications with immediate application of protection course, if no drainage system is used, or rolled matrix drainage system.
- B. Backfill within 24-48 hours using care to avoid damaging the dampproofing.

END OF SECTION

1.0 - GENERAL

- 1.1 Scope  
The work under this section consists of all building insulation except rigid roof insulation.
- 1.2 Submittals  
Submit samples of all materials hereinafter specified for approval.
- 1.3 Protection  
All thermal insulation shall be maintained dry throughout construction. Wet insulation shall be rejected.

2.0 - PRODUCTS

- 2.1 Material
- A. 1. Primary: FSK Thermal insulation shall be batt, or blanket type having a vapor barrier on one face which shall be extended to form a 1" flange to comply with requirements of International Building Code. ASTM - C665 Type III, Class A and ASTM E - 84. The insulating material shall be fire and decay-proof, moisture-resistant mineral or glass wool specifically designed for use in insulating batts. Vapor barrier side laps shall be lapped and taped over support members. Vapor barrier materials shall be FSK foil-type and also comply with requirements for a ceiling return air plenum regardless.
2. Supplemental: Unfaced Thermal insulation shall be allowed provided it is coupled with a layer of FSK faced insulation to achieve the total required R-value and shall be batt, or blanket type to comply with requirements of International Building Code. ASTM - C665 Type III, Class A and ASTM E-84. The insulating material shall be fire and decay-proof, moisture-resistant mineral or glass wool specifically designed for use in insulating batts.

Thermal Resistance Values (R) as follows:

R-30 9" - 10"  
R-22 7"  
R-19 6" - 6-1/2"  
R-11 3-1/2" - 4"

- B. Unfaced Thermal insulation shall be batt, or blanket type to comply with requirements of International Building Code. ASTM - C665 Type III, Class A and ASTM E - 84. The insulating material shall be fire and decay-proof, moisture-resistant mineral or glass wool specifically designed for use in insulating batts.

Thermal Resistance Values (R) as follows:

R-30 9" - 10"  
R-22 7"  
R-19 6" - 6-1/2"  
R-11 3-1/2" - 4"

- C. Masonry Foam Fill Insulation shall be approved equal to:
1. Core Foam Masonry Foam Insulation by cfiFOAM.
  2. Other Pre-approved manufacturers:
    - a. Applegate C Foam Insulation by Applegate R Foam, Inc.
    - b. Core-Fill 500 by Tailored Chemical Products, Inc.
  3. Minimum Product Performance Standards
    - a. Fire-Resistance Ratings: Foam shall neither add to nor detract from fire-resistance ratings of insulated fire-resistance rated CMU walls per prevailing building codes.
    - b. Surface Burning Characteristics: Class A per ASTM E84; Flame Spread Index  $\leq 25$ ; Smoke Developed Index  $\leq 450$ .
    - c. Thermal Resistance: R-4.6/inch @ 75°F per either ASTM C518 or ASTM C177
    - d. Potential Heat:  $\leq 100$  Btu/lb. when tested per NFPA 259 (ASTM D5865).
  4. Installation Guidelines
    - a. Fill all open cells and voids in hollow concrete masonry walls where shown on the drawings.
    - b. The foam insulation shall be pressure injected through a series of 5/8" to 7/8" diameter holes drilled to access each column of block cells e.g. 8" o/c beginning approximately four (4) feet above the finished floor.
    - c. Repeat this procedure at 10' to 16' intervals above the first horizontal row of holes (or as needed) until the empty core cells are completely filled.
    - d. In walls where horizontal bond beams occur, repeat the procedure above the bond beams to assure insulating the entire wall.
    - e. If "Hi-Flow" nozzles by cfiFOAM, Inc. are used, foam may be injected at up to twenty (20) foot vertical intervals.
    - f. Patch holes with mortar and score to resemble adjacent surfaces. Insulation shall not be injected into wet walls.
  5. Quality Assurance
    - a. Manufacturing Standards; Provide insulation from a single approved source. Product components shall be of the same brand from the same approved source arriving at the site either pre-mixed according to the manufacturer's printed instructions or in unopened factory sealed containers.
    - b. Installer Qualifications for Foamed-In-Place Masonry Insulation:
      - 1.) Engage an authorized contract installer who has been trained, authorized and equipped by the product manufacturer.
    - c. At the Architect's request, the Installer shall provide infrared scanned images of the work prepared by a "Block Wall Scan IR" or equivalent trained IR technician to confirm that empty core cells are filled with foam insulation.
      - 1.) Insulation voids shall be foamed at no added cost to the Owner.
- D. Rigid thermal insulation shall be 1" thick by 16" wide for cavity walls and 24" wide if indicated for slabs. The insulating material shall have a minimum compressive strength of 25 psi and maximum water vapor transmission rate of 1.1 perm-inch and shall conform to ASTM C578, Type III-IV, R-value/inch @ 75 degrees F 5.0. Adhesive, in cavities, shall be equal to Styrofoam brand mastic #7 or #11 as distributed by Dow. All joints shall be taped.
- E. Rigid thermal insulated sheathing shall be 3/4" thick x 48" wide foil faced vapor

barrier material with minimum compressive strength of 25 psi and maximum water vapor transmission rate of .03 perm-inch.

- F. Sound Attenuation Batt Insulation shall be 3-1/2" thick fiberglass insulation with a Noise Reduction coefficient of 1.05. Equal to Owens Corning.
- G. Air/Vapor Barrier - Basis of Design: Spunbonded polyolefin, non-woven, non-perforated barrier equal to Dupont Tyvek Commercial Wrap, Class A and related assembly components. All seams, edges and penetrations shall be taped and sealed per manufacturer's recommendations.
  - 1. Shall be allowed as a substitution and similar to FSK facing material. As such this material would be used in conjunction with unfaced insulation and shall be provided continuous and attached to applicable framing members. All seams, edges and penetrations shall be taped and sealed per manufacturer's recommendations.

### 3.0 - EXECUTION

#### 3.1 Installation

- A. Thermal Insulating material shall be laid tight and installed so as to avoid gaps and settlement. All voids, offsets, and bends shall be completely filled. R values shall be provided as indicated in single layer or multiple layers totaling the "R" value indicated. If multiple layers are used to meet total "R" value indicated, layers must be provided perpendicular to one another. The layer closest to the conditioned space must be provided with FSK facing on the interior face where visible for an Inspection.

Insulation shall be laid tight and continuous over all areas where indicated.

- B. Masonry foam fill insulation shall be provided at all exterior wall assemblies and where indicated to thoroughly fill CMU cells and voids continuous from bottom to top of exterior and applicable masonry walls. Install in accordance with manufacturer's printed recommendations and procedures.
- C. Rigid thermal insulation
  - 1. Walls - Adhere insulation to walls in a horizontal position, closely butted and with vertical joints staggered. Provide joint mastic and joint tape to the foam and apply in accordance with manufacturer's recommendations.
  - 2. Floor Slab - Lay insulation on vapor barrier butted end to end at full perimeter of exterior walls.

Backfill against insulation with fill and gravel.
  - 3. During storage and installation, observe good fire safety practices, including job site housekeeping.
  - 4. If adhesive is required, use mastic for bonding foam board to non-absorbent surfaces such as dense concrete, metal, brick, glass, and paint.
- D. Rigid thermal insulated sheathing shall be placed on stud system and secured in accordance with manufacturer's recommendations and specifications.

(NOTE: Use 4 x 8 x 3/4" plywood sheathing at all corners and wall openings.)
- E. Sound Attenuation Batt Insulation shall be placed on ceiling or stud system and secured and sealed in accordance with manufacturer's recommendations and specifications. Place around or over mechanical equipment rooms, toilet rooms, window in-fill spaces, and other areas as indicated.



- F. Mesh, shall be provided for supporting overhead horizontal insulation and attached to applicable framing members as required, not to exceed 16" o.c. Mesh material shall be provided to maximize width as project conditions permit. Mesh fabric shall be steel wire type with nominal 2" grid. Continuous metal straps at 16" o.c. shall be an acceptable substitute.
  
- G. Air/Vapor Barrier - Shall be allowed as a substitution and similar to FSK facing material. As such this material would be used in conjunction with unfaced insulation and shall be provided continuous and attached to applicable framing members. All seams, edges and penetrations shall be taped and sealed per manufacturer's recommendations. Basis of Design: Spunbonded polyolefin, non-woven, non-perforated barrier equal to Dupont Tyvek Commercial Wrap, Class A and related assembly components.

END OF SECTION

## COMPOSITION ASPHALT SHINGLE ROOFING-- SECTION 07310

### 1.0 - GENERAL

1.1 The accompanying Division One of these specifications shall apply to and form a part of this section.

#### 1.2 Scope

- A. The work under this section consists of all composition asphalt shingle roofing, underlayment, ridge vent system, sheet metal, roof drainage accessories and all related items necessary to complete the roofing system work indicated on the drawings and herein specified including but not limited to the following:
1. Furnish and install underlayment and composition asphalt shingles including preformed hip and ridge shingles.
  2. All related sheet metal items shall be furnish and install in accordance with Section 07621 - Sheet Metal Work.  
Flashing & Sheet Metal, shall include the following items:
    - a. Eave drips, fascia, gutters and downspouts.
    - b. Flashing where composition shingles meet vertical wall finish.
    - c. Flashing for plumbing vents and electrical penetrations.
    - d. Metal flashing for all non-self flashing metal forms.
    - e. Valley flashing, base and wall cap flashing where required.
    - f. Miscellaneous Sheet Metal work
    - g. Rake flashing
    - h. Step flashing
  3. Furnish and install shingle-over ridge vent system.
- B. The following items of work include work of other trades that are to be set in cooperation with this section and flashed under this section as follows:
1. Roof exhaust fans, curbs and roof caps for exhaust fans are furnished and installed under Heating, Ventilation and Air Conditioning section and flashed under this section.
  2. Flashing & Sheet Metal at roof areas shall be furnished and installed under Section 07621, Sheet Metal Work.
- C. The following items of work are excluded from this section and specified under other sections of the work:
1. Heating, Ventilation and Air Conditioning ductwork and sheet metal.
  2. Through wall membrane flashing.

#### 1.3 Quality Assurance

- A. Manufacturer Qualifications:  
Provide primary roofing material products from a single source including: composition asphalt shingles, preformed ridge & hip cap shingles, manufacturers starter strip and underlayments all produced by a single manufacturer. Provide secondary products only as recommended by manufacturer of primary products for use with roofing system specified.

- B. Installer's Qualifications: Installer / sub-contractor must be currently in the primary business of roofing with not less than (5) five consecutive years of recorded successful experience with roofing systems comparable to that of this project under the same company name and be **authorized by the roofing material manufacturer as trained and approved for installation** of such roofing materials indicated for this project. Joint ventures shall not be allowed.
- C. A full-time field supervisor or foreman with minimum of (5) years of experience in a roofing supervisory role, having performed on projects of comparable scope and type shall be required to be on site at all times during roofing work.
- D. The Roofing Contractor shall be responsible for weathertightness of the entire roofing system.
- E. The Roofing Contractor shall inspect and accept condition of the roof deck and components of mechanical penetrations prior to installation of the roofing system.

#### 1.4 Assembly Reference Standards

- A. Underwriters Laboratories Fire Test of Roof Deck Construction Standard 1256.
- B. Underwriters Laboratories Test for Wind Uplift resistance of Roof Deck Assemblies Standard 580.
- C. ASTM D 3161 – Standard Test Method for Wind-Resistance of Asphalt Shingles
- D. ASTM D 3462 – Standard Specification for Asphalt Shingle Made from Glass Felt and Surfaced with Mineral Granules.
- E. ASTM D 7158 – Standard Test Method for Wind Resistance of Sealed Asphalt Shingles.
- F. UL 2218 Class IV Impact Resistant - Test Method of Wind Resistant Shingles with Sealed Tabs
- G. Roof Deck Manufacturers Design Manual.
- H. NRCA – “The NCRA Roofing and Waterproofing Manual”

#### 1.5 Roofing Performance Requirements

- A. The roof deck assembly shall exhibit the following performance characteristics:
  - 1. Wind Uplift Rating - FM 1-90
  - 2. Factory Mutual Classifications - FM Class 1
  - 3. Fastener Withdrawal Strength - 40 lbs. min.
- B. Composition Asphalt Shingles shall be self sealing and provided resistant to wind damage as tested. **All Shingle Roofing Systems must comply with wind classifications according to 2015 IBC Section 1504.1, Risk Category 3. – No exceptions.**
- C. Certification of Roofing System Contractor(s), Roofing Material Manufacturer, and Roofing Material Manufacturer's Field Inspector shall each execute the Certification of Roofing System, a copy of which immediately follows this Section.

- D. Contractor to register roofing project with the manufacturer prior to the pre-roofing conference and prior to submitting shop drawings. As part of the submittals package, copy of the acknowledgement of the manufacturer is required.

1.6 Submittals

- A. Product Data: Submit manufacturer's technical product data, test reports, maintenance data, installation instructions and recommendations for each type of roofing product required. Include highlighted data substantiating that materials comply with requirements.
- B. Submit a sample panel to match existing adjacent shingles for approval. (If required)
- C. Installer's Qualifications -
- D. Sample Warranty
- E. Copy of Acknowledgement Letter from manufacturer that project has been registered.

1.7 Pre-Roofing Conference

Prior to Project startup, a conference will be held at Project site or at location designated by Owner or Architect. Required attendees include the Owner, Architect, DCM Inspector, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, steel deck Installer, ventilated panel installer and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment. ATTENDANCE OF THE CONTRACTOR'S FOREMAN IS MANDATORY.

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:

The roof shingle installer foreman must be in attendance. The roof shingle manufacturer's representative must be in attendance.

- A. Tour representative areas of roofing substrates (decks), inspect and discuss condition of substrate, penetrations and other preparatory work performed by other trades.
- B. Review structural loading limitations of deck and inspect deck for proper installation and fastening as required. Inspect deck for required slope etc.
- C. Review roofing system requirements (drawings, specifications and other contract documents). Review required submittals / warranty issues.
- D. Review and finalize construction schedule related to roofing work and verify availability of materials.
- E. Review roof application procedures, technique, details and roof specifics.
- F. Review job specific safety requirements, safety barriers, street blocking, haul routes, building access, site contact, facilities, security, etc.
- G. **The Representative for the Roofing Materials Manufacturer shall bring a copy of the warranty(ies) for the roofing material(s) for comparison to the warranty(ies) specified. This sample warranty is required to be job specific, covering all requirements, per the specifications. If the sample warranty is**

**not provided as required, the conference will be voided, an inspection fee will be issued, and it will have to be rescheduled.**

## 2.0 – PRODUCTS

### 2.1 Manufacturers - Shingle

- A. As a quality of standard and basis for comparison, this specification is based on products manufactured by Certaineed Corporation. Similar products manufactured by GAF and Tamco are also approved providing that the products by these manufacturers meet or exceed these specifications. Inferior products by these same manufacturers that do not meet the criteria requirements provided herein will not be approved.
- B. Other manufacturers requesting pre-approval for their product, must meet or exceed these specifications and warranty requirements. Comply with Section 01360 – Product Substitutions and submit to Architect at least ten days prior to bid.

### 2.2 Product - Shingles

- A. Basis of Design - Certain Teed Landmark (AR): Conforming to ASTM D 3018 Type I – Self Sealing; UL Certification of ASTM D 3462, ASTM D 3161 Class "F" /UL997 Wind Resistance and UL Class A Fire Resistance ASTM E108; ASTM D 7158 Class H Wind Resistance; UL2390/ASTM D 6381 Class H Wind Resistance; UL 997 Wind Resistance; UL790 Fire Resistance: Class A.  
**All Shingle Roofing Systems must comply with wind classifications according 2015 IBC Section 1504.1, Risk Category 3. – No exceptions. Minimum Wind Speed 120 MPH.**
- B. Composed of glass fiber mat base; ceramic coated/UV resistant mineral surface granules across entire face of shingle; four tab shingle with each tab independently colored by granules no bleed over of granules from previous tab. Two pieces of the shingle are laminated together in asphaltic cement. All shingles shall have self-sealing adhesive strips.
- C. Weight: 250 - 270 pounds per square (100 square feet) (12.0 kg/sq. m) minimum.
- D. Color: As selected by Architect from manufacturer's full range selection.
- E. Limitations: Use on roofs with slopes greater than 2:12 pitch. On slopes greater than 21/12 pitch apply 1 inch diameter spots of asphalt roofing cement (ASTM D 4586 Type II) under the shingle tab corner according to application instructions provided on the shingle package
- F. Shingle System to be complete with manufacturer's starter shingles and performed ridge and hip shingles. Roof Shingles to be field verified to match existing color and finish – subject to Architect's approval. Weight of shingle should meet a minimum standard of 250 lbs per square (100sf).
- G. Provide an extra (1) one square (100 s.f.) of same shingles in unbroken bundles for the Owner's future use.

### 2.2 Underlayments:

- A. Ice and Watershield: W.R. Grace or approved equal.
1. Provide for entirety of roof surface.
- 2.3 Fasteners:
- A. Hot dip galvanized, sharp pointed, conventional barbed shank roof nails, 11 to 12 gauge, with minimum of 3/8" diameter flat heads, minimum of 1-1/4" length or of sufficient length to penetrate at least 3/4" into wood decking shall be used as required. **Pneumatically driven fasteners, nails, or staples will not be allowed to be used on this project.**
- 2.4 Roof cement shall be asbestos free non-hardening, elastic waterproof type ASTM 4586, Type II ; Consistency as required by roofing material manufacturer.
- 2.5 Fasteners for metal flashing materials shall be heavy galvanized. Exposed fasteners for sheet metal flashings shall be screw-type with weatherseal washers. Prefinished to match.
- 2.6 All other required materials necessary for a complete job as recommended by the roofing manufacturer or as required by good practice.
- 2.7 General Requirements
- A. Delivery and storage of material: Store and handle roof materials in a manner which will ensure that there is **no possibility** of significant moisture pick-up. Store in a dry, well ventilated, weather tight place. Unless protected from weather or other moisture sources, do not leave unused roofing materials on the roof surface overnight or when roofing work is not in progress. Store rolls of materials and other materials on pallets or other raised surface. Handle and store materials or equipment in a manner to avoid significant or permanent deflection of deck. All material must be protected from the weather by protective tarps. **Manufacturer's plastic covers are not acceptable means of protection.**
- B. Scheduling and coordinating work: Schedule and coordinate roofing and sheet metal installations with the work of other trades where it is integral or contiguous therewith. Materials furnished under this section, which are to be built-in by other trades, shall be delivered to the site in sufficient time to avoid delays to construction progress. Instruct other trades concerning the location and placement of reglets, wood nailers and cleats.
- C. Proper surfaces: Surfaces to which roofing and sheet metal are to be applied shall be even, smooth, sound, thoroughly clean and dry, and free from projection nail heads or other defects that would affect the application. Report in writing any unsatisfactory surfaces to the Architect in advance of roofing work.
- D. Dis-similar metals: Where dis-similar metals about, the juncture shall be executed in a manner that will facilitate drainage and thus minimize the possibility of galvanic action.
- E. Accessories: All accessories or other items essential to the completeness of the sheet metal installation shall be provided as required. All such items, unless otherwise indicated on the drawings or specified, shall be of the same kind of materials as the item to which applied and the gauges shall conform to recognized industry standards of sheet metal practice.

2.8 Application Of The Underlayment And Roofing Shingles

- A. Underlayment Application:
1. Provide self-adhering ice and water shield underlayment at all valleys, penetrations, curbs, rakes, eaves and roof edges. Install 18" each side of valleys and 18" from edges. Provide for entire roof surface.
- B. Shingle Application:
1. All shingles shall be hand nailed. Installation with Nail guns shall not be permitted.
  2. Install Composition Asphalt Shingles system, including but not limited to: shingles, pre-formed ridge and hip shingles in accordance with manufacturer's printed instructions and in accordance with The NRCA Roofing and Waterproofing Manual per NRCA
  3. Install all shingles with uniform exposure as specified by the manufacturer.
  4. Install manufactured starter strips, pre-formed ridge and hip shingles in strict accordance with manufacturer's printed requirements.
    - a. Provide starter strip at lowest roof edge and along rake edges.
    - b. Shingles shall extend  $\frac{3}{4}$ " beyond roof edge flashing.
    - c. Fasten ridge shingle with nail of length sufficient to fully penetrate roof decking.
  5. Install valley flashings and base and wall cap flashings (where roofing meets masonry walls) in strict accordance with the roofing manufacturer's printed specifications.
    - a. Provide closed cut valleys per manufacturer's printed instructions; initial layer to lap the valley without fasteners in the valley and upper layer to be cut back two inches parallel to valley center.
- C. Install vent pipe in strict accordance with the manufacturer's instruction for application.
- D. Fasten shingles in locations as indicated by the shingle manufacturer's printed instruction according to roof slope and wind load requirements. **Only hand nailing shall be acceptable; pneumatic nailing will not be allowed.**
- E. Lap cap shingles in direction away from prevailing winds.
- F. Properly flash all other penetrations in accordance with the roofing manufacturer's printed instructions.
- G. Upon completion of application all shingles shall be properly nailed, with even / uniform exposure, and straight lines and free of loose, crooked, or buckled shingles. Entire installation shall be watertight and properly bonded to flashing.

2.9 Miscellaneous Sheet Metal Work

- A. Work under this section includes all other incidental sheet metal items shown on drawings as accessories, trims, and flashings to the composition asphalt roof

shingles that may not be specifically included in other sections of the specifications and/or work.

- B. Install metal flashing in accordance with The NRCA Roofing and Waterproofing Manual per NRCA including but not limited to:
  - 1. Step Flashing
  - 2. Cricket Flashing
  - 3. Rake and Eave Drip Edge Flashing
  - 4. Apron Flashing
  - 5. Pipe and Post Flashing
  - 6. Lead Vent Pipe Flashing
- C. See Sheet Metal Work - Section 07621 for additional information.

#### 2.10 Miscellaneous Items

- A. Install and flash all items furnished and set by others as specified, in accordance with good practice, properly flashed and bonded weathertight into roofing.
- B. Provide an engraved / painted aluminum plaque, nominal 4" x 8" in size to be mounted near the roof as directed by the Architect indicating the following: Date of roof installation, General Contractor, Subcontractor, Material Manufacturer, Product Information, Warranty Period, Architect, Architect's Job No., etc.

#### 2.11 Roofing Guarantee

- A. **STATE OF ALABAMA ROOFING GUARANTEE** - All work included in this section shall be jointly and unconditionally guaranteed by the General Contractor and the Contractor for this section, against leaks from faulty or defective materials and workmanship for a period of **Five (5) Years** starting on the date of acceptance of the project by the Owner. The Roofing Guarantee is included in these specifications and shall be executed in six (6) original copies, signed by the appropriate parties and submitted to the Architect, Owner and the appropriate State Departments through the Architect.
- B. **Manufacturer's Warranty**
  - 1. The Contractor shall provide to the Owner, the Roofing manufacturer's fully executed **Forty (40) Year** shingle warranty on shingle material
    - a. Shingle
      - Forty Year Material Warranty
      - 5 Years of Non-prorated Warranty, Surestart Protection
      - 15 Years of Algae Resistant Warranty
  - 2. The warranty shall contain language in which the Laws of the State of Alabama shall govern.
  - 3. Manufacturer's roofing warranties which contain language regarding the governing of the warranty by any state other than the **State of Alabama**, must be amended to exclude such language, and substituting the requirement that the Laws of the State of Alabama shall govern all such warranties.
- C. **Special Warranty:** Form in which manufacturer agrees to repair or replace asphalt shingles that fail in materials within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Manufacturing defects.



- b. Structural failures including failure of asphalt shingles to self-seal after a reasonable time.
2. Material Warranty Period: Forty (40) years from Date of Substantial Completion with first Five (5) years non-prorated. Limited Lifetime Warranty.
3. **Wind Speed Warranty Period: Asphalt shingles will resist blow-off or damage for Five (5) years from Date of Substantial Completion in compliance with wind classifications according 2015 IBC Section 1504.1, Risk Category 3. Minimum 120 MPH.**
4. Algae Discoloration Warranty Period: Asphalt shingles will not discolor Fifteen (15) years from Date of Substantial Completion.
5. Workmanship Warranty Period: Workmanship is the responsibility of the Roofing Contractor. Five (5) years from Date of Substantial Completion.

END OF SECTION

**CERTIFICATION OF ROOFING SYSTEM**

**Project:** \_\_\_\_\_

**Architect's Job No:** \_\_\_\_\_ **DCM Project No.** \_\_\_\_\_

**Owner:** \_\_\_\_\_

**General Contractor:** \_\_\_\_\_

**Roofing Subcontractor:** \_\_\_\_\_

**Roofing Material Manufacturer:** \_\_\_\_\_

**Roofing Material Manufacturer's Inspector:** \_\_\_\_\_

The undersigned Contractors, Manufacturer Representative and Inspector do hereby state that the Roofing System for the Project identified above has been provided in compliance with all Codes specified and as required by Local and State of Alabama laws and regulations and has been provided in compliance with the specified Performance Requirements.

**SIGNATURES**

**General Contractor:** \_\_\_\_\_  
Signature Printed Name

**Roofing Subcontractor:** \_\_\_\_\_  
Signature Printed Name

The Roofing Material Manufacturer further states that the Roofing System Provided by Manufacturer to the Roofing Contractor complies with International Building Code 2021 for the Roofing System that has been installed.

**Roofing Material Manufacturer:** \_\_\_\_\_  
Signature Printed Name

The Roofing Material Manufacturer's Field Inspector certifies that he/she has made field inspections in the proper number and sequence to assure Roofing Material Manufacturer that the Roofing System supplied has been installed to comply with Manufacturer's installation requirements as well as the 2021 IBC.

**Roofing Material Manufacturer's Inspector:** \_\_\_\_\_  
Signature Printed Name

1.0 - GENERAL

- 1.1 Scope  
The work under this section consists of thru-wall flashing.
- 1.2 Submittals  
Submit for approval all materials proposed for use under this section.

2.0 - PRODUCTS

- 2.1 Flashing (Masonry)  
Flashing shall be Polyvinyl Chloride, 30 mil (.030") waterproof sheeting equal to Wire-Bond or other pre-approved product.

Flashing (Non-Masonry)

Flashing shall be a self-adhering flexible membrane consisting of Elvaloy thermoplastic resin with the following physical properties:

Tensile Strength: 2000 psi per ASTM D412  
Ultimate Elongation: 25 percent  
Shore A Hardness: 83 per ASTM D 2240  
Corners and End Dams; preformed shapes

Acceptable Manufacturers:

Flex Flash – as manufacture by Hohmann & Barnard, Inc. or pre-approved equal.

Surface Adhered Membrane with Drip – as manufactured by Hyload Flashings

DuPont Thru-Wall Flashings – as manufactured by DuPont Chemical Co.

- 2.2 Adhesive & Primers  
Adhesive & primers for bonding and splicing shall be as recommended by the manufacturer of the material used.

3.0 - EXECUTION

- 3.1 Extent  
Wall flashing shall generally be installed continuous at each floor level, over exterior wall openings, under sills, and at other locations as indicated and as required.
- 3.2 Installation
  - A. All surfaces to receive the flashing shall be reasonably smooth, free from irregularities and primed as recommended by manufacturers installation instructions. On all masonry surfaces, the flashing shall be laid continuously in a fresh bed of mortar above and below. Only at non-masonry vertical surfaces shall flashing be affixed continuously with adhesive and term bar to hold flashing in place.
  - B. At grade level floors, thru-wall flashing shall exit finish veneer minimum one course below finish floor and below weep holes.

END OF SECTION

1.0 - GENERAL

- 1.1 Scope  
The work under this section consists of caulking and sealants.
- 1.2 Work Included  
See the drawings for all items and places requiring caulking. Completely seal with specified caulking compound joints around door frame and frame base and window frames (inside and outside); all other openings in masonry, concrete, or precast concrete joints in or between precast concrete panels; beneath all exterior thresholds; around plumbing fixtures; all places indicated on the drawings to be caulked; and all other places where caulking is required, whether specifically shown on the drawings or not.
- 1.3 Submittals  
Submit for approval product literature and samples of all materials proposed for use. Colors to be approved in the field by the Architect to match adjacent construction color.

2.0 - PRODUCTS

- 2.1 Sealant
- A. Exterior sealant shall be a gun grade one part silicone compound. Materials shall be Tremco Spectrem 1, Dow Corning No. 790 or Pecora No. 890, color as selected.
  - B. Primer, if required, for the silicone sealant shall be a quick drying clean primer as recommended by the manufacturer of the material used.
- 2.2 Caulking
- A. Interior caulking compound shall be a paintable, one part, gun grade butyl rubber base material equal to Tremco Tremflex 834 Acrylic, Pecora BC-158 or DAP Butyl Flex or acrylic latex base caulking compound equal to Pecora AC-20 or DAP Latex Caulk.
  - B. Floor Caulking compound shall be a tintable, semi-self leveling polyurethane base equal to Tremco THC900/901. Colors shall be selected by Architect from manufacturers entire line of colors.
- 2.3 Fire Caulking  
All locations indicated and/or all penetrations or openings into fire barriers shall be sealed with fire caulk material meeting UL requirements for such application. Submit product literature indicating UL compliance for approval. All trades shall use same fire caulk product. Installer shall be certified by the manufacturer.
- 2.4 Compressible Joint Sealant  
Sealant shall be compressible polyurethane foam impregnated with polybutylene, Polytite as manufactured by Polytite Manufacturing Corporation, or other material as approved.
- 2.5 Filler  
Filler shall be polyethylene foam, polyurethane foam, untreated jute, pointing mortar or other oil-free materials subject to approval of the manufacturer of the caulking or sealant compound.

2.6 Accessories

- A. Bond breaker shall be polyethylene tape.
- B. Solvents, cleaning agents, and other accessory materials shall be as recommended by the sealant manufacturer.

3.0 - EXECUTION

3.1 Joint Preparation

- A. Joints deeper than 1/2" shall be built up to a depth of 3/8" below adjacent surfaces with approved filler material prior to applying sealant. All surfaces must be clean and dry. Any protective coating or foreign matter such as oil, dust, grease, dirt, or frost on building materials that will impair bond shall be removed. Masonry and concrete surfaces shall be sound. If required by manufacturer's instructions, apply brush coat of primer to surfaces and allow to dry before applying sealant.
- B. At the option of the applicator, the surfaces next to the joints may be masked to obtain a clean neat line. Remove tape immediately after tooling the sealant.

3.2 Application

- A. Caulking or sealant shall be used from manufacturer's original cartridge in a standard open type, hand operated caulking gun. Nozzle shall be cut to proper size to obtain a neat, smooth and uniform bead. When handling bulk material, manufacturer's instructions shall be followed.
- B. A full bead of caulking or sealant shall be applied into joint under sufficient pressure, drawing nozzle across caulking or sealant to leave a slightly concave surface. Tool with a caulking tool or soft bristled brush moistened with solvent within 10 minutes after exposure. All sealed joints shall be watertight.
- C. Joints shall be caulked before painting adjacent work. Do not paint over silicone sealant compound.
- D. Fire caulk shall be installed to comply with manufacturer's requirements, UL requirements, and requirements of authority having jurisdiction.

3.3 Clean-up

On non-porous surfaces, excess uncured caulking shall be immediately removed with a solvent moistened cloth. On porous surfaces, excess caulking should be allowed to cure overnight, then remove by lightly wire brushing or sanding. All adjacent surfaces shall be clean and free from stains.

END OF SECTION

1.0 - GENERAL

1.1 Related Documents

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

1.2 Summary

A. Section Includes:

1. Acoustical ceiling panels.
2. Exposed grid suspension system.
3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.

B. Related Sections:

1. Section 09260 - Gypsum Board
2. Section 09910 - Painting
3. Division 15 Sections - Mechanical Work
4. Division 16 Sections - Electrical Work

C. Substitutions:

1. Prior Approval: Unless otherwise provided for in the Contract documents, proposed product substitutions may be submitted no later than TEN (10) working days prior to the date established for receipt of bids. Acceptability of a proposed substitution is contingent upon the Architect's review of the proposal for acceptability and approved products will be set forth by the Addenda. If included in a Bid are substitute products which have not been approved by Addenda, the specified products shall be provided without additional compensation.
2. Submittals which do not provide adequate data for the product evaluation will not be considered. The proposed substitution must meet all requirements of this section, including but not necessarily limited to, the following: Single source materials suppliers (if specified in Section 1.5); Underwriters' Laboratories Classified Acoustical performance; Panel design, size, composition, color, and finish; Suspension system component profiles and sizes; Compliance with the referenced standards.  
*See Section 01360 – Product Substitution for submittal process information and Product Substitution Form.*

1.3 References

A. American Society for Testing and Materials (ASTM):

1. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
2. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
3. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
4. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

6. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
  7. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
  8. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.
  9. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems.
  10. ASTM E 1264 Classification for Acoustical Ceiling Products.
  11. ASTM E 1477 Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.
  12. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
  13. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material.
- B. ASHRAE Standard 62.1-2004, "Ventilation for Acceptable Indoor Air Quality"

#### 1.4 Submittals

- A. Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.
- B. Samples: Minimum 6 inch x 6 inch samples of specified acoustical panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees.
- C. Shop Drawings: Layout and details of acoustical ceilings. Show locations of items which are to be coordinated with, or supported by the ceilings.
- D. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC, and AC.
- E. If the material supplied by the acoustical subcontractor does not have an Underwriter's Laboratory classification of acoustical performance on every carton, subcontractor shall be required to send material from every production run appearing on the job to an independent or NVLAP approved laboratory for testing, at the architect's or owner's discretion. All products not conforming to manufacturer's current published values must be removed, disposed of and replaced with complying product at the expense of the Contractor performing the work.

#### 1.5 Quality Assurance

- A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.
- B. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
  1. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.
    - a. Flame Spread: 25 or less
    - b. Smoke Developed: 50 or less

2. Fire Resistance Ratings: As indicated by reference to design designations in UL Fire Resistance Directory, for types of assemblies in which acoustical ceilings function as a fire protective membrane and tested per ASTM E 119.
  - a. Protect lighting fixtures and air ducts to comply with requirements indicated for rated assembly.

- C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.6 Delivery, Storage, and Handling

- A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.7 Project Conditions

- A. Space Enclosure:

All ceiling products and suspension systems must be installed and maintained in accordance with Armstrong written installation instructions for that product in effect at the time of installation and best industry practice. Prior to and after installation, the ceiling product must be kept clean and dry, in an environment that is between 32°F (0°C) and 120°F (49°C) and not subject to Abnormal Conditions within the space or with interfacing construction such as walls or soffits. Abnormal conditions include exposure to chemical fumes, vibrations, moisture, excessive humidity, or excessive dirt or dust buildup.

HumiGuard Plus Ceilings: Installation of the products shall be carried out where the temperature is between 32°F (0° C) and 120°F (49° C). It is not necessary for the area to be enclosed or for HVAC systems to be functioning. All wet work (plastering, concrete, etc) must be complete and dry. The ceilings must be maintained to avoid excessive dirt or dust buildup that would provide a medium for microbial growth on ceiling panels. Microbial protection does not extend beyond the treated surface as received from the factory, and does not protect other materials that contact the treated surface such as supported insulation materials.

1.8 Warranty

- A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace acoustical panels that fail within the warranty period. Failures include, but are not limited to:

1. Acoustical Panels: Sagging and warping as a result of defects in materials or factory workmanship.
2. Grid System: Rusting and manufacturer's defects
3. Acoustical Panels with BioBlock Plus or designated as inherently resistive to the growth of micro-organisms installed with Armstrong suspension systems: Visible sag and will resist the growth of mold/mildew and gram positive and gram negative odor and stain causing bacteria.

- B. Warranty Period Humiguard:



1. Acoustical panels and grid systems with HumiGuard Plus or HumiGuard Max performance supplied by one source manufacturer is thirty (30) years from date of substantial completion.
- C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

#### 1.9 Maintenance

- A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
1. Acoustical Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.
  2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

### 2.0 - PRODUCTS

#### 2.1 Manufacturers

- A. Ceiling Panels:  
Armstrong World Industries, Inc. USG or pre-approved equal.

#### 2.2 Acoustical Ceiling Units

- A. Acoustical Panels Type L1 (without fire guard): Product:  
Fine Fissured, 1728
1. Surface Texture: Medium
  2. Composition: Mineral Fiber
  3. Color: White
  4. Size: 24in X 24in X 5/8in
  5. Edge Profile: Square Lay-In for interface with Prelude XL 15/16" Exposed Tee.
  6. Noise Reduction Coefficient (NRC): ASTM C 423; Classified with UL label on product carton, 0.55.
  7. Ceiling Attenuation Class (CAC): ASTM C 1414; Classified with UL label on product carton, 35
  8. Emissions Testing: < 13.5 ppb of formaldehyde when used under typical conditions required by ASHRAE Standard 62.1- 2007, "Ventilation for Acceptable Indoor Air Quality"
  9. Flame Spread: ASTM E 1264;
  10. Light Reflectance (LR): ASTM E 1477; White Panel: Light Reflectance: 0.85.
  11. Dimensional Stability: HumiGuard Plus - Temperature is between 32°F (0° C) and 120°F (49° C). It is not necessary for the area to be enclosed or for HVAC systems to be functioning. All wet work (plastering, concrete, etc) must be complete and dry.
  12. Antimicrobial Protection: BioBlock Plus - Resistance against the growth of mold/mildew and gram positive and gram negative odor and stain causing bacteria.

## 2.3 Suspension Systems (WITHOUT FIRE GUARD CEILING TILES)

- A. Components: All main beams and cross tees shall be commercial quality hot-dipped galvanized aluminum as per ASTM A 653. Main beams and cross tees are double-web steel construction with type exposed flange design. Exposed surfaces chemically cleansed, capping pre-finished galvanized aluminum in baked polyester paint. Main beams and cross tees shall have rotary stitching (exception: extruded aluminum or stainless steel).
  - 1. Structural Classification: ASTM C 635 HD.
  - 2. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.
  - 3. Acceptable Product: Prelude XL 15/16" Exposed Tee as manufactured by Armstrong World Industries, Inc.
- B. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
- C. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least time three design load, but not less than 12 gauge.
- D. Edge Moldings and Trim: Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations, including light fixtures, that fit type of edge detail and suspension system indicated. Provide moldings with exposed flange of the same width as exposed runner.

## 3.0 - EXECUTION

### 3.1 Examination of Adjoining Work

Do not proceed with installation until all wet work or work that has become wet such as concrete, CMU, terrazzo, plastering and painting has been completed and thoroughly dried out.

### 3.2 Preparation

- A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.
- B. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.
  - 1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

### 3.3 Installation

- A. Install suspension system and panels in accordance with the manufacturer's instructions, and in compliance with ASTM C 636 and with the authorities having jurisdiction.
- B. Suspend main beam from overhead construction with hanger wires spaced 4'-0" on center along the length of the main runner. Install hanger wires plumb and straight. Main beams are to be supported with hanger wires within 8" of vertical surface terminations.

- C. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.
- D. Vertical Wall or soffit surfaces intended to be paint finished shall receive the first coat of primer or block fill prior to installation of wall moulding.
- E. For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.
- F. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

3.4 Adjusting and Cleaning

- A. Replace damaged and broken panels.
- B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage.
- C. Ceiling Touch-Up Paint, (Item #5760, 8oz. bottles) (Item #5761, quart size cans), "global white" latex paint should be used to hide minor scratches and nicks in the surface and to cover field tegularized edges that are exposed to view.
- D. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

1.0 - GENERAL

1.1 Section Includes

- A. Flooring and accessories as shown on the drawings and schedules as required for complete installation.

1.2 Submittals

- A. Submit shop drawings, seaming plan, coving details, and manufacturer's technical data, installation and maintenance instructions for flooring and accessories.
- B. Submit the manufacturer's standard samples showing the required colors for flooring and applicable accessories.
- C. If required, submit the manufacturer's certification that the flooring has been tested by an independent laboratory and complies with the required fire tests.
- D. See Section 01350 – Submittals.

1.3 Quality Assurance and Regulatory Requirements

- A. Installer Qualifications: Firm with minimum five years successful experience completing resilient tile installation similar to that required.
- B. Provide types of flooring and accessories supplied by one manufacturer, including leveling and patching compounds, and adhesives.
- C. Materials within each area shall be from one production run as indicated by cartons bearing the same manufacturer's color code.
- D. Materials shall be uniform in thickness and size with accurately cut edges. No seconds, off-goods, or remnants will be allowed.
- E. Provide flooring material to meet the following fire test performance criteria as tested by a recognized independent testing laboratory:
  - 1. ASTM E 648 Critical Radiant Flux of 0.45 watts per sq. cm. or greater, Class I.
  - 2. ASTM E 662 (Smoke Generation) Maximum Specific Optical Density of 450 or less.
- F. Pre-Installation Conference: Conduct meeting at site prior to commencing work related to resilient tile installation.
  - 1. Require attendance of parties directly affecting resilient tile installation.
  - 2. Review site conditions, procedures, and coordination required with related work.

1.4 Environmental Conditions

- A. Deliver materials in good condition to the jobsite in the manufacturer's original unopened containers that bear the name and brand of the manufacturer, project identification, and shipping and handling instructions.
- B. Store materials in a clean, dry, enclosed space off the ground, and protected from the weather and from extremes of heat and cold. Protect adhesives from freezing. Store flooring, adhesives and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.
- C. Maintain a minimum temperature in the spaces to receive the flooring and accessories of 65°F (18°C) and a maximum temperature of 100°F (38°C) for at least 48 hours before, during, and for not less than 48 hours after installation. Thereafter, maintain a minimum temperature of 55°F (13°C) in areas where work is completed. Protect all materials from the direct flow of heat from hot-air registers, radiators, or other heating fixtures and appliances.
- D. Install flooring and accessories after the other finishing operations, including painting, have been completed. Close spaces to traffic during the installation of the flooring. Do not install flooring over concrete slabs until they are sufficiently

dry to achieve a bond with the adhesive, in accordance with the manufacturer's recommended bond and moisture tests.

## 2.0 - PRODUCTS

### 2.1 Resilient Tile Flooring Materials

- A. Provide "Standard Excelon" Tile Flooring manufactured by Armstrong or pre-approved equal, having a nominal total thickness of 1/8", 12 in. x 12 in. Color and pattern as selected by architect from manufacturer's full range of colors. Vinyl composition tile shall conform to the requirements of ASTM F 1066, Class 2 – through pattern.
- B. Resilient tile patterns shall be indicated on architectural plans. Spacing and patterns shall be as indicated or directed.

### 2.2 Adhesives

- A. For Tile Installation System, Full Spread: Resilient Tile Adhesive under the tile and Wall Base Adhesive at the wall base shall be as manufactured or recommended by the manufacturer of the materials used. Provide epoxy adhesive at "wet" areas.

### 2.3 Accessories

- A. For patching, smoothing, and leveling monolithic subfloors (concrete, terrazzo, quarry tile, ceramic tile, and certain metals), shall be as manufactured or recommended by the manufacturer of the products used.
- B. For sealing joints between the top of wall base or integral cove cap and irregular wall surfaces such as masonry, provide plastic filler applied according to the manufacturer's recommendations.
- C. Provide transition/reducing strips tapered to meet abutting materials as shown on drawings.
- D. Provide threshold of thickness and width as shown on the drawings.
- E. Provide feature resilient edge strips, 1" wide x 24" length, of equal gauge to the flooring, homogeneous vinyl composition and color as selected by the Architect from standard colors available.
- F. Provide metal edge strips of width shown on the drawings and of required thickness to protect exposed edges of the flooring. Provide units of maximum available length to minimize the number of joints. Use butt-type metal edge strips for concealed anchorage, or overlap-type metal edge strips for exposed anchorage. Unless otherwise shown, provide strips made of extruded aluminum with a mill finish.
- G. Provide expansion joint cover equal to Construction Services GFST Series. Install per manufacturer's written instructions.

### 2.4 Warranty

- A. Flooring materials under this section shall be warranted against manufacturing defects for five years from date of substantial completion.
- B. Installation shall be warranted for two years from date of substantial completion. Installation warranty shall include guarantee that products have been installed according to manufacturer's installation instructions, edition which is current at the time of installation.
- C. Prorated Manufacturer's Warranty
  - 1. **Within One Year:** If a defect is reported in writing to the manufacturer within one year of final completion, manufacturer will supply new material of the same grade sufficient to repair or replace the defective material. Manufacturer will also pay for reasonable labor costs.

2. **Within Two Years:** If a defect is reported in writing to the manufacturer after one year, but within two years of substantial completion, manufacturer will supply new material of same grade sufficient to repair or replace defective material. Manufacturer will also pay fifty per cent of reasonable labor costs.
3. **After Two Years:** If a defect is reported in writing to the manufacturer after two years, but within five years of substantial completion, manufacturer will supply new material of same grade sufficient to repair or replace defective material.

### 3.0 - EXECUTION

#### 3.1 Inspection

- A. Examine subfloors prior to installation to determine that surfaces are smooth and free from cracks, holes, ridges, and other defects that might prevent adhesive bond or impair durability or appearance of the flooring material.
- B. Inspect subfloors prior to installation to determine that surfaces are free from curing, sealing, parting and hardening compounds; residual adhesives; adhesive removers; and other foreign materials that might prevent adhesive bond. Visually inspect for evidence of moisture, alkaline salts, carbonation, dusting, mold, or mildew.
- C. Report conditions contrary to contract requirements that would prevent a proper installation. **DO NOT** proceed with the installation until unsatisfactory conditions have been corrected.

#### 3.2 Preparation

- A. Smooth concrete surfaces, removing rough areas, projections, ridges, and bumps, and filling low spots, control or construction joints, and other defects as recommended by the flooring manufacturer.
- B. Remove paint, varnish, oils, release agents, sealers, and waxes. Remove residual adhesives as recommended by the flooring manufacturer. Remove curing and hardening compounds not compatible with the adhesives used, as indicated by a bond test or by the compound manufacturer's recommendations for flooring. Avoid organic solvents.
- C. For Tile Installation System, Full Spread perform subfloor moisture testing in accordance with ASTM F 2170, "Standard Test Method for Determining Relative Humidity in Concrete Slabs Using in-situ Probes", ASTM F 1869, "Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride" or as required by manufacturer to determine if surfaces are dry; free of curing and hardening compounds, old adhesive, and other coatings; and ready to receive flooring. Relative humidity shall not exceed 80% and MVER shall not exceed 5 lbs./1000 sq. ft./24 hrs. On installations where both the Percent Relative Humidity and the Moisture Vapor Emission Rate tests are conducted, results for both tests shall comply with the allowable limits listed above. Do not proceed with flooring installation until results of moisture tests are acceptable. All test results shall be documented and retained.
- D. For Tile High-Moisture Installation Warranty, perform subfloor moisture testing in accordance with ASTM F 2170, "Standard Test Method for Determining Relative Humidity in Concrete Slabs Using in-situ Probes", ASTM F 1869, "Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride", or required by manufacturer to determine if surfaces are dry; free of curing and hardening compounds, old adhesive, and other coatings; and ready to receive flooring. Relative humidity shall not exceed 90% and MVER shall not exceed 7 lbs./1000 sq. ft./24 hrs. On installations where both the Percent Relative Humidity and the Moisture Vapor Emission Rate tests are conducted, results for both tests shall comply with the allowable limits listed

above. Do not proceed with flooring installation until results of moisture tests are acceptable. All test results shall be documented and retained.

- E. Perform pH tests on concrete floors regardless of their age or grade level. All test results shall be documented and retained
- F. Vacuum or broom-clean surfaces to be covered immediately before the application of flooring. Make subfloor free from dust, dirt, grease, and all foreign materials.

### 3.3 Installation of Tile Flooring

- A. Install flooring in strict accordance with the latest edition of Manufacturer's Guaranteed Installation System and recommended work practices from the Resilient Floor Covering Institute.
- B. Install flooring wall to wall before the installation of floor-set cabinets, casework, furniture, equipment, movable partitions, etc. Extend flooring into toe spaces, door recesses, closets, and similar openings as shown on the drawings.
- C. If required, install flooring on pan-type floor access covers. Maintain continuity of color and pattern within pieces of flooring installed on these covers. Adhere flooring to the subfloor around covers and to covers.
- D. Scribe, cut, and fit to permanent fixtures, columns, walls, partitions, pipes, outlets, and built-in furniture and cabinets.
- E. Install flooring with adhesives, tools, and procedures in strict accordance with the manufacturer's written instructions. Observe the recommended adhesive trowel notching, open times, and working times.
- F. Border pieces less than 6" wide are NOT acceptable.
- G. Installation Direction: Quarter-turned unless otherwise indicated by Architect.

### 3.4 Installation of Accessories

- A. Apply top set wall base to walls, columns, casework, and other permanent fixtures in areas where top-set base is required. Install base in lengths as long as practical from base materials that are mitered or coped. Tightly bond base to vertical substrate with continuous contact at horizontal and vertical surfaces.
- B. Fill voids with plastic filler along the top edge of the resilient wall base or integral cove cap on masonry surfaces or other similar irregular substrates.
- C. Place resilient edge strips tightly butted to flooring, and secure with adhesive recommended by the edge strip manufacturer. Install edge strips at edges of flooring that would otherwise be exposed.
- D. Apply butt-type and/or overlap metal edge strips where shown on the drawings, before and/or after flooring installation. Secure units to the substrate, complying with the edge strip manufacturer's recommendations.

### 3.5 Cleaning and Protection

- A. Immediately After Installation
  1. Sweep, Dust mop or vacuum the floor thoroughly to remove all loose dust and dirt.
  2. Remove any dried adhesive residue with a clean white cloth dampened with mineral spirits, carefully follow warnings on container.
  3. Damp mop the floor with a properly diluted neutral detergent solution as recommended by manufacturer.
  4. Apply high quality commercial floor sealer and Two (2) coats of high quality commercial floor polish as recommended by manufacturer.  
DO NOT wet wash, machine scrub or strip the floor for at least 4 to 5 days after installation. This is to prevent excess moisture from interfering with the adhesive bond and/ or seam treatments.
- B. Preparation for Use

1. Scrub the floor with a neutral detergent and scrubbing pad as recommended by manufacturer.
  2. Thoroughly rinse floor and allow to dry.
  3. Apply Three (3) additional coats of high-quality commercial floor polish as recommended by Manufacturer for a total of Five (5) coats for final acceptance.
- C. Perform maintenance according to the latest edition of manufacturer's Guaranteed Installation System.
- D. Protect installed flooring as recommended by the flooring manufacturer against damage from rolling loads, other trades, or the placement of fixtures and furnishings.

END OF SECTION



1.0 – GENERAL

1.1 Scope

- A. The work under this section consists of all painting, finishing work and related items.
- B. Paint or Painting shall include sealers, primers, stains, and oil, alkyd, latex and enamel paints and the application of these materials on surfaces prepared to produce a complete job whether or not every item is specifically mentioned. Where items are not mentioned they shall be furnished as specified for similar work. **Only work specifically noted as being excluded shall be left unfinished.**
- C. This specification includes field painting of all exposed piping, metal, ductwork, conduit, hangers, mechanical and electrical equipment in finished spaces. A finished space is one listed in the Finish Schedule as having finish materials on walls and/or ceiling.

1.2 List of Proposed Materials

The contractor shall either verify in writing that he intends to apply the products listed in the Paint Schedule, or shall submit for approval a list of comparable materials of another listed approved manufacturer. This submittal shall include full identifying product names and catalog numbers.

1.3 Submittals

- A. As soon as practicable after contract is let, submit for approval a detailed schedule of the paint proposed, listing the name of each product, and the surface to which it will be applied. Omission of any item from the approved schedule shall not relieve Contractor of his obligation.
- B. Product Data: For each paint system indicated. Include block fillers and primers.
  - 1. Material List: 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: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.
  - 3. Coating Maintenance Manual: Upon conclusion of the project, the Contractor or paint manufacturer / supplier shall furnish a coating maintenance manual, such as Sherwin-Williams "Custodian Project Color and Product Information" report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product / color / finish was used, product data pages, Material Safety Data Sheet (MSDS), care and cleaning instructions, Touch-up procedures.

1.4 Storage of Materials

- A. Deliver all painting materials to job site at least three (3) days before beginning painting in original unbroken containers showing manufacturers name and type of paint, subject to Architect's inspection and approval.

- B. All materials used on the job shall be stored in a single place. Such storage place shall be kept neat and clean, and all damage thereto or its surroundings shall be made good. Any soiled or used rags, waste, and trash must be removed from the building every night, and every precaution taken to avoid the danger of fire.

1.5 Protection of Other Work

The painting contractor shall furnish and lay drop cloths in all areas where painting is being done to protect floors and other work from damage. He shall be responsible for any damage to other work and shall replace any materials which have been damaged to such an extent that they cannot be restored to their original condition. All damage must be repaired to the satisfaction of the Architect.

1.6 Job, Weather, and Temperature Conditions

- A. Maintain temperature in building at constant 65° F. or above and provide adequate ventilation for escape of moisture from the building in order to prevent condensation mildew, damage to other work, and improper drying.
- B. Exterior painting shall not be done when the temperature is below 50° F., while the surface is damp, or during cold, rainy, or frosty weather, or when the temperature is likely to drop to freezing within 24 hours. Avoid painting surfaces while they are exposed to hot sun.
- C. Before painting is started in any area, the area shall be broom cleaned and excessive dust shall be removed from all areas to be painted. After painting operations begin in a given area, clean only with commercial vacuum cleaning equipment.
- D. Adequate illumination shall be provided in all areas where painting operations are in progress.

1.7 Inspection of Surfaces

- A. Before starting any work, surfaces to receive paint finishes shall be examined carefully for defects which cannot be corrected by the procedures specified under paint manufacturers recommended "Preparation of Surfaces" and which might prevent satisfactory painting results. Work shall not proceed until such damages are correct.
- B. At areas of existing previously painted surface, the painting contractor shall field verify to assure compatibility between existing paint / coating material and the proposed new paint / coating material prior to procuring such new materials or products. Should a material or product compatibility conflict be discovered, the Contractor shall immediately notify the Architect for direction prior to proceeding with procuring such materials or products.
- C. The beginning of work in a specific area shall be construed as acceptance of the surfaces and the Contractor shall be fully responsible for satisfactory work.

1.8 Quality Assurance

- A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

- B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats. An inspection is required by manufacture in between prime coat and finish. Per the request of the Architect.
- C. Coordination of Work: Review other Sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings systems for various substrates. Upon request from other trades, furnish information or characteristics of finish materials provided for use, to ensure compatible prime coats are used.
- D. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in PDCA P5. Duplicate finish of approved sample Submittals.

1.9 Cooperation With Other Trades

- A. This work shall be scheduled and coordinated with other trades and shall not proceed until other work and/or job conditions are as required to produce satisfactory results.
- B. The contractor shall examine the specifications for the various trades and shall thoroughly familiarize himself with all provisions regarding painting. **All surfaces that are left unfinished by the requirements of other sections shall be painted or finished as part of the work covered by this section.**

1.10 Maintenance Material

The contractor shall turn over to the Owner at the final inspection one gallon of each type and final color of the paint used on the project.

2.0 – PRODUCTS

2.1 Materials

- A. Except where otherwise specifically stated hereinafter, painting materials shall be products of one of the following manufacturers without substitution of "Equal", and shall be in that manufacturer's top grade of the respective type: Benjamin Moore, PPG, or Sherwin-Williams (Basis of Design). The term "top grade" refers to the manufacturers advertised line of best quality and not to "Professional" or "maintenance" lines. Any deviations from the requirements of this article shall only be by written change order with contract price adjusted accordingly.
- B. If job-mixed paints are used, submit proposed formulas for approval before proceeding with work. Thinning and tinting materials shall be as recommended by the manufacturer of the material used.
- C. Paints and finishing materials shall be free from skins, lumps, or any foreign matter when used, and pigments, fillers, etc., shall be kept well stirred while being applied.
- D. Interior finish materials shall comply with flame spread limitations and smoke production limitations as follows:

Walls and Ceilings - Flame Spread - 25 or less ASTM E-84.  
Smoke Production - 350 or less ASTM E-84.

## 2.2 Colors

- A. Not limited to "stock" ready-mixed colors. Bring to directed shades or tones by mixing.
- B. In two-coat or three-coat work use slightly different colors for different coats to avoid skipping.
- C. Accent or feature areas when indicated shall be colors as selected. Color spacing and pattern shall be as indicated and/or directed. Maximum three (3) colors per area.
- D. Complete color scheme shall be as indicated on Finish Legend and Schedule.

## 2.3 Accessory Materials

Provide all required ladders, scaffolding, drop cloths, maskings, scrapers, tools, sandpaper, dusters, cleaning solvents, and waste as required to perform the work and achieve the results specified herein.

## 3.0 – EXECUTION

### 3.1 Workmanship

- A. Surfaces shall be clean, dry, and free of oil, grease, dirt, mildew, loose or peeling paint, loose wood particles, and in proper condition for painting. All work shall be carefully done by skilled mechanics. Finished surfaces shall be uniform in coverage, gloss, finish and color, and free from brush marks. All coats shall be thoroughly dry before applying succeeding coats.
- B. Do all work in strict accordance with manufacturer's label directions.
- C. Hand sand woodwork until smooth and free from raised grain and other surface imperfections. First coat shall be applied before erection, to all surfaces, front and back. After woodwork is primed, fill nail holes, cracks, etc., full and smooth with putty. Lightly sand between coats where necessary in accord with good practice. Fully finish the top and bottom edges of doors and other woodwork edges not normally visible. Shellac knots and pitch streaks before painting.
- D. On concrete or masonry, do no painting until the surface has dried to the equivalent of eight days drying time under well ventilated conditions in good drying weather.
- E. Vertical surfaces to Interface with suspended acoustical panel ceiling shall be primed/filled to a minimum of 8" about finish ceiling elevation prior to the installation of the acoustical panel ceiling perimeter wall edge molding/trim.
- F. Wash metal surfaces with mineral spirits to remove any dirt, grease, before applying materials. Where rust or scale is present, use wire brush, or sandpaper clean before painting. Clean shop coats of paint that become marred and touch up with specified primer.
- G. Treat galvanized metal surfaces chemically with compound designed for this purpose, apply as per manufacturer's directions before applying first paint coat.
- H. Remove and protect hardware panels, accessories, device plates, lighting fixtures, factory finished work, and similar items; or provide ample in-place protection. Upon

completion of each space, carefully replace all removed items.

- I. Exterior doors shall have tops, bottoms, and side edges finished the same as the exterior faces of these doors. Interior door shall have vision windows, louvers, grilles, etc. Finished to match door frame.
- J. All closets and the interior of all cabinets shall be finished the same as adjoining room paint or stain unless otherwise scheduled. All other surfaces shall be finished the same as nearest or adjoining surfaces unless otherwise scheduled or directed.

### 3.2 Schedule

- A. Exterior Exposed Concrete and/or Clay Brick Masonry  
Primer: Loxon Exterior / Interior Concrete & Masonry Primer / Sealer, LX02W0050  
Block Filler:S-W: Pro Industrial Heavy Duty Acrylic Block filler, B42W00150  
Finish:  
S-W: A-100 Exterior Latex

Sheen indicated on Finish Schedule

- B. Interior Concrete and Concrete Masonry

- 1. Concrete Masonry Surfaces shall be filled unless noted otherwise.  
Prime: Pro Industrial Heavy Duty Acrylic Block Filler, B42W00150  
Finish Apply Two Coats:  
S-W: Pro Industrial Pre-Catalyzed Waterbased Epoxy  
(K45W1151 Egshel, K46W1151 S/G)

**Provide at all wet areas**

S-W: Pro Industrial Waterbased Catalyzed Epoxy, B73 Series  
(EgShel, B73-360 / Gloss, B73-300)

- a. Note: Block Filler should achieve a smooth pinhole free appearance.
- b. This is necessary for proper protection before top coat is applied.
- c. Apply at recommended film thickness and spread rate as indicated by manufacturer.
- d. Architect requires manufacturer' inspection between block filler and top coat.

- 2. Concrete (Cast in Place or Precast)  
Primer: Loxon Exterior / Interior Concrete & Masonry Primer / Sealer  
LX02W0050  
Finish Apply Two Coats:  
S-W: Pro Industrial Pre-Catalyzed Waterbased Epoxy  
(K45W1151 Egshel, K46W1151 S/G)

### 3.3 Material Application

- A. All materials shall be applied in complete accordance with manufacturer's printed instructions.
- B. All coats shall be thoroughly dry before the succeeding coat is applied.

END OF SECTION

PROTECTIVE COVER-WALKWAY - SECTION 10530  
(Aluminum Baked Enamel Acrylic Finish)

1.0 - GENERAL

1.1 Scope

The work of this section shall include all labor, material, and equipment necessary to furnish and install Walkway Cover and accessories hereafter specified and/or indicated on the Drawings.

1.2 Manufacturer

Walkway Cover shall be Tennessee Valley Metals, Peachtree Protective Covers, Inc., Superior Metals, Mitchell Metals or approved equal as long as they meet or exceed specifications and adhere to drawing details.

1.3 Shop Drawings

Shop drawings shall be generated under the services of a structural engineer licensed in the State of Alabama, sealed and signed and submitted to the architect for approval before fabrication. These drawings to show: size, arrangement, foundation and type of material, connections and relationship to adjacent work and compliance with applicable codes.

1.4 Guarantee

The Walkway Cover Contractor shall guarantee all materials and workmanship covered by this section for a period of one (1) year from date of final acceptance of the Contract, or from occupancy of the building, whichever is earlier.

2.0 - PRODUCTS

2.1 General

- A. Structural roof system for walkway shall be complete with all required components and accessories as shown on the Drawings and as required.
- B. The system shall be designed to structurally withstand severe icing, heavy hail, and 110 mph wind loads. Minimal structural capacity for all components shall meet the latest edition of the IBC as adopted by the Authority having jurisdiction.

2.2 Concealed Drainage

Water shall drain internally from deck to beams and/or to columns, spouting out at ground level through columns.

2.3 Materials

- A. Roof Panel: The self-supporting aluminum Roof Panel shall be an alloy accurately roll formed to the deep channel design shown on the Drawing. It shall have a depth required for span and be furnished with an interlocking design to provide a weathertight load-bearing deck. The gauge of the panels shall be as required to support the load in accordance with engineering prints and calculations provided by the manufacturer. Material to be baked enamel acrylic. Color as selected by Architect.
- B. Roll-formed Fascia: The fascia shall be accurately roll formed from an aluminum alloy to the sculptured design shown on the drawing so that it will serve as a built-in gutter for roof drainage and as a structural frame member with a height of not less than 6-1/4" and a gutter width of not less than 2-3/8".

Gutter cross sectional area shall be 4 square inches. Fascia gauge shall be as required for the load to be supported in accordance with engineering prints and calculations provided by the manufacturer. Materials to be baked enamel acrylic. Color as selected by Architect.

- C. Finish: The enameled finish on roof panels, roll-formed fascia and related enameled components shall be designed for optimum performance in exterior installations under all environmental conditions. The finish shall be applied in accordance with and conform to, or exceed the Painted Sheet "Quality Standards" and recommended ASTM, Military and/or Federal Test Methods specified by the Aluminum Association in their publication "Aluminum Standards & Data".

All exposed materials shall be pre-finished. Color choices shall include industry standard bronze, dark bronze, medium bronze, white, cream, etc.

Galvanized metal shall be solvent clean with VM&P Naphtha.  
Primer: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310

Finish: Apply two coats  
S-W Pro Industrial HP Acrylic Coating, S/G, B66-650  
OR S-W Pro Industrial HP Acrylic Coating, Gloss, B66-600

Non-primed metal shall be cleaned and etched with approved acid and washed with water.

Primer: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310

Finish: Apply two coats  
S-W Pro Industrial HP Acrylic Coating, S/G, B66-650  
OR S-W Pro Industrial HP Acrylic Coating, Gloss, B66-600

Primed metals shall be inspected, scuffs, and abrasions sanded free of rust and receive full coat of primer. Concealed metal surfaces shall be spot primed.

Spot Primer Coat – S-W Pro Industrial Pro-Cryl Universal Primer,  
B66-310

Finish: Apply two coats  
S-W Pro Industrial HP Acrylic Coating, S/G, B66-650  
OR S-W Pro Industrial HP Acrylic Coating, Gloss, B66-600

- D. Component Accessories: Roof Brackets, Post Brackets, Flashing, etc., shall be of same materials and finishes as specified for prime components. Each part and its use is described in the engineering prints and calculations provided by the manufacturer. Each part shall be used as specified in the aforementioned prints. Posts shall be used as specified. All components must match finish color as selected by Architect.

- E. Hardware: All bolts, nuts, washers, and screws used in joining the members of the canopy together shall be stainless steel up to 1/4" diameter nominal size. Any hardware 1/4" diameter and larger shall be hot dip galvanized to withstand 200 hours' salt spray test of maximum resistance to rust and corrosion. Provide concealed fasteners where possible. All hardware must match finish color as selected by Architect.

### 3.0 - EXECUTION

#### 3.1 Installation

- A. Installed units shall have the following minimum pitch for water drainage of the roof.  
Minimum pitch for all panels and fascia:  
Up to 10'-1/8" ft.  
Over 10'-1/4" ft.
- B. Installed unit shall be properly caulked with a suitable, high quality material where needed and where specified.
- C. Installed unit shall meet local building code requirements and conform to the engineering prints provided by the manufacturer.

#### 3.2 Erection

- A. Columns and beams shall be aligned with care before columns are grouted. Downspout columns shall be filled to the discharge level to prevent standing water, and downspout deflectors installed after grouting.
- B. Grout shall be #2000 compressive strength. Mix by volume, 1 part Portland cement and 3 parts masonry sand. Add water to make pouring consistency and vibrate with a small rod to fill voids.
- C. Extreme care shall be taken to prevent damage or scratching. All workmanship must be of the very best, with neat miters and fitted joints.

#### 3.3 Flashing

At adjoining construction, as indicated or required.

#### 3.4 Clean Up

Remove all debris from the site as it accumulates. Clean Protective Walkway Cover at completion of installation and leave in as new condition.

END OF SECTION



MACHINE ROOM-LESS HYDRAULIC PASSENGER ELEVATORS – SECTION 14240

1.0 GENERAL

1.01 SUMMARY

- A. Section includes: Machine room-less hydraulic passenger elevators as shown and specified. Elevator work includes:
1. Standard pre-engineered hydraulic passenger elevators.
  2. Elevator car enclosures, hoistway entrances and signal equipment.
  3. Operation and control systems.
  4. Jack(s).
  5. Accessibility provisions for physically disabled persons.
  6. Equipment, machines, controls, systems and devices as required for safely operating the specified elevators at their rated speed and capacity.
  7. Materials and accessories as required to complete the elevator installation.
- B. Related Sections:
1. Division 1 General Requirements: Meet or exceed all referenced sustainability requirements.
  2. Division 3 Concrete: Installing inserts, sleeves and anchors in concrete.
  3. Division 4 Masonry: Installing inserts, sleeves and anchors in masonry.
  4. Division 5 Metals:
    - a. Providing hoist beams, pit ladders, steel framing, auxiliary support steel and divider beams for supporting guide-rail brackets.
    - b. Providing steel angle sill supports and grouting hoistway entrance sills and frames.
  5. Division 9 Finishes: Providing elevator car finish flooring and field painting unfinished and shop primed ferrous materials.
  6. Division 16 Sections:
    - a. Providing electrical service to elevators, including fused disconnect switches where permitted. (note: fused disconnect switch to be provided as part of elevator manufacture product, see section 2.11 Miscellaneous elevator components for further details.)
    - b. Emergency power supply, transfer switch and auxiliary contacts.
    - c. Heat and smoke sensing devices.
    - d. Convenience outlets and illumination in control room (if applicable), hoistway and pit.
  7. Division 22 Plumbing
    - a. Sump pit and oil interceptor.
  8. Division 23 Heating, Ventilation and Air Conditioning
    - a. Heating and ventilating hoistways and/or control room.

- C. Work Not Included: General contractor shall provide the following in accordance with the requirements of the Model Building Code and ANSI A17.1 Code. For specific rules, refer to ANSI A17.1, Part 3 for hydraulic elevators. State or local requirements must be used if more stringent. The cost of this work is not included in the TK Elevator's proposal, since it is a part of the building construction.
1. Elevator hoist beam to be provided at top of elevator shaft. Beam must be able to accommodate proper loads and clearances for elevator installation and operation.
  2. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports and bracing including all setting templates and diagrams for placement.
  3. Hatch walls require a minimum two hours of fire rating. Hoistway should be clear and plumb with variations not to exceed 1/2" at any point.
  4. Elevator hoistways shall have barricades, as required.
  5. Install bevel guards at 75° on all recesses, projections or setbacks over 2" (4" for A17.1 2000 areas) except for loading or unloading.
  6. Provide rail bracket supports at pit, each floor and roof. For guide rail bracket supports, provide divider beams between hoistway at each floor and roof.
  7. Pit floor shall be level and free of debris. Reinforce dry pit to sustain normal vertical forces from rails and buffers.
  8. Where pit access is by means of the lowest hoistway entrance, a vertical ladder of non-combustible material extending 42" minimum, (48" minimum for A17.1-2000 areas) shall be provided at the same height, above sill of access door or handgrips.
  9. All wire and conduit should run remote from the hoistways.
  10. When heat, smoke or combustion sensing devices are required, connect to elevator control cabinet terminals. Contacts on the sensors should be sided for 12 volt D.C.
  11. Install and furnish finished flooring in elevator cab.
  12. Finished floors and entrance walls are not to be constructed until after sills and door frames are in place. Consult elevator contractor for rough opening size. The general contractor shall supply the drywall framing so that the wall fire resistance rating is maintained, when drywall construction is used.
  13. Where sheet rock or drywall construction is used for front walls, it shall be of sufficient strength to maintain the doors in true lateral alignment. Drywall contractor to coordinate with elevator contractor.
  14. Before erection of rough walls and doors; erect hoistway sills, headers, and frames. After rough walls are finished; erect fascias and toe guards. Set sill level and slightly above finished floor at landings.
  15. To maintain legal fire rating (masonry construction), door frames are to be anchored to walls and properly grouted in place.
  16. The elevator wall shall interface with the hoistway entrance assembly and be in strict compliance with the elevator contractor's requirements.
  17. General Contractor shall fill and grout around entrances, as required.
  18. All walls and sill supports must be plumb where openings occur.
  19. Locate a light fixture (200 lx / 19 fc) and convenience outlet in pit with switch located adjacent to the access door.

20. Provide telephone line, light fixture (200 lx / 19 fc), and convenience outlet in the hoistway at the landing where the elevator controller is located. Typically this will be at the landing above the 1st floor. Final location must be coordinated with elevator contractor.
21. As indicated by elevator contractor, provide a light outlet for each elevator, in center of hoistway.
22. For signal systems and power operated door: provide ground and branch wiring circuits.
23. For car light and fan: provide a feeder and branch wiring circuits to elevator control cabinet.
24. Controller landing wall thickness must be a minimum of 8 1/2 inches thick. This is due to the controller being mounted on the second floor landing in the door frame on the return side of the door. For center opening doors, the controller is located on the right hand frame (from inside the elevator cab looking out). These requirements must be coordinated between the general contractor and the elevator contractor.
25. Cutting, patching and recesses to accommodate hall button boxes, signal fixtures, etc..

#### 1.02 SUBMITTALS

- A. Product data: When requested, the elevator contractor shall provide standard cab, entrance and signal fixture data to describe product for approval.
- B. Shop drawings:
  1. Show equipment arrangement in the corridor, pit, and hoistway and/or optional control room. Provide plans, elevations, sections and details of assembly, erection, anchorage, and equipment location.
  2. Indicate elevator system capacities, sizes, performances, safety features, finishes and other pertinent information.
  3. Show floors served, travel distances, maximum loads imposed on the building structure at points of support and all similar considerations of the elevator work.
  4. Indicate electrical power requirements and branch circuit protection device recommendations.
- C. Powder Coat paint selection: Submit manufacturer's standard selection charts for exposed finishes and materials.
- D. Plastic laminate selection: Submit manufacturer's standard selection charts for exposed finishes and materials.
- E. Metal Finishes: Upon request, standard metal samples provided.
- F. Operation and maintenance data. Include the following:
  1. Owner's manuals and wiring diagrams.
  2. Parts list, with recommended parts inventory.

#### 1.03 QUALITY ASSURANCE

- A. **Manufacturer Qualifications:** An approved manufacturer with minimum 15 years of experience in manufacturing, installing, and servicing elevators of the type required for the project.
1. The manufacturer of machines, controllers, signal fixtures, door operators cabs, entrances, and all other major parts of elevator operating equipment.
    - a. The major parts of the elevator equipment shall be manufactured by the installing company, and not be an assembled system.
  2. The manufacturer shall have a documented, on-going quality assurance program.
  3. ISO-9001:2000 Manufacturer Certified
  4. ISO-14001:2004 Environmental Management System Certified
  5. LEED Gold certified elevator manufacturing facility.
- B. **Installer Qualifications:** The manufacturer or an authorized agent of the manufacturer with not less than 15 years of satisfactory experience installing elevators equal in character and performance to the project elevators.
- C. **Regulatory Requirements:**
1. ASME A17.1 Safety Code for Elevators and Escalators, latest edition or as required by the local building code.
  2. Building Code: National.
  3. NFPA 70 National Electrical Code.
  4. NFPA 80 Fire Doors and Windows.
  5. Americans with Disabilities Act - Accessibility Guidelines (ADAAG)
  6. Section 407 in ICC A117.1, when required by local authorities
  7. CAN/CSA C22.1 Canadian Electrical Code
  8. CAN/CSA B44 Safety Code for Elevators and Escalators.
  9. California Department of Public Health Standard Method V1.1–2010, CA Section 01350
- D. **Fire-rated entrance assemblies:** Opening protective assemblies including frames, hardware, and operation shall comply with ASTM E2074, CAN4-S104 (ULC-S104), UL10(b), and NFPA Standard 80. Provide entrance assembly units bearing Class B or 1 1/2 hour label by a Nationally Recognized Testing Laboratory (2 hour label in Canada).
- E. **Inspection and testing:**
1. Elevator Installer shall obtain and pay for all required inspections, tests, permits and fees for elevator installation.
  2. Arrange for inspections and make required tests.
  3. Deliver to the Owner upon completion and acceptance of elevator work.
- F. **Sustainable Product Qualifications:**
1. **Environmental Product Declaration:**
    - a. **GOOD:** If Product Category Rules (PCR) are not available, produce a publicly available, critically reviewed life-cycle

assessment conforming to ISO 14044 that has at least a cradle to gate scope.

- b. BEST: If Product Category Rules (PCR) are available, produce and publish an Environmental Product Declaration (EPD) based on a critically reviewed life-cycle assessment conforming to ISO 14044, with external verification recognized by the EPD program operator.
- 2. Material Transparency:
    - a. GOOD: Provide Health Product Declaration at any level
    - b. BETTER: Provide Health Product Declaration (HPD v2 or later). Complete, published declaration with full disclosure of known hazards, prepared using the Health Product Declaration Collaborative's "HPD builder" on-line tool.
    - c. BEST: Cradle to Cradle Material Health Certificate v3, Bronze level or higher.
  - 3. LEED v4 – Provide documentation for all Building Product Disclosure AND Optimization credits in LEED v4 for product specified.
  - 4. Living Building Challenge Projects: Provide Declare label for products specified.

#### 1.04 DELIVERY, STORAGE AND HANDLING

- A. Manufacturing shall deliver elevator materials, components and equipment and the contractor is responsible to provide secure and safe storage on job site.

#### 1.05 PROJECT CONDITIONS

- A. Temporary Use: Elevators shall not be used for temporary service or for any other purpose during the construction period before Substantial Completion and acceptance by the purchaser unless agreed upon by Elevator Contractor and General Contractor with signed temporary agreement.

#### 1.06 WARRANTY

- A. Warranty: Submit elevator manufacturer's standard written warranty agreeing to repair, restore or replace defects in elevator work materials and workmanship not due to ordinary wear and tear or improper use or care for 12 months after final acceptance.

#### 1.07 MAINTENANCE

- A. Furnish maintenance and call back service for a period of 12 months for each elevator after completion of installation or acceptance thereof by beneficial use, whichever is earlier, during normal working hours excluding callbacks.
  - 1. Service shall consist of periodic examination of the equipment, adjustment, lubrication, cleaning, supplies and parts to keep the elevators in proper operation. Maintenance work, including emergency call back repair service, shall be performed by trained employees of the elevator contractor during regular working hours.

2. Submit parts catalog and show evidence of local parts inventory with complete list of recommended spare parts. Parts shall be produced by manufacturer of original equipment.
3. Manufacturer shall have a service office and full time service personnel within a 100 mile radius of the project site.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Manufacturer: Design based around TK Elevator's endura Machine Room-Less hydraulic elevator.

### **2.02 MATERIALS, GENERAL**

- A. All Elevator Cab materials including frame, buttons, lighting, wall and ceiling assembly, laminates and carpet shall have an EPD and an HPD, and shall meet the California Department of Public Health Standard Method V1.1-2010, CA Section 01350 as mentioned in 1.03.9 of this specification.
- B. Colors, patterns, and finishes: As selected by the Architect from manufacturer's full range of standard colors, patterns, and finishes.
- C. Steel:
  1. Shapes and bars: Carbon.
  2. Sheet: Cold-rolled steel sheet, commercial quality, Class 1, matte finish.
  3. Finish: Factory-applied baked enamel for structural parts, powder coat for architectural parts. Color selection must be based on elevator manufacture's standard selections.
- D. Plastic laminate: Decorative high-pressure type, complying with NEMA LD3, Type GP-50 General Purpose Grade, nominal 0.050" thickness. Laminate selection must be based on elevator manufacture's standard selections.
- E. Flooring by others.

### **2.03 HOISTWAY EQUIPMENT**

- A. Platform: Fabricated frame of formed or structural steel shapes, gusseted and rigidly welded with a wood sub-floor. Underside of the platform shall be fireproofed. The car platform shall be designed and fabricated to support one-piece loads weighing up to 25% of the rated capacity.
- B. Sling: Steel stiles bolted or welded to a steel crosshead and bolstered with bracing members to remove strain from the car enclosure.
- C. Guide Rails: Steel, omega shaped, fastened to the building structure with steel brackets.

- D. Guides: Slide guides shall be mounted on top and bottom of the car.
- E. Buffers: Provide substantial buffers in the elevator pit. Mount buffers on continuous channels fastened to the elevator guide rail or securely anchored to the pit floor. Provide extensions if required by project conditions.
- F. Jack: A jack unit shall be of sufficient size to lift the gross load the height specified. Factory test jack to ensure adequate strength and freedom from leakage. Brittle material, such as gray cast iron, is prohibited in the jack construction. Provide the following jack type: Twin post holeless. Two jacks piped together, mounted one on each side of the car with a polished steel hydraulic plunger housed in a sealed steel casing having sufficient clearance space to allow for alignment during installation. Each plunger shall have a high pressure sealing system which will not allow for seal movement or displacement during the course of operation. Each Jack Assembly shall have a check valve built into the assembly to allow for automatically re-syncing the two plunger sections by moving the jack to its fully contracted position. The jack shall be designed to be mounted on the pit floor or in a recess in the pit floor. Each jack section shall have a bleeder valve to discharge any air trapped in the section..
- G. Automatic Self-Leveling: Provide each elevator car with a self-leveling feature to automatically bring the car to the floor landings and correct for over travel or under travel. Self-leveling shall, within its zone, be automatic and independent of the operating device. The car shall be maintained approximately level with the landing irrespective of its load.
- H. Wiring, Piping, and Oil: Provide all necessary hoistway wiring in accordance with the National Electrical Code. All necessary code compliant pipe and fittings shall be provided to connect the power unit to the jack unit. Provide proper grade inherently biodegradable oil as specified by the manufacturer of the power unit (see Power Unit section 2.04.G for further details)
- I. Pit moisture/water sensor located approximately 1 foot above the pit floor to be provided. Once activated, elevator will perform "flooded pit operation", which will run the car up to the designated floor, cycle the doors and shut down and trip the circuit breaker shunt to remove 3 phase power from all equipment, including pit equipment.
- J. Motorized oil line shut-off valve shall be provided that can be remotely operated from the controller landing service panel. Also a means for manual operation at the valve in the pit is required.

#### 2.04 POWER UNIT

- A. Power Unit (Oil Pumping and Control Mechanism): A self-contained unit located in the elevator pit consisting of the following items:
  1. NEMA 4/Sealed Oil reservoir with tank cover including vapor removing tank breather
  2. An oil hydraulic pump.

3. An electric motor.
  4. Electronic oil control valve with the following components built into single housing; high pressure relief valve, check valve, automatic unloading up start valve, lowering and leveling valve, and electro-magnetic controlling solenoids.
- B. Pump: Positive displacement type pump specifically manufactured for oil-hydraulic elevator service. Pump shall be designed for steady discharge with minimum pulsation to give smooth and quiet operation. Output of pump shall not vary more than 10 percent between no load and full load on the elevator car.
- C. Motor: Standard manufacture motor specifically designed for oil-hydraulic elevator service. Duty rating – motors shall be capable of 80 starts per hour with a 30% motor run time during each start.
- D. Oil Control Unit: The following components shall be built into a single housing. Welded manifolds with separate valves to accomplish each function are not acceptable. Adjustments shall be accessible and be made without removing the assembly from the oil line.
1. Relief valve shall be adjustable and be capable of bypassing the total oil flow without increasing back pressure more than 10 percent above that required to barely open the valve.
  2. Up start and stop valve shall be adjustable and designed to bypass oil flow during start and stop of motor pump assembly. Valve shall close slowly, gradually diverting oil to or from the jack unit, ensuring smooth up starts and up stops.
  3. Check valve shall be designed to close quietly without permitting any perceptible reverse flow.
  4. Lowering valve and leveling valve shall be adjustable for down start speed, lowering speed, leveling speed and stopping speed to ensure smooth "down" starts and stops. The leveling valve shall be designed to level the car to the floor in the direction the car is traveling after slowdown is initiated.
  5. Provided with constant speed regulation in both up and down direction. Feature to compensate for load changes, oil temperature, and viscosity changes.
  6. Solid State Starting: Provide an electronic starter featuring adjustable starting currents.
  7. A secondary hydraulic power source (powered by 110VAC single phase) must be provided. This is required to be able to raise (reposition) the elevator in the event of a system component failure (i.e. pump motor, starter, etc.)
  8. Oil Type: Provide a zinc free, inherently biodegradable lubricant formulated with premium base stocks to provide outstanding protection for demanding hydraulic systems, especially those operating in environmentally sensitive areas.

## 2.05 HOISTWAY ENTRANCES



- A. Doors and Frames: Provide complete hollow metal type hoistway entrances at each hoistway opening bolted\knock down construction.
  - 1. Manufacturer's standard entrance design consisting of hangers, doors, hanger supports, hanger covers, fascia plates (where required), sight guards, and necessary hardware.
  - 2. Main landing door & frame finish: Stainless steel panels, no. 4 brushed finish with no. 4 brushed finish entrance frame.
  - 3. Typical door & frame finish: Stainless steel panels, no. 4 brushed finish with no. 4 brushed finish entrance frame.
  
- B. Integrated Control System: the elevator controller to be mounted to hoistway entrance above 1st landing. The entrance at this level, shall be designed to accommodate the control system and provide a means of access to critical electrical components and troubleshooting features. See section 2.09 Control System for additional requirements.
  
- C. At the controller landing, the hoistway entrance frame shall have space to accommodate and provide a lockable means of access (group 2 security) to a 3 phase circuit breaker. See section 2.11 Miscellaneous Elevator Components for further details
  
- D. Interlocks: Equip each hoistway entrance with an approved type interlock tested as required by code. Provide door restriction devices as required by code.
  
- E. Door Hanger and Tracks: Provide sheave type two point suspension hangers and tracks for each hoistway horizontal sliding door.
  - 1. Sheaves: Polyurethane tires with ball bearings properly sealed to retain grease.
  - 2. Hangers: Provide an adjustable device beneath the track to limit the up-thrust of the doors during operation.
  - 3. Tracks: Drawn steel shapes, smooth surface and shaped to conform to the hanger sheaves.
  
- F. Hoistway Sills: Extruded metal, with groove(s) in top surface. Provide mill finish on aluminum.

## 2.06 PASSENGER ELEVATOR CAR ENCLOSURE

- A. Car Enclosure:
  - 1. Walls: Cab type TKS, reinforced cold-rolled steel. Walls shall be finished with factory applied powder coat.
  - 2. Reveals and frieze: Not Applicable
  - 3. Canopy: Cold-rolled steel with hinged exit.
  - 4. Ceiling: Suspended type, LED lighting with translucent diffuser mounted in a metal frame. Framework shall be finished with a factory applied powder coat finish.
  - 5. Cab Fronts, Return, Transom, Soffit and Strike: Provide panels faced with brushed stainless steel

6. Doors: Horizontal sliding car doors reinforced with steel for panel rigidity. Hang doors on sheave type hangers with polyurethane tires that roll on a polished steel track and are guided at the bottom by non-metallic sliding guides.
    - a. Door Finish: ASTM A1008 steel panels, factory applied powder coat enamel finish.
    - b. Cab Sills: Extruded aluminum, mill finish.
  7. Handrail: Provide 2" flat metal bar on rear wall on front opening cars and side walls only on front and rear opening cars. Handrails shall have a stainless steel, no. 4 brushed finish.
  8. Ventilation: Manufacturer's standard exhaust fan, mounted on the car top.
  9. Protection pads and buttons: Not required
- B. Car Top Inspection: Provide a car top inspection station with an "Auto-Inspection" switch, an "emergency stop" switch, and constant pressure "up and down" direction and safety buttons to make the normal operating devices inoperative. The station shall give the inspector complete control of the elevator. The car top inspection station shall be mounted in the door operator assembly.

## 2.07 DOOR OPERATION

- A. Door Operation: Provide a direct or alternating current motor driven heavy duty operator designed to operate the car and hoistway doors simultaneously. The door control system shall be digital closed loop and the closed loop circuit shall give constant feedback on the position and velocity of the elevator door. The motor torque shall be constantly adjusted to maintain the correct door speed based on its position and load. All adjustments and setup shall be through the computer based service tool. Door movements shall follow a field programmable speed pattern with smooth acceleration and deceleration at the ends of travel. The mechanical door operating mechanism shall be arranged for manual operation in event of power failure. Doors shall automatically open when the car arrives at the landing and automatically close after an adjustable time interval or when the car is dispatched to another landing. AC controlled units with oil checks, or other deviations are not acceptable.
1. No Un-Necessary Door Operation: The car door shall open only if the car is stopping for a car or hall call, answering a car or hall call at the present position or selected as a dispatch car.
  2. Door Open Time Saver: If a car is stopping in response to a car call assignment only (no coincident hall call), the current door hold open time is changed to a shorter field programmable time when the electronic door protection device is activated.
  3. Double Door Operation: When a car stops at a landing with concurrent up and down hall calls, no car calls, and no other hall call assignments, the car door opens to answer the hall call in the direction of the car's current travel. If an onward car call is not registered before the door closes to within 6 inches of fully closed, the travel shall reverse and the door shall reopen to answer the other call.

4. Nudging Operation: The doors shall remain open as long as the electronic detector senses the presence of a passenger or object in the door opening. If door closing is prevented for a field programmable time, a buzzer shall sound. When the obstruction is removed, the door shall begin to close at reduced speed. If the infra-red door protection system detects a person or object while closing on nudging, the doors shall stop and resume closing only after the obstruction has been removed.
5. Door Reversal: If the doors are closing and the infra-red beam(s) is interrupted, the doors shall reverse and reopen. After the obstruction is cleared, the doors shall begin to close.
6. Door Open Watchdog: If the doors are opening, but do not fully open after a field adjustable time, the doors shall recycle closed then attempt to open six times to try and correct the fault.
7. Door Close Watchdog: If the doors are closing, but do not fully close after a field adjustable time, the doors shall recycle open then attempt to close six times to try and correct the fault.
8. Door Close Assist: When the doors have failed to fully close and are in the recycle mode, the door drive motor shall have increased torque applied to possibly overcome mechanical resistance or differential air pressure and allow the door to close.

- B. Door Protection Device: Provide a door protection system using microprocessor controlled infra-red light beams. The beams shall project across the car opening detecting the presence of a passenger or object. If door movement is obstructed, the doors shall immediately reopen.

## 2.08 CAR OPERATING STATION

- A. Car Operating Station, General: The main car control in each car shall contain the devices required for specific operation mounted in an integral swing return panel requiring no applied faceplate. Wrap return shall have a brushed stainless steel finish. The main car operating panel shall be mounted in the return and comply with handicap requirements. Pushbuttons that illuminate using long lasting LED's shall be included for each floor served, and emergency buttons and switches shall be provided per code. Switches for car light and accessories shall be provided.
- B. Emergency Communications System: Integral phone system provided.
- C. Auxiliary Operating Panel:
- D. Column Mounted Car Riding Lantern: A car riding lantern shall be installed in the elevator cab and located in the entrance. The lantern, when illuminated, will indicate the intended direction of travel. The lantern will illuminate and a signal will sound when the car arrives at a floor where it will stop. The lantern shall remain illuminated until the door(s) begin to close.

- E. Special Equipment:  
Limited Access Operation: Keyswitch in car only.
  
- F. Digital Services: Cloud-based IoT monitoring system comes standard with these options:

Remote Monitoring with Application Programming Interface (API) Integration

ADA Phone - Code Compliant Cellular Connectivity

## 2.09 CONTROL SYSTEMS

- A. Controller: Shall be integrated in a hoistway entrance jamb. Should be microprocessor based, software oriented and protected from environmental extremes and excessive vibrations in a NEMA 1 enclosure. Control of the elevator shall be automatic in operation by means of push buttons in the car numbered to correspond to floors served, for registering car stops, and by "up-down" push buttons at each intermediate landing and "call" push buttons at terminal landings.
  
- B. Service Panel – to be located outside the hoistway in the controller entrance jamb and shall provide the following functionality/features:
  - 1. Access to main control board and CPU
  - 2. Main controller diagnostics
  - 3. Main controller fuses
  - 4. Universal Interface Tool (UIT)
  - 5. Remote valve adjustment
  - 6. Electronic motor starter adjustment and diagnostics
  - 7. Operation of pit motorized shut-off valve with LED feedback to the state of the valve in the pit
  - 8. Operation of auxiliary pump/motor (secondary hydraulic power source)
  - 9. Operation of electrical assisted manual lowering
  - 10. Provide male plug to supply 110VAC into the controller
  - 11. Run/Stop button
  
- C. Automatic Light and Fan shut down: The control system shall evaluate the system activity and automatically turn off the cab lighting and ventilation fan during periods of inactivity. The settings shall be field programmable.
  
- D. Emergency Power Operation: (Battery Lowering 10-DOC) When the loss of normal power is detected, a battery lowering feature is to be activated. The elevator will lower to a predetermined level and open the doors. After passengers have exited the car, the doors will close and the car will shutdown. When normal power becomes available, the elevator will automatically resume operation. The battery lowering feature is included in the elevator contract and does not utilize a building-supplied standby power source.

E. Special Operation:  
Limited Access Operation: A key switch shall be provided to initiate the Limited Access Operation. The activation of this operation shall restrict the operation of the elevator car calls to selected floors on a per-floor, per elevator basis.

F. Digital Services:

Cloud-based IoT Monitoring System (standard): Contractor shall provide a cloud-based IoT (internet of things) monitoring system capable of tracking door movements and timing, trips, power cycles, car calls, out-of-service events and modes. This observation will continue 24/7 and it shall be capable of providing service technicians a minimum of three recommended solutions for defined failure events and automatically dispatch service technicians in the event of failure(s) while sending notifications to end users of changes in their equipment's state via both email and mobile device. Access to IoT and related equipment data and status will be made available in both a web portal and mobile application secured by password and username with at least two-factor authentication. Finally, this system must be self-contained and not require internet provision by others.

Along with the monitoring system, options are available.

Remote Monitoring with Application Programming Interface (API) Integration: Contractor shall provide a portal and mobile device application (app) that communicates relevant service and operational information such as elevator operational status, open service call tickets, call ticket history and performance and service history. This system shall provide a REST application programming interface (API) capable of transmitting relevant information from the cloud-based IoT monitoring system. This data includes equipment operational status, door movements, service and maintenance history, traffic statistics and failure alerts.

ADA Phone – Code Compliant Cellular Connectivity: Contractor shall provide a phone service through a self-contained cellular based VoIP system. This system shall meet code, include a backup battery capable of powering the emergency communication equipment for 4+ hours in the event of a power outage. The solution shall have remote monitoring capability to ensure continuous connectivity with a means of remote troubleshooting. Remote monitoring capability shall include, at a minimum, the ability to monitor connectivity and power supply. Remote monitoring shall be capable of providing local alerts to response personnel when on-site intervention is required.

## 2.10 HALL STATIONS

- A. Hall Stations, General: Buttons shall illuminate to indicate call has been registered at that floor for the indicated direction.
1. Provide one pushbutton riser with faceplates having a brushed stainless steel finish.

- a. Phase 1 firefighter's service key switch, with instructions, shall be incorporated into the hall station at the designated level.
- B. Floor Identification Pads: Provide door jamb pads at each floor. Jamb pads shall comply with Americans with Disabilities Act (ADA) requirements.
- C. Hall Position Indicator: Not Applicable
- D. Hall lanterns: Not Applicable
- E. Special Equipment: Not Applicable

#### 2.11 MISCELLANEOUS ELEVATOR COMPONENTS

- A. Oil Hydraulic Silencer: Install multiple oil hydraulic silencers (muffler device) at the power unit location. The silencers shall contain pulsation absorbing material inserted in a blowout proof housing.
- B. Lockable three phase circuit breaker with auxiliary contact with shunt trip capability to be provided. Circuit breaker to be located behind locked panel (Group 2 security access) at controller landing entrance jamb and should be sized according to the National Electrical Code.
- C. Lockable single phase 110V circuit breaker for cab light and fan to be provided. Circuit breaker to be located behind locked panel (Group 2 security access) at controller landing entrance jamb should be sized according to the National Electrical Code

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Before starting elevator installation, inspect hoistway, hoistway openings, pits and/or control room, as constructed, verify all critical dimensions, and examine supporting structures and all other conditions under which elevator work is to be installed. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.
- B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

#### 3.02 INSTALLATION

- A. Install elevator systems components and coordinate installation of hoistway wall construction.
  - 1. Work shall be performed by competent elevator installation personnel in accordance with ASME A17.1, manufacturer's installation instructions and approved shop drawings.

2. Comply with the National Electrical Code for electrical work required during installation.
- B. Perform work with competent, skilled workmen under the direct control and supervision of the elevator manufacturer's experienced foreman.
  - C. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports, and bracing including all setting templates and diagrams for placement.
  - D. Welded construction: Provide welded connections for installation of 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 qualification of welding operators.
  - E. Coordination: Coordinate elevator work with the work of other trades, for proper time and sequence to avoid construction delays. Use benchmarks, lines, and levels designated by the Contractor, to ensure dimensional coordination of the work.
  - F. Install machinery, guides, controls, car and all equipment and accessories to provide a quiet, smoothly operating installation, free from side sway, oscillation or vibration.
  - G. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum safe, workable dimensions at each landing.
  - H. Erect hoistway sills, headers, and frames before erection of rough walls and doors; erect fascia and toe guards after rough walls finished. Set sill units accurately aligned and slightly above finish floor at landings.
  - I. Lubricate operating parts of system, where recommended by manufacturer.

### 3.03 FIELD QUALITY CONTROL

- A. Acceptance testing: Upon completion of the elevator installation and before permitting use of elevator, perform acceptance tests as required and recommended by Code and governing regulations or agencies. Perform other tests, if any, as required by governing regulations or agencies.
- B. Advise Owner, Contractor, Architect, and governing authorities in advance of dates and times tests are to be performed on the elevator.

### 3.04 ADJUSTING

- A. Make necessary adjustments of operating devices and equipment to ensure elevator operates smoothly and accurately.

### 3.05 CLEANING

- A. Before final acceptance, remove protection from finished surfaces and clean and polish surfaces in accordance with manufacturer's recommendations for type of material and finish provided. Stainless steel shall be cleaned with soap and water and dried with a non-abrasive surface; it shall not be cleaned with bleach-based cleansers.
- B. At completion of elevator work, remove tools, equipment, and surplus materials from site. Clean equipment rooms and hoistway. Remove trash and debris.
  - 1. Use environmentally preferable and low VOC emitting cleaners for each application type. Cleaners that contain solvents, pine and/or citrus oils are not permitted.

### 3.06 PROTECTION

- A. At time of Substantial Completion of elevator work, or portion thereof, provide suitable protective coverings, barriers, devices, signs, or other such methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

### 3.07 DEMONSTRATION

- A. Instruct Owner's personnel in proper use, operations, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train Owner's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions.
- B. Make a final check of each elevator operation, with Owner's personnel present, immediately before date of substantial completion. Determine that control systems and operating devices are functioning properly.

### 3.08 ELEVATOR SCHEDULE

- A. Elevator Qty. 1
  - 1. Elevator Model: endura MRL Twinpost above-ground 1-stage
  - 2. Elevator Type: Hydraulic Machine Room-Less, Passenger
  - 3. Rated Capacity: 2100 lbs.
  - 4. Rated Speed: 75 ft./min.
  - 5. Operation System: TAC32H
  - 6. Travel: 11'-4"
  - 7. Landings: 2 total



8. Openings:
  - a. Front: 2
  - b. Rear: 0
9. Clear Car Inside: 5'-8" wide x 4'-3" deep
10. Inside clear height: 7'-4" standard
11. Door clear height: 7'-0" standard
12. Hoistway Entrance Size: 3'-0" wide x 7'-0" high
13. Door Type: One-speed | RH Side opening
14. Power Characteristics: 208 volts, 3 Phase, 60 Hz.
15. Seismic Requirements: Zone
16. Hoistway Dimensions: 7'-4" wide x 5'-9" deep
17. Pit Depth: 4'-0"
18. Button & Fixture Style: Traditional Signal Fixtures
19. Special Operations:  
Limited Access with Keyswitches in Car
  
20. Digital Services:  
Remote Monitoring with Application Programming Interface (API)  
Integration  
  
ADA Phone - Code Compliant Cellular Connectivity

3.09 SPECIAL CONDITIONS (Note: Add Special Conditions as Needed)

**END OF SECTION**

**NEW ELEVATOR FOR  
LOCUST FORK ELEMENTARY SCHOOL  
155 SCHOOL ROAD  
LOCUST FORK, AL 35097  
BLOUNT COUNTY BOARD OF EDUCATION**

**Plumbing**

Section 15050 - Basic Mechanical Materials and Methods

Section 15145 - Hangers and Supports

Section 15410 - Plumbing Piping

**WHORTON ENGINEERING, INC.**

HVAC - PLUMBING - PROCESS CONTROL

*Heather Page*

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DATE 08-28-2024

25 SUMMERALL GATE ROAD  
ANNISTON, ALABAMA 36205



## BASIC MECHANICAL MATERIALS AND METHODS - SECTION 15050

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes the following basic mechanical materials and methods to complement other Division 15 Sections.
  - 1. Piping materials and installation instructions common to most piping systems.
  - 2. Concrete base construction requirements.
  - 3. Escutcheons.
  - 4. Dielectric fittings.
  - 5. Flexible connectors.
  - 6. Mechanical sleeve seals.
  - 7. Equipment nameplate data requirements.
  - 8. Nonshrink grout for equipment installations.
  - 9. Field-fabricated metal and wood equipment supports.
  - 10. Installation requirements common to equipment specification sections.
  - 11. Mechanical demolition.
  - 12. Cutting and patching.
  - 13. Touchup painting and finishing.
- B. Pipe and pipe fitting materials are specified in Division 15 piping system Sections.

#### 1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
  - 1. ABS: Acrylonitrile-butadiene-styrene plastic.

2. CPVC: Chlorinated polyvinyl chloride plastic.
3. NP: Nylon plastic.
4. PE: Polyethylene plastic.
5. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. CR: Chlorosulfonated polyethylene synthetic rubber.
2. EPDM: Ethylene propylene diene terpolymer rubber.

#### 1.4 SUBMITTALS

- A. Product Data: For dielectric fittings, flexible connectors, mechanical sleeve seals, and identification materials and devices.
- B. Shop Drawings: Detail fabrication and installation for metal and wood supports and anchorage for mechanical materials and equipment.
- C. Coordination Drawings: For access panel and door locations.
- D. Coordination Drawings: Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:
  1. Planned piping layout, including valve and specialty locations and valve-stem movement.
  2. Clearances for installing and maintaining insulation.
  3. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
  4. Equipment and accessory service connections and support details.
  5. Exterior wall and foundation penetrations.
  6. Fire-rated wall and floor penetrations.
  7. Sizes and location of required concrete pads and bases.
  8. Scheduling, sequencing, movement, and positioning of large equipment into building during construction.
  9. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
  10. Reflected ceiling plans to coordinate and integrate installation of air outlets and inlets, light fixtures, communication system components, sprinklers, and other ceiling-mounted items.
- E. Samples: Of color, lettering style, and other graphic representation required for each identification material and device.

#### 1.5 QUALITY ASSURANCE

- A. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.
- B. Equipment Selection: Equipment of higher electrical characteristics, physical dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. Additional costs shall be approved in advance by appropriate Contract Modification for these increases. If minimum energy ratings or efficiencies of equipment are specified, equipment must meet design and commissioning requirements.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and prevent entrance of dirt, debris, and moisture.
- B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.
- C. Protect flanges, fittings, and piping specialties from moisture and dirt.
- D. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

## 1.7 SEQUENCING AND SCHEDULING

- A. Coordinate mechanical equipment installation with other building components.
- B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.
- C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.
- D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.
- E. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- F. Coordinate requirements for access panels and doors if mechanical items requiring access are concealed behind finished surfaces. Access panels and doors are specified in Division 8 Section "Access Doors."
- G. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and similar concealment.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Dielectric Unions:
    - a. Capitol Manufacturing Co.
    - b. Central Plastics Co.
    - c. Eclipse, Inc.; Rockford-Eclipse Div.
    - d. Epco Sales Inc.
    - e. Hart Industries International, Inc.

- f. Watts Industries, Inc.; Water Products Div.
  - g. Zurn Industries, Inc.; Wilkins Div.
2. Dielectric Flanges:
- a. Capitol Manufacturing Co.
  - b. Central Plastics Co.
  - c. Epco Sales Inc.
  - d. Watts Industries, Inc.; Water Products Div.
3. Dielectric-Flange Insulating Kits:
- a. Calpico, Inc.
  - b. Central Plastics Co.
4. Dielectric Couplings:
- a. Calpico, Inc.
  - b. Lochinvar Corp.
5. Dielectric Nipples:
- a. Grinnell Corp.; Grinnell Supply Sales Co.
  - b. Perfection Corp.
  - c. Victaulic Co. of America.
6. Metal, Flexible Connectors:
- a. ANAMET Industrial, Inc.
  - b. Central Sprink, Inc.
  - c. Flexicraft Industries.
  - d. Flex-Weld, Inc.
  - e. Grinnell Corp.; Grinnell Supply Sales Co.
  - f. Hyspan Precision Products, Inc.
  - g. McWane, Inc.; Tyler Pipe; Gustin-Bacon Div.
  - h. Mercer Rubber Co.
  - i. Metraflex Co.
  - j. Proco Products, Inc.
  - k. Uniflex, Inc.
7. Rubber, Flexible Connectors:
- a. General Rubber Corp.
  - b. Mercer Rubber Co.
  - c. Metraflex Co.
  - d. Proco Products, Inc.
  - e. Red Valve Co., Inc.
  - f. Uniflex, Inc.
8. Mechanical Sleeve Seals:
- a. Calpico, Inc.
  - b. Metraflex Co.
  - c. Thunderline/Link-Seal.

## 2.2 PIPE AND PIPE FITTINGS

- A. Refer to individual Division 15 piping Sections for pipe and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

## 2.3 JOINING MATERIALS

- A. Refer to individual Division 15 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
  - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness, unless thickness or specific material is indicated.
    - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
  - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- E. Solder Filler Metals: ASTM B 32.
  - 1. Alloy Sn95 or Alloy Sn94: Approximately 95 percent tin and 5 percent silver, with 0.10 percent lead content.
- F. Brazing Filler Metals: AWS A5.8.
  - 1. BCuP Series: Copper-phosphorus alloys.
  - 2. BAg1: Silver alloy.
- G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- H. Solvent Cements: Manufacturer's standard solvent cements for the following:
  - 1. ABS Piping: ASTM D 2235.
  - 2. CPVC Piping: ASTM F 493.
  - 3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
  - 4. PVC to ABS Piping Transition: ASTM D 3138.
- I. Plastic Pipe Seals: ASTM F 477, elastomeric gasket.
- J. Flanged, Ductile-Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon-steel bolts and nuts.
- K. Couplings: Iron-body sleeve assembly, fabricated to match OD of plain-end, pressure pipes.
  - 1. Sleeve: ASTM A 126, Class B, gray iron.

2. Followers: ASTM A 47 malleable iron or ASTM A 536 ductile iron.
3. Gaskets: Rubber.
4. Bolts and Nuts: AWWA C111.
5. Finish: Enamel paint.

## 2.4 DIELECTRIC FITTINGS

- A. General: Assembly or fitting with insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.
- B. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types and matching piping system materials.
- C. Insulating Material: Suitable for system fluid, pressure, and temperature.
- D. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
- E. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
- F. Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
  1. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig minimum working pressure as required to suit system pressures.
- G. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
- H. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

## 2.5 FLEXIBLE CONNECTORS

- A. General: Fabricated from materials suitable for system fluid and that will provide flexible pipe connections. Include 125-psig minimum working-pressure rating, unless higher working pressure is indicated, and ends according to the following:
  1. 2-Inch NPS and Smaller: Threaded.
  2. 2-1/2-Inch NPS and Larger: Flanged.
  3. Option for 2-1/2-Inch NPS and Larger: Grooved for use with keyed couplings.
- B. Bronze-Hose, Flexible Connectors: Corrugated, bronze, inner tubing covered with bronze wire braid. Include copper-tube ends or bronze flanged ends, braze welded to hose.
- C. Stainless-Steel-Hose/Steel Pipe, Flexible Connectors: Corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Include steel nipples or flanges, welded to hose. Do not use for potable water.
- D. Stainless-Steel-Hose/Stainless-Steel Pipe, Flexible Connectors: Corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Include stainless-steel nipples or flanges, welded to hose. Do not use for potable water.



- E. Rubber, Flexible Connectors: CR or EPDM elastomer rubber construction, with multiple plies of NP fabric, molded and cured in hydraulic presses. Include 125-psig minimum working-pressure rating at 220 deg F. Units may be straight or elbow type, unless otherwise indicated. Do not use for potable water unless units comply with NSF61.
- 2.6 MECHANICAL SLEEVE SEALS
- A. Description: Modular design, with interlocking rubber links shaped to continuously fill annular space between pipe and sleeve. Include connecting bolts and pressure plates.
- 2.7 PIPING SPECIALTIES
- A. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:
    - 1. Steel Sheet Metal: 0.0239-inch minimum thickness, galvanized, round tube closed with welded longitudinal joint.
    - 2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.
    - 3. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
    - 4. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
      - a. Underdeck Clamp: Clamping ring with set screws.
  - B. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type if required to conceal protruding fittings and sleeves.
    - 1. ID: Closely fit around pipe, tube, and insulation of insulated piping.
    - 2. OD: Completely cover opening.
    - 3. Cast Brass: One piece, with set screw.
      - a. Finish: Polished chrome-plate.
    - 4. Cast Brass: Split casting, with concealed hinge and set screw.
      - a. Finish: Polished chrome-plate.
    - 5. Stamped Steel: One piece, with set screw and chrome-plated finish.
    - 6. Stamped Steel: One piece, with spring clips and chrome-plated finish.
    - 7. Stamped Steel: Split plate, with concealed hinge, set screw, and chrome-plated finish.
    - 8. Stamped Steel: Split plate, with concealed hinge, spring clips, and chrome-plated finish.
    - 9. Stamped Steel: Split plate, with exposed-rivet hinge, set screw, and chrome-plated finish.
    - 10. Stamped Steel: Split plate, with exposed-rivet hinge, spring clips, and chrome-plated finish.
    - 11. Cast-Iron Floor Plate: One-piece casting.
- 2.8 IDENTIFYING DEVICES AND LABELS
- A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 15 Sections. If more than one type is specified for application, selection is Installer's option, but provide one selection for each product category.
  - B. Equipment Nameplates: Metal nameplate with operational data engraved or stamped; permanently fastened to equipment.

1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data.
  2. Location: Accessible and visible location.
- C. Snap-on Plastic Pipe Markers: Manufacturer's standard preprinted, semirigid, snap on, color-coded, complying with ASME A13.1.
- D. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, permanent adhesive, color-coded, pressure-sensitive vinyl, complying with ASME A13.1.
- E. Plastic Duct Markers: Manufacturer's standard color-coded, laminated plastic. Comply with the following color code:
1. Green: Cold air.
  2. Yellow: Hot air.
  3. Yellow/Green or Green: Supply air.
  4. Blue: Exhaust, outside, return, and mixed air.
  5. For hazardous exhausts, use colors and designs recommended by ASME A13.1.
  6. Nomenclature: Include the following:
    - a. Direction of airflow.
    - b. Duct service.
    - c. Duct origin.
    - d. Duct destination.
    - e. Design cubic feet per meter.
- F. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated.
1. Fabricate in sizes required for message.
  2. Engraved with engraver's standard letter style, of sizes and with wording to match equipment identification.
  3. Punch for mechanical fastening.
  4. Thickness: 1/16 inch, for units up to 20 sq. in. or 8 inches long; 1/8 inch for larger units.
  5. Fasteners: Self-tapping stainless-steel screws or contact-type permanent adhesive.
- G. Plastic Equipment Markers: Color-coded, laminated plastic. Comply with the following color code:
1. Green: Cooling equipment and components.
  2. Yellow: Heating equipment and components.
  3. Yellow/Green: Combination cooling and heating equipment and components.
  4. Brown: Energy reclamation equipment and components.
  5. Blue: Equipment and components that do not meet any criteria above.
  6. For hazardous equipment, use colors and designs recommended by ASME A13.1.
  7. Nomenclature: Include the following, matching terminology on schedules as closely as possible:
    - a. Name and plan number.
    - b. Equipment service.
    - c. Design capacity.
    - d. Other design parameters such as pressure drop, entering and leaving conditions, and rpm.

8. Size: Approximate 2-1/2 by 4 inches for control devices, dampers, and valves; and 4-1/2 by 6 inches for equipment.
- H. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in mechanical identification, with corresponding designations indicated. Use numbers, lettering, and wording indicated for proper identification and operation/maintenance of mechanical systems and equipment.
  1. Multiple Systems: If multiple systems of same generic name are indicated, provide identification that indicates individual system number and service such as "Boiler No. 3," "Air Supply No. 1H," or "Standpipe F12."

## 2.9 GROUT

- A. Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.
  1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
  2. Design Mix: 5000-psi, 28-day compressive strength.
  3. Packaging: Premixed and factory packaged.

## PART 3 - EXECUTION

### 3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. General: Install piping as described below, unless piping Sections specify otherwise. Individual Division 15 piping Sections specify unique piping installation requirements.
- B. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings.
- C. Install piping at slope in accordance with related codes.
- D. Install components with pressure rating equal to or greater than system operating pressure.
- E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.
- F. Install piping free of sags and bends.
- G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.
- H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.
- I. Install piping to allow application of insulation plus 1-inch clearance around insulation.
- J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- K. Install fittings for changes in direction and branch connections.

- L. Install couplings according to manufacturer's written instructions.
- M. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:
  - 1. Chrome-Plated Piping: Cast brass, one piece, with set screw, and polished chrome-plated finish. Use split-casting escutcheons if required, for existing piping.
  - 2. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw.
  - 3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
  - 4. Insulated Piping: Cast brass or stamped steel; with concealed hinge, spring clips, and chrome-plated finish.
  - 5. Piping in Utility Areas: Cast brass or stamped steel, with set-screw or spring clips.
- N. Sleeves are not required for core drilled holes.
- O. Permanent sleeves are not required for holes formed by PE removable sleeves.
- P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
  - 2. Build sleeves into new walls and slabs as work progresses.
  - 3. Install sleeves large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
    - a. Steel Pipe Sleeves: For pipes smaller than 6-inch NPS.
    - b. Steel, Sheet-Metal Sleeves: For pipes 6-inch NPS and larger, penetrating gypsum-board partitions.
    - c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
      - 1. Seal space outside of sleeve fittings with nonshrink, nonmetallic grout.
  - 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants.
  - 5. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated.
- Q. Aboveground, Exterior-Wall, Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
  - 1. Install steel pipe for sleeves smaller than 6 inches in diameter.
  - 2. Install cast-iron "wall pipes" for sleeves 6 inches in diameter and larger.
  - 3. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.

- R. Underground, Exterior-Wall, Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.
- S. Fire-Barrier Penetrations: Maintain fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping materials.
- T. Verify final equipment locations for roughing-in.
- U. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.
- V. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:
1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
  2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
  3. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube."
  4. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
  5. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
    - a. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
    - b. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
    - c. Align threads at point of assembly.
    - d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
    - e. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
  6. Welded Joints: Construct joints according to AWS D10.12, "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe," using qualified processes and welding operators according to "Quality Assurance" Article.
  7. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.
  8. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following:
    - a. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
    - b. PVC Pressure Piping: ASTM D 2672.
    - c. PVC Nonpressure Piping: ASTM D 2855.

- W. Piping Connections: Make connections according to the following, unless otherwise indicated:
1. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.
  2. Install flanges, in piping 2-1/2-inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
  3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
  4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

### 3.2 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to provide maximum possible headroom, if mounting heights are not indicated.
- B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to Architect.
- C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- D. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- E. Install equipment giving right of way to piping installed at required slope.
- F. Install flexible connectors on equipment side of shutoff valves, horizontally and parallel to equipment shafts if possible.

### 3.3 LABELING AND IDENTIFYING

- A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.
  1. Plastic markers, with application systems. Install on insulation segment if required for hot, uninsulated piping.
  2. Locate pipe markers as follows if piping is exposed in finished spaces, machine rooms, and accessible maintenance spaces, such as shafts, tunnels, plenums, and exterior nonconcealed locations:
    - a. Near each valve and control device.
    - b. Near each branch, excluding short takeoffs for fixtures and terminal units. Mark each pipe at branch, if flow pattern is not obvious.
    - c. Near locations if pipes pass through walls, floors, ceilings, or enter nonaccessible enclosures.
    - d. At access doors, manholes, and similar access points that permit view of concealed piping.
    - e. Near major equipment items and other points of origination and termination.
    - f. Spaced at maximum of 50-foot intervals along each run. Reduce intervals to 25 feet in congested areas of piping and equipment.
    - g. On piping above removable acoustical ceilings, except omit intermediately spaced markers.

- B. Equipment: Install engraved plastic-laminate sign or equipment marker on or near each major item of mechanical equipment.
  - 1. Lettering Size: Minimum 1/4-inch- high lettering for name of unit if viewing distance is less than 24 inches, 1/2-inch- high lettering for distances up to 72 inches, and proportionately larger lettering for greater distances. Provide secondary lettering two-thirds to three-fourths of size of principal lettering.
  - 2. Text of Signs: Provide name of identified unit. Include text to distinguish between multiple units, inform user of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
- C. Duct Systems: Identify air supply, return, exhaust, intake, and relief ducts with duct markers; or provide stenciled signs and arrows, showing duct system service and direction of flow.
  - 1. Location: In each space, if ducts are exposed or concealed by removable ceiling system, locate signs near points where ducts enter into space and at maximum intervals of 50 feet.
- D. Adjusting: Relocate identifying devices as necessary for unobstructed view in finished construction.

### 3.4 PAINTING AND FINISHING

- A. Apply paint to exposed piping according to the following, unless otherwise indicated:
  - 1. Interior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
  - 2. Interior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.
  - 3. Interior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
  - 4. Exterior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.
  - 5. Exterior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.
  - 6. Exterior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.
- B. Do not paint piping specialties with factory-applied finish.
- C. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

### 3.5 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated, but not less than 6 inches larger in both directions than supported unit. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psi, 28-day compressive-strength concrete and reinforcement.

### 3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

- B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

### 3.7 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage to support and anchor mechanical materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

### 3.8 DEMOLITION

- A. Disconnect, demolish, and remove Work specified in Division 15 Sections.
- B. If pipe, ductwork, insulation, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.
- C. Accessible Work: Remove indicated exposed pipe and ductwork in its entirety.
- D. Work Abandoned in Place: Cut and remove underground pipe a minimum of 2 inches (50 mm) beyond face of adjacent construction. Cap and patch surface to match existing finish.
- E. Removal: Remove indicated equipment from Project site.
- F. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

### 3.9 CUTTING AND PATCHING - ROOF/CURB PENETRATIONS

- A. The HVAC contractor shall not cut or penetrate the roof. Roofing contractor to make all roof penetrations and provide/install all curbs. Coordinate curb and roof penetrations needed with roofing contractor. Refer to roof curb specifications.

### 3.10 CUTTING AND PATCHING – GENERAL

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair cut surfaces to match adjacent surfaces.

### 3.11 GROUTING

- A. Install nonmetallic, nonshrink, grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's written instructions.
- B. Clean surfaces that will come into contact with grout.



- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placing of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases to provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout according to manufacturer's written instructions.

#### PART 4 - HVAC EQUIPMENT

##### 4.1 EXHAUST FANS

- A. Description: Fan shall be ceiling mounted, direct driven, centrifugal exhaust fan.
- B. Certifications: Fan shall be manufactured at an ISO 9001 certified facility. Fan shall be listed by Underwriters Laboratories (UL 705) and UL listed for Canada (cUL 705). Fan shall bear the AMCA certified ratings seal for sound and air performance.
- C. Construction: The fan wheel housing and integral outlet duct shall be injection molded from a specially engineered resin exceeding UL requirements for smoke and heat generation.
  - 1. The outlet duct shall have provision for an aluminum backdraft damper with continuous aluminum hinge rod.
  - 2. The inlet box shall be minimum 22 gauge galvanized steel.
  - 3. Motor shall be isolation mounted to a one piece galvanized stamped steel integral motor mount/inlet.
  - 4. A field wiring compartment with receptacle shall be standard.
  - 5. To accommodate different ceiling thickness, an adjustable prepunched mounting bracket shall be provided.
  - 6. A white, high impact styrene injection molded grill shall be provided as standard. Unit shall be designed with provision for field conversion from ceiling to in-line.
  - 7. Unit shall be shipped in ISTA certified transit tested packaging.
- D. Wheel: Wheel shall be centrifugal forward curved type, injection molded of polypropylene resin. Wheel shall be balanced in accordance with AMCA Standard 204-96, Balance Quality and Vibration Levels for Fans.
- E. Motor: Motor shall be open drip proof type with permanently lubricated sealed bearings and include impedance or thermal overload protection and disconnect plug. Motor shall be furnished at the specified voltage and phase.

##### 4.2 REFRIGERANT PIPING AND ACCESSORIES

- A. General: Sized and installed in accordance with compressor manufacturer's recommendations. Material shall be soft copper. Joints, fitting, etc. shall be in accordance with manufacturer's recommendations.

##### 4.3 HVAC EQUIPMENT

- A. HVAC equipment shall be in accordance with the manufacturer's standard equipment as listed and scheduled on the plans.

4.4 WARRANTIES

- A. Warranties shall begin at date of substantial completion. All compressors shall include minimum of five year warranty. One year warranty for labor, parts, units, etc. is required for all equipment.

END OF SECTION 15050

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes hangers and supports for mechanical systems piping and equipment.

1.3 DEFINITIONS

- A. Terminology used in this Section is defined in MSS SP-90.

1.4 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each type of hanger and support.
- C. Submit pipe hanger and support schedule showing manufacturer's Figure No., size, location, and features for each required pipe hanger and support.
- D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.
- E. Shop drawings for each type of hanger and support, indicating dimensions, weights, required clearances, and methods of component assembly.
- F. Licensed Engineer's hanger and support installation report specified in the "Field Quality Control" Article.

1.5 QUALITY ASSURANCE

- A. Qualify welding processes and welding operators according to AWS D1.1 "Structural Welding Code-Steel."
  - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- B. Qualify welding processes and welding operators according to ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications."
- C. NFPA Compliance: Comply with NFPA 13 for hangers and supports used as components of fire protection systems.

- D. Listing and Labeling: Provide hangers and supports that are listed and labeled as defined in NFPA 70, Article 100.
  - 1. UL and FM Compliance: Hangers, supports, and components include listing and labeling by UL and FM where used for fire protection piping systems.
  - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURED UNITS

- A. Hangers, Supports, and Components: Factory-fabricated according to MSS SP-58.
  - 1. Components include galvanized coatings where installed for piping and equipment that will not have a field-applied finish.
  - 2. Pipe attachments include nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing.
- B. Thermal-Hanger Shield Inserts: 100-psi (690-kPa) average compressive strength, waterproofed calcium silicate, encased with sheet metal shield. Insert and shield cover entire circumference of pipe and are of length indicated by manufacturer for pipe size and thickness of insulation.

### 2.2 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36 (ASTM A 36M), steel plates, shapes, and bars, black and galvanized.
- B. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel, hex-head, track bolts and nuts.
- C. Washers: ASTM F 844, steel, plain, flat washers.
- D. Grout: ASTM C 1107, Grade B, nonshrink, nonmetallic.
  - 1. Characteristics include post-hardening, volume-adjusting, dry, hydraulic-cement-type grout that is nonstaining, noncorrosive, nongaseous and is recommended for both interior and exterior applications.
  - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
  - 3. Water: Potable.
  - 4. Packaging: Premixed and factory-packaged.

## PART 3 - EXECUTION

### 3.1 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger requirements are specified in the Section specifying the equipment and systems.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping specification Sections.

### 3.2 HANGER AND SUPPORT INSTALLATION

- A. General: Comply with MSS SP-69 and SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Arrange for grouping of parallel runs of horizontal piping supported together on field-fabricated, heavy-duty trapeze hangers where possible.
- C. Install supports with maximum spacings complying with MSS SP-69.
- D. Where pipes of various sizes are supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
- E. Install building attachments within concrete or to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert to forms. Install reinforcing bars through openings at top of inserts.
- F. Install concrete inserts in new construction prior to placing concrete.
- G. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- H. Heavy-Duty Steel Trapezes: Field-fabricate from ASTM A 36 steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.
- I. Support fire protection systems piping independent of other piping.
- J. Install hangers and supports to allow controlled movement of piping systems, permit freedom of movement between pipe anchors, and facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- K. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
- L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so that maximum pipe deflections allowed by ASME B31.9 "Building Services Piping" is not exceeded.
- M. Insulated Piping: Comply with the following installation requirements.
  - 1. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ASME B31.9.
  - 2. Saddles: Install protection saddles MSS Type 39 where insulation without vapor barrier is indicated. Fill interior voids with segments of insulation that match adjoining pipe insulation.
  - 3. Shields: Install MSS Type 40, protective shields on cold piping with vapor barrier. Shields span an arc of 180 degrees (3.1 rad) and have dimensions in inches (mm) not less than the following:

<u>NPS (Inches)</u>	<u>LENGTH (Inches)</u>	<u>THICKNESS (Inches)</u>
1/4 to 3-1/2	12	0.048
4	12	0.060
5 and 6	18	0.060
8 to 14	24	0.075

16 to 24	24	0.105
<u>PIPE SIZE (DN)</u>	<u>LENGTH (mm)</u>	<u>THICKNESS (mm)</u>
8 to 90	300	1.22
100	300	1.52
125 and 150	450	1.52
200 to 350	600	1.91
400 to 600	600	2.67

- (1) Pipes 8 Inches (DN 200) and Larger: Include wood inserts.
- (2) Insert Material: Length at least as long as the protective shield.
- (3) Thermal-Hanger Shields: Install with insulation of same thickness as piping.

### 3.3 EQUIPMENT SUPPORTS

- A. Fabricate structural steel stands to suspend equipment from structure above or support equipment above floor.
- B. Grouting: Place grout under supports for equipment, and make a smooth bearing surface.

### 3.4 METAL FABRICATION

- A. Cut, drill, and fit miscellaneous metal fabrications for pipe and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 procedures for manual shielded metal-arc welding, appearance and quality of welds, methods used in correcting welding work, and 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. Finish welds at exposed connections so that no roughness shows after finishing, and so that contours of welded surfaces match adjacent contours.

### 3.5 ADJUSTING

- A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

### 3.6 PAINTING

- A. Touching Up: Clean field welds and abraded areas of shop paint and paint exposed areas immediately after erection of hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
  1. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).

- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 15145

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes plumbing piping systems. Systems include the following:
  - 1. Drainage and vent systems, including sanitary and storm.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with the following minimum working pressure ratings, except where indicated otherwise:
  - 1. Soil, Waste, and Vent Systems: 10-foot head of water.
  - 2. Storm Drainage Systems: 10-foot head of water.

1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Coordination drawings, drawn accurately to scale and coordinating penetrations.

1.5 QUALITY ASSURANCE

- A. Comply with the provisions of ASME B31.9 "Building Services Piping" for materials, products, and installation.
- B. Provide listing/approval stamp, label, or other marking on piping made to specified standards.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Mechanically Formed Outlet Procedure:
    - a. T-Drill Industries, Inc.

2.2 PIPES AND TUBES



- A. General: The application of the following pipe, tube, and fitting materials and joining methods required for plumbing piping systems are indicated in Part 3 Article "Pipe and Fittings Applications."
- B. Copper Drainage Tube: ASTM B 306, Type DWV, drawn temper.
- C. Poly(Vinyl Chloride) (PVC) Plastic, DWV Pipe: ASTM D 2665, Schedule 40, plain ends.

### 2.3 PIPE FITTINGS AND TUBE FITTINGS

- A. Wrought-Copper, Solder-Joint Pressure Fittings: ASME B16.22.
- B. Cast-Copper-Alloy, Solder-Joint Pressure Fittings: ASME B16.18.
- C. Wrought-Copper and Bronze, Grooved-End Fittings: ASTM B 75 (ASTM B 75M) Tube and ASTM B 584 Bronze Castings.
- D. Wrought-Copper, Solder-Joint, DWV Drainage Fittings: ASME B16.29.
- E. Cast-Copper-Alloy, Solder-Joint, DWV Drainage Fittings: ASME B16.23.
- F. Wrought-Copper, Solder-Joint, Solvent Drainage Fittings: ASME B16.43.
- G. Cast-Copper-Alloy, Solder-Joint, Solvent Drainage Fittings: ASME B16.32.
- H. Copper Tube, Grooved-End Mechanical Fittings: ASTM B 75 (ASTM B 75M), copper tube and ASTM B 584 bronze castings.
- I. Bronze Flanges: ASME B16.24, Classes 150 and 300.
- J. Copper Unions: ASME B16.18, cast-copper-alloy body, hexagonal stock, with ball-and-socket joint, metal-to-metal seating surfaces, and solder-joint, threaded, or solder-joint and threaded ends.
  - 1. Threaded Ends: Threads conforming to ASME B1.20.1.
- K. Malleable-Iron Unions: ASME B16.39, Classes 150 and 300, hexagonal stock, with ball-and-socket joint, metal-to-metal bronze seating surfaces, and female threaded ends having threads conforming to ASME B1.20.1.
- L. Polyethylene Encasement: AWWA C105, 8-mil minimum thickness, tube or sheet.
- M. Poly(Vinyl Chloride) (PVC) Plastic, DWV Pipe Fittings: ASTM D 2665, made to ASTM D 3311; socket-type; drain, waste, and vent pipe patterns.
- N. Poly(Vinyl Chloride) (PVC) Plastic Tubular Fittings: ASTM F 409, accessible and replaceable, solvent-cement and threaded types, drain pattern.
- O. Poly(Vinyl Chloride) (PVC) Plastic, Threaded Pipe Fittings: ASTM D 2464, Schedule 80.
- P. Poly(Vinyl Chloride) (PVC) Plastic, Schedule 40, Socket-Type Pipe Fittings: ASTM D 2466.

### 2.4 JOINING MATERIALS

- A. Solder, brazing, and welding filler metals are specified in Division 15 Section "Basic Mechanical Materials and Methods."

- B. Sleeve-Type Couplings for Plain-End, Nonpressure System Pipe: Rubber or elastomeric sleeve and stainless steel band assembly, fabricated to match outside diameters of pipes to be joined.
  - 1. Sleeves: ASTM C 564, rubber for cast-iron soil pipe and ASTM F 477, elastomeric seal for plastic pipe. Sleeves for dissimilar or other pipe materials shall be compatible with pipe materials being joined.
  - 2. Bands: Stainless steel, one at each pipe insert.
- C. Couplings for Grooved-End Copper Tube and Grooved-End Copper Fittings: ASTM A 536 ductile-iron or ASTM A 47 malleable-iron housing having copper-colored enamel finish, with synthetic-rubber gasket having central-cavity, pressure-responsive design and suitable for hot water, with ASTM A 183 carbon-steel bolts and nuts.

### PART 3 - EXECUTION

#### 3.1 PIPE AND FITTINGS APPLICATIONS

- A. General: Use pipe, tube, fittings, and joining methods for piping systems according to the following applications.
- B. Soil, Waste, and Vent Piping Below Ground: Use the following:
  - 1. 2 to 4 Inches: Poly(vinyl chloride) (PVC) plastic DWV pipe; PVC socket-type drain, waste, and vent pipe pattern fittings; and solvent-cemented joints.
- C. Soil, Waste, and Vent Piping Above Ground: Use the following:
  - 1. 2 to 4 Inches: Poly(vinyl chloride) (PVC) plastic DWV pipe; PVC socket-type drain, waste, and vent pipe pattern fittings; and solvent-cemented joints.
  - 2. 1-1/4 and 1-1/2 Inches: Poly(vinyl chloride) (PVC) plastic DWV pipe; PVC socket-type drain, waste, and vent pipe pattern fittings; and solvent-cemented joints.
- D. Storm Drainage Piping Below Ground: Use the following:
  - 1. 2 to 4 Inches: Poly(vinyl chloride) (PVC) plastic DWV pipe; PVC socket-type drain, waste, and vent pipe pattern fittings; and solvent-cemented joints.
- E. Storm Drainage Piping Above Ground: Use the following:
  - 1. 2 to 4 Inches: Poly(vinyl chloride) (PVC) plastic DWV pipe; PVC socket-type drain, waste, and vent pipe pattern fittings; and solvent-cemented joints.

#### 3.2 PIPING INSTALLATION, GENERAL

- A. Basic piping installation requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."

#### 3.3 DRAINAGE AND VENT PIPING INSTALLATION

- A. Make changes in direction for drainage and vent piping using appropriate Y branches, Y branches with 1/8 bends, and long-sweep 1/4, 1/5, 1/6, 1/8, and 1/16 bends. Sanitary tees and short-sweep quarter bends may be used on vertical stacks of drainage lines where change in direction of flow is

from horizontal to vertical. Use long-turn double-Y-branch and 1/8-bend fittings where 2 fixtures are installed back to back or side by side and have a common drain. Straight tees, elbows, and crosses may be used on vent lines. Make no change in direction of flow greater than 90 degrees. Where different sizes of drainage pipes and fittings are connected, use proper size standard increasers and reducers. Reduction of the size of drainage piping in the direction of flow is prohibited.

- B. Lay buried building drains beginning at low point of each system, true to grades and alignment indicated, with unbroken continuity of invert. Place hub or bell ends of piping facing upstream. Install required gaskets according to manufacturer's recommendations for use of lubricants, cements, and other special installation requirements. Maintain swab or drag in piping and pull past each joint as completed.
- C. Install drainage and vent piping at the following minimum slopes, except where another slope is indicated:
  - 1. Sanitary Building Drain: 1/4 inch per foot (1:50) (2 percent) for piping 3 inches and smaller; 1/8 inch per foot (1:100) (1 percent) for piping 4 inches and larger.
  - 2. Horizontal Sanitary Drainage Piping: 1/4 inch per foot (1:50) (2 percent).
  - 3. Storm Building Drain: 1/8 inch per foot (1:100) (1 percent).
  - 4. Horizontal Storm Drainage Piping: 1/4 inch per foot (1:50) (2 percent).
  - 5. Vent Piping: 1/8 inch per foot (1:100) (1 percent).
- D. Install underground plastic drainage piping according to ASTM D 2321.
- E. Install PVC drainage pipe and fittings according to ASTM D 2665.

### 3.4 JOINT CONSTRUCTION

- A. Basic piping joint construction is specified in Division 15 Section "Basic Mechanical Materials and Methods."
- B. Grooved Copper Tube and Grooved-Tube Fitting Joints: Assemble joints with coupling, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
- C. Mechanically Formed Outlet Joints: Make joints according to forming equipment manufacturer's written instructions. Use tool designed for piping material being joined, drill pilot hole, and form collar for branch connection.
  - 1. Copper Tube: Dimple tube to form seating stop and braze branch tube into formed collar outlet.
- D. PVC DWV Pipe: Join PVC drainage pipe and fittings according to ASTM D 2665.
- E. Handling of Solvent Cements, Primers, and Cleaners: Comply with procedures in ASTM F 402 for safe handling during joining of plastic pipe and fittings with solvent cements.

### 3.5 HANGERS AND SUPPORTS INSTALLATION

- A. Hanger and support devices are specified in Division 15 Section "Supports and Anchors."
- B. Install hangers for horizontal piping with following maximum spacing and minimum rod sizes:

Nom. Pipe Size	Steel Pipe Max. Span	Copper Tube Max. Span	Min. Rod Diameter
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<u>(Inches)</u>	<u>(Feet)</u>	<u>(Feet)</u>	<u>(Inches)</u>
Up to 3/4	7	5	3/8
1	7	6	3/8
1-1/4	7	7	3/8
1-1/2	9	8	3/8
2	10	8	3/8
2-1/2	11	9	1/2
3	12	10	1/2
3-1/2	13	11	1/2
4	14	12	5/8, 1/2 for copper
5	16	13	5/8, 1/2 for copper
6	17	14	3/4, 5/8 for copper
8	19	16	7/8, 3/4 for copper
10	22	18	7/8, 3/4 for copper
12	23	19	7/8, 3/4 for copper

(1) Support vertical steel pipe and copper tube at each floor.

C. Pipe Attachments: Install the following:

1. Riser Clamps: MSS Type 8 or Type 42 for vertical runs.
2. Adjustable Steel Clevis Hangers: MSS Type 1 for individual straight horizontal runs 100 feet and less.
3. Adjustable Roller Hangers: MSS Type 43 for individual straight horizontal runs longer than 100 feet.
4. Spring Cushion Rolls: MSS Type 49, where indicated, for individual straight horizontal runs longer than 100 feet.
5. Pipe Rolls: MSS Type 44 for multiple straight horizontal runs 100 feet or longer. Support pipe rolls on trapeze.
6. Spring Hangers: MSS Type 52 for support of base of vertical runs.

D. Support plastic pipe and tubing not included in table according to manufacturer's recommendations.

### 3.6 FIELD QUALITY CONTROL

A. Inspect drainage piping as follows:

1. Do not enclose, cover, or put into operation drainage and vent piping system until it has been inspected and approved by the authority having jurisdiction.
2. During progress of installation, notify the plumbing official having jurisdiction at least 24 hours prior to time such inspection must be made. Perform tests specified below in presence of the plumbing official.
  - a. Roughing-In Inspection: Arrange for inspection of piping system after system roughing-in, before concealing, and prior to setting fixtures.
  - b. Final Inspection: Arrange for final inspection by plumbing official to observe tests specified below and to ensure compliance with requirements of plumbing code.
3. Reinspections: Make required corrections and arrange for reinspection by plumbing official when piping system fails to pass test or inspection.
4. Reports: Prepare inspection reports signed by the plumbing official.

B. Drainage and Vent Piping System Tests: Test drainage and vent systems according to procedures

of authority having jurisdiction or, in absence of published procedure, as follows:

1. Test for leaks and defects in new drainage and vent piping systems and parts of existing systems that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with a diagram of the portion of the system tested.
2. Leave uncovered and unconcealed in new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose for testing work that has been covered or concealed before it has been tested and approved.
3. Rough Plumbing Test Procedure: Except for outside leaders and perforated or open-jointed drain tile, test piping of plumbing drainage and venting systems on completion of roughing-in piping installation. Tightly close all openings in piping system and fill with water to point of overflow, but not less than 10 feet head of water. Water level shall not drop during the period from 15 minutes before inspection starts through completion of inspection. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and their traps filled with water, test connections and prove gastight and watertight. Plug stack openings on roof and building drain where it leaves the building and introduce air into the system equal to pressure of 1 inch water column. Use a U tube or manometer inserted in the trap of a water closet to measure this pressure. Air pressure shall remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects using new materials and retest system or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

### 3.7 CLEANING

- A. Clean interior of piping system. Remove dirt and debris as work progresses.

### 3.8 COMMISSIONING

- A. Check plumbing equipment and verify proper settings, adjustments, and operation.
- B. Check plumbing specialties and verify proper settings, adjustments, and operation.
- C. Energize pumps and verify proper operation.

### 3.9 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- B. Place plugs in ends of uncompleted piping at end of day or when work stops.
- C. Exposed ABS or PVC Piping: Protect plumbing vents exposed to sunlight with 2 coats of a water-based latex paint.

END OF SECTION 15410

**NEW ELEVATOR FOR  
LOCUST FORK ELEMENTARY SCHOOL  
(#24-39)**

**PROJECT NO. 2482**

**AUGUST 2024**

**STEWART ENGINEERING, INC.  
ELECTRICAL CONSULTANTS**

**PHONE (256) 237-0891**

**ANNISTON, ALABAMA 36202**



## ELECTRICAL - SECTION 16000

### 1.0 GENERAL

#### 1.1 Related Documents

The general provisions of the contract, including General Conditions and General Requirements, apply to the work specified in this section.

#### 1.2 Description of Work

Furnish all labor and materials required to complete the electrical work indicated on drawings or herein specified. Major work included in this section shall be:

- A. Arrange with local utility companies for providing such electrical and electronic services as indicated or herein specified. Pay to utility companies any charges associated with providing these services.
- B. Remove or relocate all electrical or electronic services located on or crossing through the project property, either above or below grade, which would obstruct the construction of the project or conflict in any manner with the completed project or any code pertaining thereto.
- C. Furnish and install complete electrical light and power system.
- D. Connect all meters, switchboards, panelboards, circuit breakers, power outlets, convenience outlets, switches and/or other equipment forming part of the system.
- E. Connect all electrical equipment mentioned in this section or noted on drawings, whether furnished by Electrical Contractor or by others.
- F. Furnish and install all disconnect switches not included as integral part of equipment.
- G. Complete alterations and additions to existing Fire Alarm System.
- H. Complete alterations and additions to electrical systems in existing buildings.
- I. Procure and pay for permits and certificates as required by Local and State Ordinances and Fire Underwriters Certificate of Inspection.
- J. Visit the Site and determine conditions which affect this contract. Failure to do so will in no way relieve contractor of his responsibility under this contract.
- K. Submit to Architect a Certificate of Final Inspection from local Inspection Department along with assurance of completion of any items on this list.

#### 1.3 Qualifications Of Electrical Subcontractor

The Electrical Subcontractor shall meet the following qualifications:

- A. In business as an Electrical Contractor for two (2) years prior to the date of opening bids. Employees of a General Contractor will not be acceptable for work for this Section.

- B. Have completed at least five (5) projects with Electrical installations of character and scope comparable with this project. Contractor must supply list of projects, with the project shop drawings, for approval. If Contractor uses subcontractor for any portion of project, the name of this subcontractor must be submitted, along with similar project list, for approval.
- C. If Electrical Subcontractor proposes to use any other Subcontractor for any part of the work, these Subcontractors shall also meet the above qualifications before bid is acceptable.
- D. If Subcontractor's office is located more than 75 miles from jobsite, he shall submit the name of a service company with a 20 mile radius of the jobsite, for approval, who will be responsible through him for service required during the warranty period.

#### 1.4 Drawings

- A. Drawings indicate diagrammatically extent, general character and approximate location of work. Where work is indicated but with minor details omitted, furnish and install it complete so as to perform its intended function. For Building Details and Mechanical Equipment follow Architectural, Structural and Mechanical Drawings and fit electrical work thereto.
- B. Take finish dimensions at Job in preference to scale dimension.
- C. Except as above noted, make no changes in or deviations from work as shown or specified except on written order of Architect.

#### 1.5 Manufacturers Drawings and Data

- A. Within twenty (20) days after award of contract submit six (6) copies of Manufacturer's drawings to Architect for review of the following items. Partial submittals will be acceptable. Shop drawings of a specified item or system to be in one submittal:
  - 1. Lighting Fixtures
  - 2. Fire Alarm System
  - 3. Disconnects
  - 4. List of five (5) projects that Contractor (and any sub-contractor) has completed similar in size and capacity to this project
- B. Drawings of power equipment to contain exact details of device placement, phasing and numbering in elevation form. They shall also contain elevation view of front panelboard/switchboard outside cover.
- C. See Section 01350 – Administrative Requirements, for submittal procedures.

#### 1.6 Progress of Work

- A. Cooperate with other crafts and schedule work as needed. Do not delay other trades. Maintain necessary competent mechanics and supervision to provide an orderly progression of the work.
- B. Be informed as to equipment furnished by other trades but not liable for added cost incurred by equipment substitutions made by others above wiring indicated on drawings.



1.7 Insurance

- A. This Contractor to carry Workman's Compensation Insurance and Public Liability Insurance and save Owner free from damage from suits arising out of the performance of this contract.

1.8 Protection of Persons and Property During Construction

- A. Take all precautions to provide safety and protection to persons and protection of materials and property as necessary, including protection from injury from rotating or moving equipment, tools, hot surfaces, holes, shafts, falling objects, electrical energy and all other potential hazards. Erect signs, barricades, warning lights, instruct workmen and others who may be subject to construction hazards.
- B. Protect items of equipment from stains, corrosion, scratches and any other damage or dirt, whether in storage at job site or installed. No damaged or dirty equipment, lenses or reflectors will be accepted.

1.9 Service Entrance

- A. Main service shall be as shown on drawings. Verify with the local utility company that the location, arrangement, voltage, phase and connections to utility service as well as required metering equipment are coordinated with and in accordance with requirements of the local utility company. If their requirements are at variance with these drawings or specifications, the contract price shall include any additional cost necessary to meet those requirements without extra cost to the Owner after contract is entered into. Notify Architect of any changes required before proceeding with work.

1.10 Cleaning Up

- A. During the progress of the work keep the Owner's premises in a neat and orderly condition, free from accumulation of debris resulting from this work and at completion of the work, remove all material, scrap, etc., not a part of this contract.

1.11 Operating and Maintenance Instructions

- A. Turn over to Architect one set of marked "as built" drawings, one set of all equipment catalogs and maintenance data and one set of shop drawings on all equipment requiring same. Explain and demonstrate electrical systems to Owner's representative.

1.12 Guarantee

- A. Guarantee that all work executed under this section will be free from defects of workmanship and materials for a period of one year from date of final acceptance of this work. Promptly repair, replace or otherwise make good, any defect becoming apparent during this period, upon notification and at no charge to Owner.
- B. See Section 01910 – Closeout Submittals, for additional warranty requirements.

1.13 Temporary Systems

- A. The Electrical Contractor shall be responsible for the furnishing and installation of all equipment and materials necessary for providing temporary power required by all trades during construction. All temporary wiring shall be installed so as not to interfere with the new construction and shall be made in a safe and approved manner.
- B. It shall be the responsibility of the Electrical Contractor to visit the site prior to submitting bid and thoroughly review all existing conditions affecting the temporary system requirements.

## 2.0 PRODUCTS

### 2.1 Standard of Materials

- A. All materials shall be new and listed by the Underwriters' Laboratories as conforming to these standards.
- B. Material substitutions will be considered only when evidence of equality and suitability, satisfactory to the Architect, has been presented in writing, with samples, if requested by the Architect. All proposed substitutions shall be approved in writing at least five days prior to bid date.
- C. It shall be understood that the Architect has the authority and may reject any material or equipment not specified or approved, or showing defects of manufacturer or workmanship, before or after installation.

### 2.2 Conduits

- A. Rigid: To be mild steel piping, galvanized inside and outside, and conform to ASA Specification C80.180.1 and Underwriters' Laboratories Specifications. By Sprang, Republic, Wheatland, Triangle or Pittsburg.
- B. Intermediate Metal Conduit: Shall be hot dipped galvanized inside and outside, and manufactured in accordance with U.L. Standard #6 or #1242. By Allied or approved equal.
- C. E.M.T.: To be of high grade steel electro-galvanized outside and lacquer or enamel coating inside and conform to ASA Specification C80.1 and Underwriters' Laboratories Specifications. By Sprang, Republic, Wheatland, Triangle or Pittsburg.
- D. PVC: To be of high impact PVC Schedule 40 and conform to Underwriters' Laboratories Standard UL-651. PVC to be used only where indicated on drawings. By Pittsburg, R. G. Sloane or Carlon.

### 2.3 Couplings and Connectors

- A. Rigid & IMC: By Raco, Efcor, Republic or Appleton.
- B. E.M.T.: All steel raintight type. Pressure indented type or cast metal will not be approved. All connectors to be insulated. By Appleton, Raco or Efcor.
- C. PVC: To be of high impact PVC Schedule 40. Joints to be made with PVC solvent cement as recommended by manufacturer. By Pittsburg, R.G. Sloane or Carlon.

### 2.4 Bushings

- A. All rigid bushings 1 1/4" and larger shall be the insulated grounding type. All other bushings shall be OZ. Mfg. Co., Type B or Efcor Type 55 insulated metallic type or by Sylvania.

- 2.5 Conduit Seals
- A. All conduit seals for wall, floor or ceiling penetrations shall be by 3M Company or approved equal.
- 2.6 Conduit Accessories
- A. Conduit clamps and supports by Efcor, Steel City or G. A. Tinnerman. Conduit fittings by Pyle-National, Crouse-Hinds and Appleton.
- 2.7 Building Wire
- A. Conductors shall have current carrying capacities as per N.E.C. and with 600 volt insulation THW #12 minimum. Conductors #3 and smaller to be copper. Conductors #2 and larger to be copper unless specifically indicated aluminum on drawings. Insulation for conductors to be N.E.C. Type THW for #3 and smaller. Insulation for conductors #2 and larger shown in cable specifications. By Phelps-Dodge, Rome, Simplex, General Cable, Okonite or Anaconda.
- 2.8 Cable
- A. Conductors for 0-600 volts shall have copper, current carrying capacities as per N.E.C. with cross-linked polyethylene insulation and thickness to IPCEA standards, and U.L. Standard #44. Rated for wet and dry locations. Type THW or THWN. By Phelps-Dodge, Rome, Simplex, General Cable, Okonite or Anaconda.
- 2.9 Fixture Wire
- A. Conductors for fixtures of 300 watts or less shall be #16 type TFN, for fixtures of more than 300 watts #14 type TFN shall be used. Conductors in channel of fluorescent fixtures shall be type THHN or RHH. Conductors shall be either Phelps-Dodge, Anaconda, Rome or General Cable.
- 2.10 Control and Signal System Wire
- A. Type TFF minimum size #16 copper and fully color coded. Conductors by Phelps-Dodge, Anaconda, Rome or General Cable.
- 2.11 Junction Boxes (thru 4-11/16")
- A. Sheet Metal: To be standard type with knockouts made of hot dipped galvanized steel by Steel City, Raco, Appleton or approved equal.
- B. Cast: To be type FS, FD, JB, GS or SEH as required for application.
- C. Junction and Pull Boxes (larger than 4-11/16"): To be cast aluminum for all below grade exterior use and where shown all other shall be oil tight, JIC boxes not less than 16 gauge. Hoffman type "CH" Boxes.

## 2.12 Gutters

- A. Up to and including 8" x 8" shall be a standard manufacturer's item as manufactured by Square D, ITE or B & C Company. Special gutters shall be made of code grade galvanized sheet steel with hinged covers having approved fastening devices. At each location shown for gutters, install a wood backboard not less than 3/4" thick, paint 2 coats of gray enamel, mount all equipment thereon. Conductors serving a gutter shall be extended without reduction in size for the entire length of the gutter. Tap-offs to the switches and other items serviced by the gutter shall be made with Penn-Union and Anderson compression connectors for aluminum conductors. Properly tape and insulate.

## 2.13 Outlet Boxes

- A. Standard type with knockouts made of hot dipped galvanized steel. Ceiling outlet boxes shall be 4" octagon 1-1/2" deep or larger if required due to number of wires.
- B. Boxes shall be provided with approved 3/8" fixture studs where required. Except when located in exposed concrete block switch and receptacles boxes shall be 4" square for single gang installation. Appropriate gang boxes shall be used for mounting ganged switches. Use Raco square block boxes for exposed block walls. By Steel City, Raco, National or Appleton.

## 2.14 Safety Switches

- A. Furnish and install safety switches as indicated on the drawings. Switch to be NEMA Heavy Duty type HD and Underwriters' Laboratories listed. Safety switches to be G.E., Cutler Hammer, Sylvania or Square D Heavy Duty type.
- B. Appropriately identify each safety switch by engraving micarta name plate.

## 2.15 Fuses

- A. Branch feeder fuses to be Bussman Manufacturing Company dual element and fusetrone. Main switch fuses to be Bussman Manufacturing Company dual Hi-Cap. Fuses to be used only where indicated on drawings. Equals by Littell Fuse accepted.

## 2.16 Manual Motor Switches

- A. Thermal overload protection to be provided for single phase motors by manual switches with overload units rated as required by specific motor to be served. Manufactured by Cutler Hammer or Square D with NEMA Type 1 enclosure.

## 2.17 Wiring Devices

- A. Switches shall be A.C. type as made by Hubbell, P & S, Sierra, Bryant, Slater or Arrow Hart as shown on the drawings.
- B. Receptacles shall be Hubbell, Bryant, P & S, Sierra, Slater or Arrow Hart as shown on the drawings.
- C. Wiring devices shall be gray with stainless steel plates, beige with brass, ivory with ivory bakelite, brown and brown bakelite.

## 2.18 Special Purpose Receptacles

- A. Special purpose receptacles (other than 120V, 20A) shall be complete with a matching cord grip cap of the same manufacturer. See plans for special receptacles required in various locations.

## 2.19 Floor Outlets

- A. Floor outlets shall be an adjustable, galvanized floor box finished with accessories as required for a complete installation for power or communications. Except as identified otherwise on the plans, use Type "A" outlets as follows:
  - 1. Type "A" Outlet: Power outlets shall be Hubbell #2429 floor box finished with #S-2425 brass plate, #SC-3091 service fitting, receptacle and required accessories. Signal outlets shall be the same except #SC-3090 service fitting.
  - 2. Type "B" Outlet: Power outlets shall be Hubbell #2429 floor box finished with #S-3825 brass plate and complete with duplex receptacle and required accessories. Signal outlets shall be the same, less receptacle and with #S-2425 plate and #S-3086 nozzle furnished to the Owner.
  - 3. Type "C" Outlet: Power outlets shall be Hubbell #B-2529 floor box furnished with #S-3042 carpet flange and #S-3040 service fitting with duplex receptacle. Signal outlets shall be the same, except with #S-3041 service fitting.
- B. Where equipment is to be connected above floor level, delete service fitting and nipple or flex to connection from threaded brass floor plate.

## 2.20 Finishes

- A. All electrical items (device and telephone plates, junction, floor outlets, under-floor duct junctions, outlets, and other miscellaneous items) to match finish of building hardware in area installed. Unfinished areas with exposed conduit, shall have surface mounted boxes, gray switches and outlets, galvanized metal plates with beveled edges. All outlets to be gray with stainless steel plates.

## 2.21 Fixtures

- A. Fixtures shall be furnished as shown in fixture schedule on drawings. It shall be specifically the responsibility of this Contractor to verify exact type ceiling and recessing depth of all recessed fixtures, prior to any purchasing of fixtures. Stems shall be approved ball aligner type swivel 30 degrees from vertical and swivel below canopy. Paint stems same color as fixture trim. Stems in unfinished areas to be unpainted conduit.

## 2.22 Guarantee And Warranty - Lamps

- A. The guarantee and warranty shall apply to lamps as follows:
  - 1. LED Fixtures: Per manufacturer's warranty period for LED driver.
- B. Guarantees shall begin from date of final acceptance.

## 2.23 Fire Alarm System

### A. General

1. The contractor shall complete additions and alterations to existing low voltage, automatic and manual addressable fire alarm system, as specified herein and indicated on the drawings. The system shall include a central control panel, power supply, signal initiating devices, annunciator, remote station equipment, audible and visual alarm devices, provisions for connections to municipal fire circuits, a conduit and wiring system, all necessary devices required to provide a complete operating system.
2. The system shall comply with the applicable provisions of the current National Fire Protection Association Standard Number 72, and meet all requirements of the local authorities having jurisdiction. All equipment and devices shall be listed by the Underwriters' Laboratories, Incorporated or approved by the Factory Mutual Laboratories.
3. To establish the type and quality of system desired, the equipment specified is that of Notifier Company. No deviation will be considered unless submittals are received and approved, in writing, not less than ten (10) days prior to bid date.

### B. Control Panel (Existing)

1. Notifier with receiving and alarm zones per plans and battery standby power, shall provide for the connection of alarm circuits as indicated and shall include functions as follows:
  - a. Detect the operation of any signal initiating device.
  - b. Indicate on LCD display the device(s) alarming.
  - c. Operate all alarm and auxiliary devices.
2. The Control Panel includes the following features:
  - a. A green pilot lamp shall normally be on, indicating that the system is receiving power from the building service supply. A failure of the building service supply shall cause the lamp to go out.
  - b. A trouble lamp and trouble buzzer, operating together, shall signal any trouble condition. Failure of the building service supply, disarrangement in system wiring, or alarm condition shall cause that trouble lamp to come on and trouble buzzer to sound. A self-restoring silencing switch shall be provided to silence the trouble buzzer, which shall be so arranged that the trouble lamp will remain on until the system is restored to normal.
  - c. All alarm signals shall be automatically locked in at the Control Panel until the operated device is returned to it's normal condition, and the Panel is manually reset. A switch shall be provided on the Control Panel for silencing the alarm devices. The manual reset switch and the alarm silencing switch shall be of the self-restoring type, which cannot be left in an abnormal position.

- d. Each signal initiating circuit and each alarm circuit shall be represented on the Control Panel by an amber trouble lamp and a red alarm lamp. The lamps for each circuit shall be identified by a lettered name plate showing the circuit number and/or zone designation. Circuit trouble shall be indicated by the amber trouble lamp lighting. An alarm shall be indicated by both the amber trouble lamp and the red alarm lamp lighting. Audible trouble and alarm devices shall function as herein before specified.
- e. Each circuit shall include individual supervisory and alarm relays, and shall be so arranged that a fault condition in any circuit, or group of circuits, will not affect the proper operation of any other circuit.

Provide Transient Voltage Surge Suppression at FACP, for both the incoming power supply and the outgoing connection to the remote station receiving unit.

C. Power Supply

- 1. Shall be 24 volt D.C., filtered and regulated, and shall provide sufficient power for all system functions.
- 2. The fire alarm system main power supply shall operate from 120 volt A.C. This connection shall be made in conduit or cable in accordance with local and national codes. Separate over-current protection shall be provided, marked "FIRE ALARM".
- 3. The 120 volt A.C. main power shall be converted to low-voltage direct current for system operation. The system shall operate on 24 volts D.C. with trickle charged batteries provided as an emergency source of supply for operating the system in the event of the interruption of main power. A changeover relay in the Control Panel shall transfer to standby power automatically upon main power failure and automatically reconnect to main power upon restoration.

D. Smoke Detectors

Notifier Model SDX-551 photoelectric smoke detector, dual chamber design shall be installed where shown on plans.

E. Remote Station Receiving Panel

- 1. Terminals and other necessary facilities shall be provided in the Control Panel to permit automatic transmission of trouble and alarm signals over leased or private owned telephone cable to a Remote Station Receiving Panel located in the fire, police, or other continuously manned facility, so designated for response to fire emergency.
- 2. Receiving equipment compatible with existing system, if applicable, shall be installed under this contract. Install Notifier 911A Digital Communicator.
- 3. The contractor shall coordinate requirements with telephone company and cognizant municipal fire officials to assure a complete operating system performing all functions specified and shall so attest by written certification to the architect prior to acceptance of building for occupancy.



F. Wiring

1. All wiring shall be in accordance with the NATIONAL ELECTRICAL CODE and the local code having jurisdiction. Unless otherwise specified, minimum wire size shall be 12 gauge for A.C. and power supply connections, 14 gauge for audible alarm and auxiliary circuits, and 14 gauge for signal initiating circuits. Typical diagrams shall be provided for devices and power wiring.
2. Wiring shall be run in conduit. In general the wiring shall consist of:  
  
From the Control Panel.
  - a. West Penn No. 995 shielded twisted pair common to all Fire Alarm Stations or Detectors.
  - b. 4#14 wires common to each circuit of Fire Alarm Signals.

G. Certified Fire Alarm Contractor

1. The Certified Fire Alarm Act requires that the company installing the fire alarm system must be licensed as a Certified Fire Alarm Contractor. The contractor must have a NICET Level III Technician in a position of responsibility, and the license must be issued in the name of the certificate holder and the contractor. The Certified Fire Alarm Act also requires that technicians working for the Certified Contractor must hold a current NICET Level II, or equivalent, certification. Contractors wishing to bid this project will be required to show evidence at the pre-bid conference that he/she meets the certification requirements of the Certified Fire Alarm Act and holds a permit/license issued by the State Fire Marshall.

H Testing, Guarantee And Service

1. A Factory trained representative of the manufacturer shall supervise final testing of the system and it shall be subject to the approval and acceptance of the responsible engineer. On completion of the acceptance tests, the Owner or his representative shall be instructed in the operation and testing of the system. The Owner shall be provided with a written verification of this inspection and certification.
2. The Fire Alarm system shall be free from defects in workmanship and materials, under normal use and service, for a period of one year from date of acceptance or beneficial occupancy; whichever earlier. Any equipment shown to be defective in workmanship or material shall be repaired, replaced, or adjusted free of charge.
3. The equipment manufacturer shall be represented by a service organization, and the name of this organization shall be furnished to the Architect and Owner. The service organization shall furnish, gratis to the Owner, a one year maintenance and inspection Contract, effective from the date of final acceptance. The contract shall provide for four inspections during the contract year.

### 3.0 EXECUTION

#### 3.1 Workmanship

- A. All work shall be executed in workmanlike manner and present a neat and mechanical appearance upon completion.
- B. Balance load as equally as practical on services and all feeders, circuits, and panel busses. All wiring in panelboards shall be laced and looped in a workmanlike manner.
- C. Upon completion of work, test entire wiring system and show to be perfect working order in accordance with intent of specifications and drawings. This Contractor to have all systems ready for operation and electrician available to assist in removal of panel fronts, etc., to permit inspection as required.
- D. All work shall be in accordance with the National Electrical Code and the rules and regulations of the local bodies having jurisdiction.

#### 3.2 Excavation Cutting and Patching

- A. Provide cutting and patching required for this section of work under supervision of the General Contractor. Coordinate with other trades as work progresses so cutting and patching will be minimal.

#### 3.3 Sleeves, Inserts, and Supports

- A. Provide and install No. 16 gauge galvanized steel or iron sleeves in all walls, floors, ceilings, and partitions. Sleeves shall have not more than 1/2" clearance around pipes and insulation.
- B. Contractor shall furnish to other trades all sleeves, insert, anchors and other required items which are to be built in by trades for the securing of all hangers or other supports by the Contractor.
- C. Contractor shall assume all responsibility for the placing and size of all sleeves, inserts, etc., and either directly supervise or give explicit instructions for installation.
- D. Seal all conduits through floor, smoke or fire walls and sound barrier walls. All such penetrations shall be made with an Underwriters' Laboratories firestop assembly. Through floor conduit shall be sealed water tight.
- E. Furnish and install steel angles and channels as required for mounting and bracing heavy equipment, and conduits. Steel shall be securely bolted or welded to structure and equipment bolted to steel framework. Obtain approval of Architect prior to welding.

#### 3.4 Roof Penetrations

- A. Furnish roof flashing for all equipment installed under this section that penetrates through the roof. Galvanized sheet, 24 gauge with base extending 6" beyond pipe.

- B. All equipment shall be grounded and bonded in accordance with local regulations and National Electrical Code. Ground main service to code size cold water pipe and driven ground rod, maximum of 2 driven rods. All conduits entering a free standing switchboard or motor control center shall be bonded together with approved grounding lugs and bare copper wire.
- C. Interior metal water piping shall be bonded to the system ground as outlined in NEC Section 250-80.
- D. This Contractor shall bond all metal air ducts to the respective unit grounding conductor. Install additional bonding jumpers at joints, flexible sections, etc., to insure that entire duct system is bonded.

### 3.5 Conduit Installation

- A. Where rigid conduits enter boxes secure in place by approved lock nuts and bushings. Where E.M.T. enters boxes secure in place with approved insulated fittings. Conduit ends shall be carefully plugged during construction.
- B. Use of running threads is absolutely prohibited. Conduits shall be joined with approved conduit couplings.
- C. Install conduit runs to avoid proximity to steam or hot water pipes. In no place shall a conduit be run within 3" of such pipes except where crossings are unavoidable, then conduit shall be kept at least 1" from the covering of the pipe crossed.
- D. Before installing raceways for motors and fixed appliances, check locations of motors and appliance connections. Locate and arrange raceways appropriately.
- E. Provide flexible conduit connections to all motors and/or any equipment which has moving or vibrating parts. Sealtite flexible conduit shall be used in all cases where exposed to moisture and in mechanical equipment rooms.
- F. Exposed conduit runs shall be parallel and/or at right angles to building walls and/or partitions.
- G. Where conduit crosses a structural expansion joint, an approved conduit expansion fitting will be installed.
- H. Leave aluminum pull wire in all empty conduit.
- I. Conduit shall be cut square and the ends reamed after threading.
- J. Fasten conduit securely in place by means of approved conduit clamps, hangers, supports, and fastening. Arrangement and method of fastening all conduits subject to Architect's direction and approval.
- K. Apply two (2) coats of asphaltum paints to all underground rigid conduit. Carefully retouch any breaks in paint and allow to dry before covering. Leave exposed until after Architect's inspection.
- L. Conduits shall be sized in accordance with National Electrical Code as amended to date, except when the size is shown larger on the drawings.

- M. Conduit with an external diameter larger than  $\frac{1}{3}$  the thickness of the slab shall not be placed in the slab. Conduit in the slab shall not be spaced closer than 3 diameters on center. No conduit in porous fill.
- N. E.M.T. may be used where concealed in ceiling or walls where there is no danger of mechanical injury. Rigid conduit shall be used in floor slabs, where embedded in concrete, areas exposed to moisture and danger of mechanical injury, in hazardous areas, and for feeders and motor circuits.

### 3.6 Wire and Cable Installation

- A. No conductor shall be smaller than #12 except where so designated on the drawings or hereinafter specified.
- B. Joints and splices on wire shall be made with solderless connectors, and covered so that insulation is equal to conductor insulation. Wire nuts not permitted.
- C. Multi-wire lighting branches shall be used as indicated.
- D. No splices shall be pulled into conduit.
- E. Both conductors and conduits shall be continuous from outlet to outlet.
- F. No conductor shall be pulled until conduit is cleaned of all foreign matter.
- G. In installing parallel conductors, it is mandatory that all conductors making up the feeder be exactly the same length, the same size and type of conductor with the same insulation. Each group of conductors making up a phase or neutral must be bonded together at both ends in an approved manner.

### 3.7 Feeder Designation

- A. Non-ferrous identifying tags or pressure sensitive labels shall be fastened securely to all cables, feeders and power circuits in vaults, pull boxes, manholes, switchgear and at termination of cables. Tags or labels shall be stamped or printed to correspond with markings on drawings so that feeder or cable number or phase can be readily identified.

### 3.8 Circuits and Branch Circuits

- A. Outlets shall be connected to branch circuits as indicated on drawings by circuit number adjacent to outlet symbols, and no more outlets than are indicated shall be connected to a circuit.

### 3.9 Wire Joints

- A. On copper wire larger than #12 joints shall be made with solderless connectors and covered with Scotch #33 Electrical Tape so that insulation is equal to conductor insulation. Connectors by Penn-Union or Anderson.
- B. #12 and smaller wire joints shall be made with T & B Sta-Kon wire joints, complete with insulating caps, Ideal Wing nuts, or Buchanan Electrical Products Series 2000 pressure connectors complete with nylon snap-on insulators.

- C. Joints on aluminum cable #0 and larger shall be made with compression lugs and bolted to terminals using stainless steel bolts and Belleville washers. Torque to 50 to 60 foot pound or torque with torque wrench. Aluminum cable and joints shall be used only where indicated on drawings. Connectors by Penn-Union or Anderson. Connection to panelboard by Burndy Connector and stud.

3.10 Outlet Boxes Installation

- A. Outlet boxes shall be securely fastened.
- B. Surface Fixture outlet boxes shall be set so edge of cover comes flush with finished surface.
- C. There shall be no more knockouts opened in any outlet box than are actually required.
- D. Boxes shall be sealed during construction. Protect interiors (including panel cans) from paint and mortar.
- E. Unless otherwise shown, outlets shall be located as follows: centerline of boxes shall be following distance above the finished floor:

Receptacles General -----	1'4" - Centerline
Receptacles Over Counters -----	3'8" - Centerline
Telephone Outlets General -----	1'4" - Centerline
Wall Telephone Outlets -----	4'0" - Centerline
General Clock Outlets -----	7'6" - Centerline
Switches General -----	4'0" - Top
Fire Alarm Pulls -----	4'0" - Top
Fire Alarm Signals -----	6'8" - Bottom
Bells -----	6'8" - Centerline
T V & Computer Outlets -----	1'4" - Centerline

- F. Symbols on drawings and mounting heights as indicated on drawings and in specifications are approximate only. The exact locations and mounting heights must be determined on the job and it shall be the Contractor's responsibility to coordinate with all trades to secure correct installation, i.e., over counter in or above back splashes, in stud walls, and other specific construction features. Mount all receptacles vertical. In block walls (exposed), use nearest joint as approved by Architect.
- G. All outlets installed back-to-back in fire rated walls shall be offset a minimum of 24".

3.11 Fixture Installation

- A. Support of all fixture shall be responsibility of this Contractor. Fixtures shall be supported independent of ceiling from structure members of building. Contractor shall submit typical hanging detail to Architect/Engineer before installing any fixtures. All grid fixtures shall be wired by flex individually to junction and not wired fixture to fixture.
- B. Fixture conductors shall be connected by soldering and tying or by approved connectors.

- C. All stems on fluorescent fixtures shall be installed as follows: except fixtures with slide grip hangers first and last stem in row in first knockout from end of fixture. One stem shall be installed between each two fixtures, stem shall center joint where fixtures join, and attach by use of "joining plates". All fixtures in continuous rows other than recessed grid type shall be connected by nipples with lock nuts and bushings.
- D. Thoroughly clean all fixture lens and reflectors immediately prior to the final inspection.

### 3.12 Installation of Motors, Electric Heaters, and Controls

- A. Provide feeders and make connections for motors, electric heating units and controls.
- B. An approved H.P. rated safety switch shall be provided within sight of each motor and each heating unit. Provide fused switches where branch circuit fuses are not sized for overload protection. Weatherproof switches are to be used where switches are located outdoors. Safety switches shall be as manufactured by G.E., Square D, or Cutler Hammer.
- C. Manual motor starters with thermal overload protection may be used in lieu of safety switches for motors under 1/2 H.P. Manufacturers shall be same as above.
- D. The heating and air conditioning contractor shall furnish all motor starters.
- E. The temperature control contractor shall furnish and install all low and line voltage wiring necessary for the temperature control systems and interlocking with air handling units, cabinet unit heaters.
- F. The electrical contractor shall install all motor starters, except for factory mounted. He will furnish wire and disconnect switches. He will furnish and install all power wiring from the power panels on packaged equipment. He will not furnish nor install any low and line voltage wiring necessary for the temperature control system and interlocking with air handling units, or cabinet unit heaters.

### 3.13 Alterations & Additions to Electrical System in Existing Building

Work in existing building shall be performed as indicated or requested to perform its intended function on Electrical and Architectural plans. This contract shall include removing, relocating, extending, etc., any items of electrical nature required to facilitate work as indicated. All circuits interrupted by rework shall be extended and left energized. Contractor shall include night and weekend work in bid as required to keep all outages to a minimum four (4) hours, during non-school hours only.

### 3.14 Fire Alarm Installation

- A. All wiring shall be in accordance with Local and National Codes and Article 210 of the National Board of Fire Underwriters Standard Number 72. Unless otherwise specified, minimum wire size shall be 12 gauge for A.C. and power supply connections, 14 gauge for audible alarm circuits and 14 gauge for signal initiating circuits, or wire size as indicated on drawings.

- B. Wiring shall be run in conduit. In general, the wiring from the Control Panel shall consist of:
1. West Penn No. 995 shielded twisted pair common to all Fire Alarm stations or Detectors.
  2. 4#14 wires common to each circuit of Fire Alarm Signals.
- C. A factory- trained representative for the manufacturer shall supervise the final testing of the system and it shall be subject to the approval and acceptance of the responsible engineer. On completing of the acceptance tests, the Owner or his representative shall be instructed in the operation and testing of the system. Provide completion documents for the Fire Alarm installation.

END OF SECTION 16000

PRE-CONSTRUCTION CONFERENCE CHECK-LIST

**Project:** New Elevator for Locust Fork Elementary School

**Funding:** Local

**Location:** TBD

**Date/Time:** TBD

**DCM Insp:**

Please note that all items listed below may not be applicable to this project.

1. **Introductions / Sign In**

2. **Owner's Comments**

3. **Preface / Pass Along To Others**

4. **General Contractor's Team Members (contact information)**

**Project Manager:** \_\_\_\_\_

**Superintendent:** \_\_\_\_\_

5. **Verify all alternates accepted.**

6. **E-Verify. Alabama Immigration Law. Be sure that all subcontractors comply with E-Verify requirements.**

7. **List of Sub-Contractors, submit for approval.**

A Complete list of sub-contractors must be submitted and approved by the Architect and Owner prior to any work commencing. Contractor cannot replace subs unless approved by the Architect and Owner (GCS 41)

8. **Cost Breakdown and Progress schedule.**

Cost breakdown and progress schedule must be submitted and approved on proper state forms prior to first pay request. **GC is required to provide an updated progress schedule at each OAC.**

Start:

Completion Date:

Days:

9. **Method of approving monthly pay request.**

Due by the 25th of each month. Architect will verify, sign and forward to Owner, who will forward to DCM, if applicable.

10. **Allowances.**

A. With the exception of quantity allowances, all allowances indicated are contingency allowances and therefore the Owner may transfer balances for other discretionary uses. Overhead and profit margins SHALL NOT BE ADDED to any amount drawn from original Allowance(s) regardless of the indicated use.

B. Each contingency allowance shall be a "line item" on the Schedule of Values.



- C. The following allowance(s) are a part of this project:
  - 
  -
- D. If applicable, note special material/equipment delivery dates associated with allowances.
  -

**11. Change Orders Requests. No work prior to final approval; Architect can approve in writing if emergency.**

- A. All changes in work are to be submitted via Change Order Request, regardless of monetary value.
- B. COR's must be submitted in sequential order on GC letterhead.
- C. All COR's must be broken down to the fullest degree, including breakdown of GC's cost by GC's labor, materials, subcontractor, sub-subcontractor cost and OH&P. Subcontractor and sub-subcontractor cost must be documented with copies of quotes detailing OH&P included.
- D. COR's applied to allowances cannot include OH&P.
- E. Credit COR's must include a minimum of 5% OH&P.
- F. Upon Owner and/or Architects' approval of COR's, a revised Change Order and Allowance Usage log will be sent to GC via email.
- G. GC is to maintain a COR Log and present updated copy at each OAC meeting.
- H. **NOTE: The following information is required for ALL Change Order Requests submitted:**
  - a. Each material number shall include an invoice / quote listing unit quantities, unit price, and extended total.
  - b. Each labor number shall include a breakdown showing number of laborers, hours of labor worked, hourly wage, and extended total.
  - c. Each equipment number shall have an invoice / quote listing the hours of use, hourly rate, and extended total.
- I. An official Change Order to the State **CANNOT** be prepared if all backup paperwork is not provided and accounted for.
- J. This information is required for all contractors, subcontractors, and sub-subcontractors.

**12. Shop Drawings.**

- A. Submittal Schedule must be submitted to Architect at or before Pre-Construction Conference. Correlate this submittal schedule with the listing of subcontractors and with list of materials as specified in contract documents. The submittal schedule should be in chronological order following the critical timing of the approval of submittals in accordance with the Work Progress Schedule.
- B. Submit all items proposed for use in work. Do not combine submittals with requests for substitutions
- C. Must bear GC's action stamp as APPROVED OR APPROVED AS NOTED. Contractor shall review and stamp approval and submit shop drawings, product data and samples far enough in advance to allow ample time for Architect review. Color selections may take longer than actual submittal approval, but in any case will not be given via phone calls. If submittals are not marked as approved by the GC, they will be returned without action.

D. Digital Copies: Provide via email to [submittals@lathanassociates.com](mailto:submittals@lathanassociates.com). Do not send directly to Architect. **See attached Sample.**

E. Submittal Preparation:

- **Include the following information on transmittal / email.**
  - Date
  - Project Name and Architect's Project Number.
  - Name of the General Contractor and Contact within company.
  - Subcontractor/Supplier.
- Clearly state **Number** and title of appropriate Specification Section and **Description** of Item and if applicable
  - Name of the Manufacturer.
  - Model / Style of Item

General Contractor must review and approve shop drawings and submittals prior to submitting to Architect. Allow the Architect no less than three (3) weeks for initial review. Allow more time if the Architect must delay processing to permit coordination with the sequence of construction, related specification divisions, engineers, consultants and owner's representatives. Allow no less than two (2) weeks for reprocessing.

NOTE: No extension of Contract Time and/or additional costs will be authorized because of failure to transmit submittals sufficiently in advance of the Work to permit processing.

- F. Material shall not be fabricated or work performed without approval of respective submittal.
- G. GC is to maintain copies of all approved shop drawings at the site and have available for architect and/or engineers at all times.
- H. **GC is to maintain a Submittal Log and present updated copy log at each OAC meeting.**
- I. **Important:** Contractor shall perform no portion of the work for which the contract documents require submittal and review of Shop Drawings, Data, Installer Qualifications, etc. until respective submittal has been approved by the Architect.
- J. **Important:** Submittals are not Contract Documents and are not used to make changes in scope of project or intent of Contract Documents, and not used to request or IMPLY substitutions or to otherwise make changes in project requirements.
- K. **Important:** The only changes that can be made to the project once it is bid, is through Change Order Requests and Approvals.
- L. **Important:** After receiving approved digital submittals, General Contractor is responsible for printing and delivering 2 hard copies of the approved shop drawings to the Architect within 10 days. Submittals are not considered complete until 2 copies have been received by the Architect. This may have a direct effect on pay requests or final payment.

### 13. CAD Files / PDF

- A. This project was bid under the assumption that electronic CAD files would not be available.
- B. Electronic CAD files are owned individually by each design professional according to discipline. If electronic CAD files or portions thereof are made available, be reminded that electronic CAD files can be manipulated and do not constitute the Contract Documents. The business of acquiring such files shall be between the contractor and the individual design professional. Fees may or may not be applicable. It shall be the Contractor's responsibility to investigate and procure at no added expense to the Owner.
- C. PDF files shall be made available to the General Contractor for use during construction.

**14. Advanced notice of required inspections.**

The contractor will contact the architect by e-mail at [inspections@lathanassociates.com](mailto:inspections@lathanassociates.com) of the date the project will be ready for an inspection by the DCM Inspector: Pre-Roofing, Fire Above Ceiling, Final, and Year End. Special Inspections shall be required for all work of the Storm Shelters and the Fire Water Lines. Schedule well in advance to prevent delays.

- Inspections must be requested 14 days in advance.
- When the DCM Inspector confirms the inspection time, the Architect will send an e-mail confirming the inspection time and date.
- Cancellations of any scheduled inspection must be received in writing by e-mail no less than 48 hours prior to the schedule inspection. If an inspection is cancelled, it will be rescheduled subject to the DCM Inspector's availability.
- If an inspection is cancelled less than 48 hours prior to the schedule inspection, the re-inspection fee of \$1,500 will be charged.

**15. Inspection Minimum Requirements.**

The following minimum requirements listed below are provided to aid the contractors and architect in determining if a project is ready for a required inspection.

- Pre-Construction Conference
  - Required Attendees: Contractor, Owner, Architect, Major Subcontractors
  - Inspection Requirements:
    - ✓ Signed construction contract
    - ✓ Verification of payment of permit fee
    - ✓ Fire Alarm Contractor's Certification (from State Fire Marshal)
    - ✓ ADEM permit, if more than 1 acre of land is disturbed
- Pre-Roofing Conference
  - Required Attendees: Contractor, Owner, Architect, Roofing Subcontractor, Roofing Manufacturer's Representative
  - Inspection Requirements:
    - ✓ Roofing submittals must be approved by the architect prior to pre-roofing conference
    - ✓ Roofing manufacturer must provide documentation that roof design and roofing materials meet code requirements for wind uplift and impact resistance
    - ✓ Copy of sample roofing warranty
- Life Safety Inspections and Final Inspections
  - Required Attendees: Contractor, Owner, Architect, Engineers, Major Subcontractors, Local Fire Marshal, DCM Inspector
  - Inspection Requirements:
    - ✓ Fire alarm certification
    - ✓ Kitchen hood fire suppression system certification
    - ✓ Provide Smoke Machine for testing of Duct Detectors
    - ✓ General Contractor's Five Year Building Envelope
    - ✓ Emergency and exit lighting tests
    - ✓ Fire alarm must be monitored
    - ✓ Elevator Inspection completed and Certificate of Operation provided by the State of Alabama Department of Labor
    - ✓ Must have clear egress/access and emergency (for first responders) access to building
    - ✓ Must have ADA access completed

- Year-End Inspections
    - Required Attendees: Contractor, Owner, Architect, Engineers and /or Major subcontractors may also be required to attend
    - Inspection Requirements:
      - ✓ Owner 's list of documented warranty items
16. **Other inspections required before work is covered.**
    - A. Local inspectors may require a full range of inspections on this project, footings, under-slab, etc. A wall inspection will be held before any finish paints are applied.
    - B. Material Testing.
  17. **Observation report distribution.**  
Architect will submit field reports promptly to the Owner, GC, DCM Inspector. Architect will fill in all blanks on the field report form.  
(GCS 16 & MP 8D)
  18. **Record drawings, definitions of procedures.**  
G.C. is to keep all changes made in the field red lined daily. Cut and paste all addendums onto the plans at their respected locations. One clean set of plans is to be secured at the job trailer at all times for review by all interested parties. This set with changes could be used as the record drawings. Final pay approval is subject to receipt of these as-built drawings.
  19. **Project sign and other job signs.**  
State required sign is the only sign allowed on project.  
Job trailers with contractor and/or sub-contractor names are allowed.
  20. **Overall phasing of project.**  
Superintendent is responsible to plan ahead in order to avoid delays and conflicts. GC is to advise Architect on delays of critical path items. Superintendent is to be on site at all times when any work is in progress; no exceptions (GCS 6A & B)
  21. **Contractor's duty to coordinate work of separate contractor.**  
Contractors employed by others for installation of data, computer and etc. (GCS 40D)
  22. **Use of existing site, building and access drive.**
    - A. Use of existing building site for lay down is to be determined by local owner and Architect. Local owner will advise contractor on proper route to site. Material delivery times are to be made as to not interfere with the school bus schedule. Area is to be reviewed after this meeting, if necessary. Maintain traffic flow.
    - B. No workmen are allowed in existing building, unless prior approval is granted by the Owner and arranged by the General Contractor. There is to be no communication between workers and faculty/staff or students; through vocal, looks, stares or body language.
    - C. Since most projects are hard hat areas, the worker's name will be on his/her hat for identification purposes.
    - D. If a faculty/staff member or student is causing a problem with a worker, the worker is to report the incident to the Project Superintendent. The Superintendent should then report the incident to the Owner. Under no circumstances should the Worker try and handle the problem by him/herself.
    - E. There is to be no profanity on the job site.
    - F. School Lunchroom is off limits to workers.
    - G. Use of existing site, building and access drive.

- H. Workmen are expected to dress appropriately. Tee-shirts are expected to be non-offensive to all parties.
  - I. State school properties are tobacco free areas. No smoking, chewing, or dipping of tobacco products are allowed.
  - J. State school properties are drug free areas. Vehicles are subject to search and seizure by law enforcement authorities.
  - K. Firearms are not allowed on school property. Cased, uncased, loaded, or unloaded.
- 23. Use of existing toilets.**  
There will be no use of existing toilets. G.C. is to provide proper number of toilets for all workers. School telephone is off limits.
- 24. Coordinate any utilities supplied by the Owner / New equipment.**
- A. Existing sites, normally water only.
  - B. Coordination - OAC /Sub Meetings
  - C. New equipment utilities may be different than those existing utilities that the design is based upon. Coordinate with actual equipment cut sheets submitted and approved.
- 25. Coordinate outages with Owner.**  
Provide as much notice as possible. Superintendent is to verify that coolers and freezers are back on line. Coordinate with key testing date, do not disrupt on-going school operations. *Roofing fumes must be minimized with afterburner.*
- 26. Keeping existing exit paths open.**  
Required exits are to be maintained at all times.
- 27. Routine job clean up.**  
Debris is to be removed daily/weekly from building and site. Do not allow dumpster to spill over. Burning of trash on site is not allowed. (GCS 48, A & C)
- 28. Safety is General Contractor's responsibility.**  
As a courtesy, advise the Architect if there has been a problem.
- 29. Project limits.**  
Defined on drawings.
- 30. Building location relative to critical property line. Easements, Setbacks, etc.**  
Review with Architect before starting work.
- 31. Location of property lines, corners, etc.**  
Review with Architect before starting work.
- 32. Verify sanitary outfall before committing to floor level.**  
Plumber is to advise Superintendent ASAP and Superintendent is to notify Architect if there is a problem.
- 33. Procedure if bad soil is encountered.**  
Contact Architect immediately.
- 34. Stockpiling top soil.**  
On existing sites, location is to be approved by the Architect and Owner.
- 35. Protect existing trees, shrubbery, landscaping, sidewalks, curbs and etc. if intended to**

remain.

GC is to leave existing site in same condition as when project started.

*\*\*If disturbing more than 1 acre, discuss ADEM requirements.*

36. **Soil compaction, type soil, lab test, etc.**  
Testing Engineer is to approve compaction. Soil type is listed in the specs. For lab tests, refer to the specs. Testing disclosure.
37. **Soil Treatment.**  
Soil treatment provider is to come to the site with empty tank. Use on site water. Superintendent is to witness the treatment container seals broken and mix prepared. No pre-mixed material is to be brought to the site.
38. **Surveyor to check foundation wall. Location is critical.**
39. **Ready mix plant, file delivery tickets, slump and cylinder test.**  
Protect cylinders until tested. Superintendent is to have on file, at all times, the delivery tickets, slump and cylinder test results.
40. **Quality of concrete work. Concrete testing.**  
Concrete is to be free of hollows and humps. Finish floor areas are to be no more than 1/8" in 10'. Review specs for slump requirements. Do not add water to concrete without approval of Geotechnical personnel.
41. **Materials Testing / Re-testing**  
**Retesting shall be the at the contractor's expense.**
42. **Inspection before pouring concrete.**  
**Two (2) day notice is required before you pour footings.** Architect must approve all concrete placement. Pictures are not acceptable. Prior to footing inspection, all footings will be cleaned of loose soil, debris, and water. Steel is to be properly tied and supported.
43. **What is expected of masonry work, mortar additive.**  
All masonry work shall be as stated in the specs. Full head and bed bull-nose outside corners. Joints are expected on both sides of the units. Pre-formed corner tees, durowall and flashing are required. Mortar mix shall be made with same proportions everyday throughout entire project, using appropriate measuring devices. For tooling of brick or block, refer to specs. No brick or block less than a half unit is allowed at any opening. Full head weeps at 32" on center. All substandard masonry will be removed. Cull blocks; do not lay chipped blocks. Cut holes for electrical outlet boxes the proper size; caulking and oversized plates are not allowed.
44. **Pre-roofing conference. No roofing materials installed prior to conference.**  
Contractor, manufacturer and applicable suppliers are required to be present.  
Verify with DCM inspector if underlayment installation is acceptable prior to pre-roofing conference.
45. **G.C. is to have copies of all required roofing warranties in hand at the final inspection.** i.e. Manufacturers' and DCM Five Year warranty issued by the General Contractor and the Roofing Subcontractor, (which is to be dated the date of the substantial completion), or final cannot be held.
46. **Potential conflict of mechanical and electrical equipment.**  
It is the responsibility of the GC to coordinate the installation of all equipment where a conflict may occur. G.C., HVAC, Plumbing and Electrical subs are to read their sections of specs. Each foreman is to sign their section on the master copy, which is kept in the job trailer.

- 47. Problems with fire damper installations.**  
Installation of the dampers will be as shown on the plans. All other installation procedures will be unacceptable.
- A. Fire stop material; workmen must be certified to install firestop material. Firestop system must be a UL approved assembly. (See manufactures' manual).
  - B. Stencil all fire walls, both sides every 20ft.
- 48. Certificate of Substantial Completion.**  
Architect will provide at the final inspection, provided contractor has copies of all roof warranties and the fire alarm certification.
- 49. Project Closeout Procedures / Final payment.**
- A. Warranties must be effective the Date of Substantial Completion. All warranties must identify the product covered.
  - B. Operating and maintenance manuals. All training required for the MPE fields will be completed prior to the final request being released.
  - C. As-built drawings.
  - D. Other requirements. G.C. is to make a list of all over-stocks that are required by specs and have at final for B.O.E. signature and acceptance.
  - E. Final Payment. Punch list items must be completed to the Architect and DCM Inspector's satisfaction, all close out documents must be received by the Architect, all change orders must be fully executed and Certificate of Substantial Completion must be fully executed before final payment is made. (GCS, 34A & B, MP 7 G4)
- 50. Advertisement of Completion. Start ad after substantial completion.**
- A. 1 week for projects valued less than \$50,000.00.
  - B. 4 consecutive weeks for projects exceeding \$50,000.00.
  - C. General Contractor is responsible for placement and payment of advertisement.
- 51. Time Extensions.**  
The GC can submit time extension request to the Architect on a weekly basis, with reasons for extension. Delays caused by rain, must exceed the five year average. (GCS 23).
- 52. Quality Control.**  
Urinals 17" A.F.F. Flush valves at wide side. Rigid conduit under slab. Fire strobes 80" to bottom, within 15' of exits.
- 55. Requests For Information (RFI'S)**
- A. All RFI's must be numbered and made in writing to the Architect's email [rfi@lathanassociates.com](mailto:rfi@lathanassociates.com) by the General Contractor. Please include your name, company name, telephone number, and fax number so that we may respond appropriately. Verbal RFI's will not be answered. All RFI's must be in writing.
  - B. The Architect will not accept RFI's directly from subcontractors or vendors.
  - C. The Team List provided within the Specification Manual is for informational purposes only and should not be used to contact Engineers and/or Consultants directly with questions regarding the project.
  - D. All questions that need to be directed to an Engineer / Consultant must be routed through the Architect's office. If applicable, the Architect will contact the appropriate Engineer / Consultant for information.

- E. Bids shall be based upon the official Contract Documents consisting of Plans, Specifications and Addenda. Architect assumes no responsibility for information used by Contractors outside the official Contract Documents.
- F. **A RFI Log shall be kept by the Contractor and reviewed at each OAC Meeting.**  
It will be the contractor's responsibility to inform Architect of any outstanding RFI's in a timely manner.

**56. Liquidated Damages**

Liquidated damages will be strictly enforced for not reaching substantial completion by the scheduled completion date. Liquidated damages will be deducted from the General Contractors final payment.

**57. Miscellaneous:**